Conference Series No. 12

INTERNATIONAL ASPECTS OF STABILIZATION POLICIES

EDITED BY ANDO-HERRING-MARSTON

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PROCEEDINGS OF A CONFERENCE HELD IN

JUNE 1974

INTERNATIONAL ASPECTS of STABILIZATION POLICIES

Edited by Albert Ando
Richard Herring
and
Richard Marston

Proceedings of a Conference Held at
Williamstown, Massachusetts
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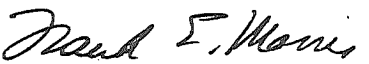
FOREWORD

The Federal Reserve Bank of Boston is pleased to publish these papers on International Aspects of Stabilization Policies presented at a conference at Mt. Hope Farm, Williamstown, Massachusetts from June 10-12, 1974. Recent developments have reinforced the importance of international interdependence and we hope that publication of the conference papers will provide valuable insight to policy makers and students in the field.

The conference was a joint effort of the Federal Reserve Bank of Boston and the International Seminar in Public Economics. The Seminar wishes to thank its continuing sponsors in various countries as well as the Japanese government whose grant permitted the participation of two Japanese scholars. We also wish to acknowledge our indebtedness to the Cochairmen of the conference, Professor Albert Ando of the University of Pennsylvania and Professor Assar Lindbeck of the Institute for International Economic Studies in Stockholm for having assembled so outstanding a group of contributors.



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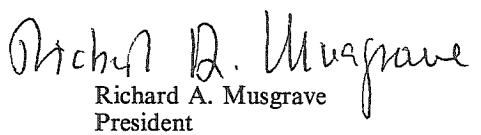

Richard A. Musgrave
President
International Seminar
in Public Economics

THE FEDERAL RESERVE BANK OF BOSTON CONFERENCE SERIES

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Introduction

Albert Ando, Richard Herring
and Richard Marston

I. Introduction

The Conference of the International Seminar on Public Economics on International Aspects of Stabilization Policies was fortunate not only because authors contributed 11 excellent papers, but also because all discussants and participants came to the conference well-prepared, and the discussion at the conference was unusually well-structured and lively. In these conference proceedings, the editors wanted to preserve in some way the spirit and atmosphere of the conference, but the obvious procedure of reproducing oral discussion at the conference from recorded transcripts proved to be impractical. We have therefore adopted the compromise solution of presenting here a fairly lengthy introduction which contains not only summaries of papers and formal discussions but also some comments by the editors. We have done our best to incorporate in our comments the essence of the discussion that took place at the conference, but these comments inevitably reflect our own biases, and the editors of this volume are solely responsible for the content of this introduction.

There is an extensive literature on stabilization problems in a "closed" economy setting. Although papers in this tradition do not ignore the external sector entirely, the usual set of assumptions are quite restrictive: export quantities and import prices are taken as exogenous, and the effects of the balance of payments on domestic monetary conditions are ignored. Thus, in these models, it is usually assumed that the government can control the domestic monetary base, or that it can set the short-term rate of interest without regard for the levels of foreign interest rates. Works of American economists are particularly rigid in this respect, mostly because the closed economy model seemed to provide an adequate description of the U.S. economy until recently.

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On the other hand, the international economic literature on stabilization problems in an "open" economy setting often spells out more or less explicitly how the effects of stabilization policy depend upon external relations of a country: whether the exchange rate is fixed or flexible; whether movement of reserves can be sterilized or not; to what extent foreign goods compete with domestic production and so on. But these models are generally not well suited for empirical work because they contain too simplified a description of the domestic aspects of the economy, making it difficult to establish the correspondence between variables used in these models and available data. In addition, they are usually formulated as completely static models, making their correspondence with data even more remote. While these models are helpful in providing a framework for evaluating in qualitative terms the effects of alternative policies, they provide no precise quantitative information, and often even the qualitative results become questionable once the models are broadened to admit more complex forms of behavior.

As the trade and financial links among countries in the world became stronger through the 1960s, a host of policy questions that used to be of mainly theoretical interest have gradually assumed practical importance, even for a "closed economy" like the United States. Thus, it is now of utmost importance to know how an economic disturbance in one country will affect both that country *and* other countries, taking into account the trade and financial linkages between these countries. And it is important to know how stabilization policy in one country will alter the effectiveness of stabilization policy in another country. The monetary policy pursued in Germany, for example, may be an important factor in determining the effectiveness of fiscal stabilization policy in France or in any other country with close ties to Germany. For these types of questions, the traditional models described above provide few useful answers.

Some efforts to deal with these increasingly important questions have emerged recently. On the empirical side, two very large-scale efforts stand out among others. One is the so called "LINK" project, which combines econometric models for most of the countries of the world in one interdependent dynamic system which describes the behavior of the world economy. While the project is of enormous scale and has not yet been developed to the satisfaction of those directly involved, it has already yielded a number of useful results, some of which will be reported in this volume.

The second is the work of John Helliwell and his associates in Canada to link up the RDX2 Model of Canada and the MPS Model of the United States. While this work confines itself to only two countries, the models involved, particularly the RDX2 Model, have much more elaborate trade and financial sectors which provide considerable insight into the channels through which the two economies are linked with one another. Other projects, though smaller in scale, have also made significant contributions in this area.

On the theoretical side, progress has been less dramatic, although recent studies have dealt with specific aspects of stabilization problems in the international context, such as those of Branson and the Scandinavian School of economists which are represented in this volume. This pattern of fairly rapid progress in empirical work and the slow evolution of theoretical formulation is not surprising. Analysis of stabilization policies in an international context involves questions of the dynamic behavior of a very large system, and until we learn to summarize the essential features of this large system in relatively small models, theoretical development in this area will be limited. Before we can attack general propositions, we must be able to describe the large system itself in some detail, and the empirical work cited above and others similar to them may be thought of as attempts at such a detailed description. But in order for such a detailed description to be acceptable, every component of the large empirical model must have a sound theoretical basis. Thus further progress in analyzing international stabilization problems depends upon the interaction between theoretical and empirical work in this area.

The Conference on International Stabilization Policy, the proceedings of which are reported in this volume, brought together two groups of economists: (1) econometricians who have developed empirical models for analyzing stabilization policy in individual countries and who are attempting to integrate such models for analyzing stabilization problems in an international context, and (2) international economic theorists who have focused on the analysis of stabilization policy in open economies. The conference was organized in the hope that these two groups would engage in a mutually beneficial dialogue. In particular, it was hoped that the econometricians would benefit from a critical review of the theoretical structure of their work by theorists, and that the theorists would benefit from an assessment of the empirical implication of their work by econometricians. The participants felt that the conference was successful from this point of view, and it is hoped that readers of this volume will find the papers and discussions contained in it to be both useful and stimulating.

This volume contains 11 papers and discussions, divided into three groups. The first group consists of papers by Branson, Gelting, Fleming, and Dosser, which are more or less theoretical in nature. The second group consists of papers by Klein and Johnson, Hickman, Helliwell, and Waelbroeck and Dramais. Each is based on econometric models of national economies linked together to represent an international economic system, and the behavior of these linked economies are studied by numerical, simulation analysis. The third group of papers, those by Behrman, Bajt, and Tatemoto are special studies of stabilization problems in institutional contexts that are less familiar to American and West-European economists; less developed countries, East-European socialist economies, and Japan.

In the remainder of this introduction, we will provide very brief summaries of the papers, and some comments on them by the editors of the volume.

II. Theoretical Studies

In a series of recent papers, Branson has attempted to analyze the impact of monetary and fiscal policies on balance-of-payments conditions in a model where the portfolio behavior of wealth holders affects the capital account of the balance of payments. In his contribution to this volume, Branson expands on his earlier work, and develops a model of an open economy which incorporates both the stock-adjustment view of capital flows and an endogenously determined real sector. Employing an expanded IS-LM framework, he analyzes the impacts of various shocks to the economy on both the flow and stock equilibria.

Branson finds that once the real sector is treated endogenously some of the impacts of monetary and fiscal policy on capital flows become ambiguous. For example, an expansionary fiscal policy will yield a stock-shift capital inflow, but the sign of the continuing-flow effect is unclear. If there is a negative transactions demand for foreign securities, the sign of the stock-shift effect of monetary policy on holdings of foreign securities is in principle ambiguous, but the sign of the continuing-flow effect is clear. Branson also notes that if there is an asset which is not internationally traded, monetary policy will be an effective tool for stimulating or depressing the level of aggregate demand.

In his comment on Branson's work, Giorgio Basevi regrets that Branson did not model the impact of foreign interest payments on the current account. He notes that the induced impact on interest payments has been shown to be an important factor in determining the net balance-of-payments impact of various policies to influence capital flows, and thus should not be neglected. Basevi also urges that Branson incorporate the wealth impact of exchange rate changes and a mechanism for determining the market value of the real stock of capital. Finally, Basevi argues that Branson should specify a transactions demand for foreign assets analogous to the transactions demand for money, in which the demand for foreign assets depends, in part, on the volume of external transactions.

Branson's formulation and his results are highly suggestive, and should provide a starting point for anyone attempting to analyze stabilization problems in the international context. Much more work will be required, however, if such a model is to be used as a guide for the econometric modeling of integrated economies. One of the most critical problems to be faced concerns the dynamic adjustment process, for which the theory as developed by Branson offers little guide. Based on past experience, empirical estimation of such adjustment processes in models involving international capital transactions will prove to be particularly difficult.

The central concern of Gelting in his contribution to this volume is the *direct* influence of prices of goods and services abroad on the domestic prices of a small, very open economy. This linkage is quite distinct from that associated with the general demand pressure, and has been the subject of investigation by Scandinavian economists in recent years. In

the model studied by Gelting, the prices of traded goods are determined in the international market, and wages in *both* exposed and shielded sectors of the economy are determined by prices and productivity in the *exposed* sector. If productivity grows faster in the exposed sector, then prices in the shielded sector will rise through time inducing adjustments in domestic absorption of tradeable goods and a deterioration of the balance of trade. Fiscal expenditure policies whether directed at the exposed or shielded sectors will likewise lead to a deterioration of the balance of trade. Gelting concludes that the model implies a natural level of unemployment, determined by the rate of productivity growth and the rate of inflation imported from abroad.

To investigate the role of capital mobility in such open economies, Gelting introduces a simple two sector model and analyzes the effects of monetary and fiscal policy on employment and prices. His analysis suggests that an increase in fiscal expenditure on the shielded sector output is more effective in raising total output than increased expenditure on the exposed sector output, and more effective under flexible than fixed rates (since monetary policy does not have to be directed toward maintaining external balance). Gelting concludes with a brief analysis of the harmful effects of prolonged inflation in an open economy, including a discussion of the distorting impact of nominal income taxation on the returns from financial and real assets.

In his comment, Stanley Black points out that Gelting's model can be more accurately described as a monetarist than a structuralist model in the Scandinavian tradition. The cost functions for traded and nontraded goods depend not on wages and productivity but on the quantity produced as in the neoclassical theory of production. Black would prefer a full employment model with flexible wages, or one in which a Phillips curve relationship explains wage changes as a function of both unemployment and productivity growth.

There were a number of comments on Gelting's paper from the floor, some of which are recorded here. Basevi and Waelbroeck suggested two conditions in which the application of Gelting's model would be inappropriate. First is the case in which domestic producers of exportables have sufficient oligopoly power to impose discriminating prices in foreign and domestic markets for their products. Second is the case in which there is substantial international mobility of labor so that, even though industries producing non-traded goods may be shielded from price competition with foreign goods in output markets, they may nonetheless be competing with foreign producers for internationally mobile labor. Musgrave called attention to some ambiguities of the differential impact of the tax system under inflation. He pointed out that, since the personal income tax is usually progressive, and the same nominal income is paid to all lenders, lenders in higher tax brackets will lose relative to lenders in lower brackets. In addition, since the tax system normally allows depreciation only at the original cost and fails to allow for increases of replacement

costs under inflation, the effective rate of tax on equity capital is increased. Hence, it is not obvious which type of capital (debt or equity) is discriminated against under inflation in existing tax systems.

Marcus Fleming* presents an analysis of the stabilization implications of recent proposals to reform the international monetary system. He focuses on three aspects of the proposals sketched in the June 1974 Outline of Reform: (i) international liquidity; (ii) adjustment to long-term external imbalance; and (iii) adjustment to short-term external imbalance.

Fleming suggests that academic economists may have attached too much importance to the impact of increases in the stock of international reserves on national demands for goods and services. He asserts that the more important impact is likely to be a reduction in the extent to which trade and capital controls and exchange rate variations are used to deal with short-term payments imbalances.

Fleming notes that most of the discussion regarding long-term imbalances focuses on how to improve the adjustment process for the major reserve currency country, the United States. He explains that this problem has two essential features: (i) how to make sure that the United States is not absolved from making adjustments by its ability to finance its deficits through expansion of reserve liabilities to other countries, and (ii) how to prevent other countries from frustrating changes in the dollar exchange rate by continuing to peg their currencies against the dollar. More generally, he notes that various reform proposals seek to ensure that countries in fundamental surplus adjust their exchange rates as readily as countries in fundamental deficit.

Fleming's analysis of the problem in adjusting to short-term external imbalance is an extension of his pathbreaking work on the impacts of monetary and fiscal policy in an open economy. Fleming examines the impacts of three different policies directed at temporary external imbalances — reserve financing, capital controls and flexible exchange rates. He asserts that the ideal policy: (i) would disperse domestic demand disturbances widely over many nations; (ii) would shield the domestic economy by offsetting external shifts in demand; and (iii) would maximize the domestic impact of changes in monetary and fiscal policy. Under these criteria Fleming concludes that, for countries with a high degree of capital mobility, floating rates are the best policy for dealing with short-term imbalances.

In his comments on Fleming's paper, Peter Kenen suggests that Fleming should have focused more on the impacts of various reform proposals on the trade-off between unemployment and price stability. Kenen believes that we need to know much more about how the choice of exchange rate systems influences price stability in order to evaluate various proposals for reform. With regard to the stabilization implications of the stock of international reserves, Kenen maintains that the salient point is

*Mr. Fleming was unable to attend the conference. His paper was summarized by Professor Kenen.

not so much the *size* of the stock, as *how* additional reserves are created. Increases of international reserves which stem from the U.S. balance-of-payments deficit lead to increases in commercial bank reserves in the corresponding surplus countries, while increases due to a rise in the monetary price of gold or new issues of Special Drawing Rights do not affect domestic liquidity directly. The former means of reserve creation may lead to internal inflationary pressures while the latter need have no impact on domestic stabilization policies. Finally, Kenen takes exception to one of Fleming's criteria for evaluating policies toward short-term external imbalances. He does not think that one should prefer policies which would spread out domestic instabilities to foreign partners. Moreover, he notes that this criterion is necessarily inconsistent with the desire to maximize the domestic impact of stabilization policies.

Richard Herring notes that econometric evidence for the Canadian economy suggests that an assumption of low capital mobility may be more appropriate than Fleming's assumption of high capital mobility for the short-run analysis. He shows that under the former assumption, Fleming's results regarding domestic demand disturbances and policy changes are reversed. In addition, he shows that Fleming's short-run analysis is inconsistent with the stock-adjustment view of capital flows and that it therefore may lead to questionable results in analyzing floating exchange rates.

Emil-Maria Claassen sets out a monetarist model to analyze policies toward short-term external imbalances as an alternative to Fleming's Keynesian model. He finds that Fleming's results are reversed completely under monetarist assumptions.

In a rejoinder, Fleming asserts that Claassen's results differ only because he has examined a different problem. Fleming analyzed an autonomous change in investment, while Claassen focused on an autonomous change in liquidity preference.

The paper by Dosser is quite different from the three preceding ones in that he analyzes the stabilization problems which arise when national governments agree to share stabilization responsibilities with a supranational entity. This is a largely unexplored aspect of stabilization policy. Simply to define the optimum degree and form of policy coordination proves to be a very complicated problem. Dosser focuses on the coordination of tax systems in the European Economic Community where both the central authority (EEC Commission) and national authorities share powers of taxation.

In abstract theory, there is a presumption in favor of complete unification of all tax systems under the control of the central authority inasmuch as this arrangement may be expected to yield the most efficient allocation of resources. But the political reality is that each national government still retains the ultimate responsibility for its own citizens' welfare. Thus, under conditions in which external shocks, unemployment and other cyclical problems may have very different national impacts, it is natural that each country wish to retain some measure of autonomy in its

stabilization policies. Thus, a number of questions immediately arise. Which taxes should be controlled by the central authority, and which others should be retained by national authorities? Should national authorities be free to design taxes under their complete control or should they be required to adhere to the specific form of taxes, being free only to determine the rates? Should there be coordination in the use of these taxes among countries and the central authority, and if so, to what extent?

The decisions on these questions are gradually being made by members of EEC with or without careful analysis, and to a lesser extent, by all countries of the world. In his paper Dosser speculates on how the detailed arrangements are likely to develop within the EEC, and presents an agenda for research to analyze the consequences of such developments on the effectiveness of stabilization policies in the EEC.

In their comments, Cooper and Corden analyze the problem of coordination of stabilization policies from a somewhat different, and more abstract framework. Corden identifies the conditions under which coordination of stabilization policies is necessary among countries. Corden concludes that maintenance of fixed exchange rates is the most important single factor making the coordination of stabilization policies necessary. Cooper reviews his own past work in the context of recent experience and Dosser's speculation of how events are likely to unfold in the EEC. Cooper concludes that if monetary unification is a serious objective, then it implies fixity of exchange rates and hence the strict harmonization of national monetary policies. If this step is taken before free and easy movement of labor among member countries is assured, then, in the short run, it is important that each country be left free to use national fiscal policy for countercyclical purposes. Over the course of time, the national economies will become more closely linked through markets for goods and services, and conventional fiscal policies for each country will become less and less effective, thus necessitating more and more reliance on regional policies of tax incentives and subsidies. Eventually, it will become necessary to coordinate these regional policies because otherwise the income distribution will become very skewed in favor of the mobile factors of production for which different regions are competing.

III. Econometric Studies

Papers in this part are all based on analysis of national econometric models linked together into an integrated system, although there is a substantial diversity among the systems used by four sets of authors. Papers by Johnson and Klein, and by Hickman are based on the "LINK" system. This system integrates 12 structural models of the principal industrial economies and several smaller regional models to form a single system simultaneously determining output and trade levels in every country. Helliwell reports an analysis based on the system which links the RDX2

Model of Canada and the MPS Model of the United States, while Waelbroeck and Dramais analyze a system consisting of fairly small, symmetric models for EEC countries.

The reliability of any conclusion that one may obtain by working with these systems, then, depends on two factors: the ability of individual country models to approximate the behavior of the domestic economies individually; and the accuracy with which the linkages among countries are depicted in these systems. Models for some major individual countries have been in existence for some time, and their strengths and weaknesses are understood reasonably well. On the other hand, some of the country models, and especially the ways in which international linkages are described in these models, are comparatively new; their reliability under a variety of conditions has not been reviewed as thoroughly as, for instance, models for the United States and for Canada. For these reasons, with the exception of Helliwell's paper which is based on the coupling of two well-tested models, the results reported in this part of our conference should be viewed as still experimental in nature.

Johnson and Klein begin their paper by providing an informative discussion of simulation techniques for large-scale econometric models. The simulation experiments using the LINK system shed light on two different issues: (a) the effect of integrating a set of national models into a global one, and (b) the effects of changes in the "conditions of international trade." The authors discuss how different the results of national simulations can be when international repercussions are taken into account (through linkage mechanisms). Using the integrated system, they then analyze the effect of changes in international "conditions" on income, prices and trade in each country. The set of experiments conducted include changes in exchange rates, raw material prices, domestic wage rates, and restrictions on the supply of oil.

Anton Barten, commenting on the paper by Johnson and Klein, lists a number of questions for which a system like LINK may provide answers. He then reviews the results of experiments reported by Johnson and Klein, and attempts to assess their reliability by comparing them against his own expectation of how the present international economic system is likely to behave. He finds that, in general, the results obtained from LINK make the world economy more stable than he expected, particularly in its price behavior. We shall comment on this point a little later in connection with the paper by Hickman.

In a second comment, Alan Peacock wonders how the results of Johnson and Klein, and of Hickman would be altered if reactions of economic policy-makers of individual countries to external and internal conditions are explicitly taken into account. In their reply, the authors accept Peacock's suggestion as a possibility in future experiments, pointing out that it presents no technical difficulty.

There was lively discussion on this paper from the floor, some of which is recorded here. Barten observed in his comment that exchange

rate policy does not influence the balance of payments very much in the long run because prices and wages adjust to exchange rate changes. To Lindbeck, this implied that exchange rate policy is an effective way of influencing domestic prices. Lindbeck also disagreed with Barten's formulation that flexible exchange rates lead to a retreat in the internationalization and integration process. Lindbeck thinks of flexible rates as a method to sustain integration of markets with a minimum of integration of policies. Stanley Black observed that the effectiveness of exchange rate changes on the balance of trade must depend on the accompanying monetary and fiscal policies, and that the LINK simulations reported by Johnson and Klein, and Hickman, assumed a *neutral* monetary and fiscal policy. If the accompanying monetary and fiscal policy is more supportive, as it is likely to be in realistic situations, the effectiveness of exchange rate changes on the balance of trade should be greater.

Bert Hickman in his contribution analyzes the international transmission of income and prices using the LINK econometric model of the world economy. Hickman uses the system to calculate own and cross country income and price multipliers associated with changes in exogenous expenditure. The calculations yield a more variable response of prices, leading to a somewhat surprising result that in general the international propagation of price movements is weaker than that of real income.

The principal channel through which price changes are transmitted from one country to another within the LINK system is via foreign trade in merchandise. Hickman himself, and others at the conference, thought that, if there is any downward bias in estimates of the strength of international propagation of price movements, the major reason for it is the absence of the monetary linkages between countries in the current LINK system.

There were others at the conference, including the present editors, who thought that there is another serious source of downward bias in the results reported by Hickman. Hickman chose to use the implicit deflator of gross national product or of gross domestic product as the main indicator of prices. These deflators are perfectly valid indicators of prices in their proper role, but they are not well-suited for the measurement of international transmission of price movements because they are price indices of the value added. As the definitions in the Appendix to Hickman's paper show, the prices of imports are netted out of the value-added price index. Hence import prices cannot have a direct impact on the GNP deflator. In some larger, more elaborate models in the LINK system, such as the one for the United States, the GNP deflator and the price index of final goods are clearly distinguished from one another. In these cases, usually, the price index of final goods is explained as a function of the price index of some value-added quantity, and the price of raw materials. This is an acceptable procedure provided that extreme care is used in both estimation and simulation, since it is well known that in this formulation

downward biases can easily be introduced in the estimation of the impact of prices of raw materials and other imports on the final goods prices. It is quite possible that results reported by Hickman are subject to bias from this type of problem.

It may be noted that the results reported by Waelbroeck and Dramais using their Desmos model, in which monetary linkages are also neglected, indicate that the transmission of price effects is stronger than the transmission of income effects. In the Desmos model, the representative price is a consumer price index rather than the GNP deflator, although one still suspects that the statistical estimates of the price equations are subject to biases discussed in the preceding paragraph. Since the LINK system contains a far larger number of countries than the Desmos model, the comparison is not very meaningful, but it is mildly suggestive, and reinforces our impression that the estimates of international transmission of prices reported by Hickman are probably biased downward.

In his contribution to this volume John Helliwell joins together and simulates two of the most fully articulated national econometric models: the RDX2 model of the Canadian economy and the MPS model of the U.S. economy. Helliwell describes a series of simulation experiments tracing the effects of stabilization policies (usually changes in government expenditures) initiated in either country or macroeconomic variables in both countries. Several of the simulation experiments are designed to demonstrate the relative importance of the three principal channels by which stabilization policies are internationally transmitted: trade flows, capital flows, and migration. Helliwell's results indicate that U.S. fiscal policy does have substantial effects on Canadian variables and that these effects vary depending on which channels of transmission are operative during the particular simulation experiment. In contrast, Canadian fiscal policy is shown to have rather small effects on U.S. variables.

Helliwell finds that in both the United States and Canada, monetary policy has a strong comparative advantage over fiscal policy in dealing with the balance of payments. This comparative advantage holds over the entire eight-year simulation period even though portfolio adjustment effects and induced interest and dividend payments are taken into account.

In his comment on Helliwell's paper, Stephen Goldfeld warns that some of the simulation results for the United States may reveal more information about the econometric model than the U.S. economy due to the rudimentary state of the international sector of the MPS model. On the other hand, he finds that the implications about the structure of the Canadian economy seem more plausible due to the comparative richness of the foreign sector in the RDX2 model. Goldfeld urges that Helliwell shift the historical period for simulation in future experiments in order to determine how sensitive the results are to the period simulated. He notes that in nonlinear models the multipliers may vary widely in different historical contexts.

Lawrence Klein commends Helliwell's simulation experiments for their careful design and makes several suggestions for additional studies. Klein proposes that in future work the two models be linked in long-run simulations. He also suggests that experiments be designed to estimate the effects on Canada and the United States of several of the special factors which influence the bilateral balance of payments such as the Interest Equalization Tax, EXPO, the U.S. draft provisions during the Viet Nam War, and the automobile trade agreement.

As indicated earlier, in contrast to the preceding three papers, Waelbroeck and Dramais base their results on simulations of a system of models of nine EEC countries which have been especially constructed to insure simple and symmetric specifications across all countries. Even so, their system contains 258 equations, indicating how easily an econometric model encompassing several countries can reach enormous size.

The model, Desmos, may be broken into four blocks of equations: a factor demand block, an income and expenditure block, a wage-price block and a trade linkage block. The factor demand block is noteworthy for its use of the Hickman-Coen technique to enforce consistency in estimation of capital and labor demand functions with the underlying production function. And the trade linkage block incorporates a refinement of the Hickman-Lau technique for explaining export market shares by including relative capacity utilization and relative production capacity as additional explanatory variables.

Waelbroeck and Dramais report simulation experiments showing the impacts on macroeconomic variables in the EEC of changes in the exogenous components of aggregate demand and of changes in exchange rates, interest rates and labor migration. There appear to be strong interactions among macroeconomic variables in each of the countries, and despite the underlying symmetry of specifications, each country demonstrates an individualized pattern of responses to exogenous shocks. Waelbroeck and Dramais conclude by showing how their model could be used to help negotiators from the nine EEC countries coordinate national policies to achieve common goals.

Keith Johnson suggests that the specifications of Desmos may be too simple to represent adequately the impacts of monetary and fiscal policy. In view of experience with the LINK models, he is especially skeptical about the way in which tax and transfer policies and the distribution of incomes between wages and profits are implicitly lumped together in the equation determining disposable income.

Johnson also questions the use of a capacity measure in the export share equations inasmuch as Waelbroeck and Dramais have assumed that capital is both variable and malleable in the short run. He notes that under these conditions, the traditional justification for defining capacity output by evaluating the production function at full employment with the capital stock fixed is no longer meaningful. Finally, Johnson warns that the analysis of the "controllability" of the Desmos model, which relies

solely on the signs of the policy multipliers, may be seriously misleading. He reworks the analysis assigning typical orders of magnitude to the policy responses and reaches different conclusions than did Waelbroeck and Dramais concerning the impacts of combinations of policy instruments.

Large scale econometric studies covering more than one country and linkages among them have a very short history. Those who are engaged in these studies face much more formidable difficulties than those who are working with national models not so much because of the size of the system but because of uneven availability of data and unsettled conceptual problems. Three of the four papers presented in this part of the volume reflect this state of the art and despite enormous skill, ingenuity, and hard work on the part of authors, the reliability of the results of these studies are somewhat less than the comparable results obtained from national models.

The exception to this statement is the paper by Helliwell. There are three basic reasons why his paper is an exception. Helliwell began his work with two models which are not only better articulated and tested than many others and have more careful specification of financial sectors, but are rather similar in their general conceptual framework. Second, the data bases for the United States and for Canada are more broadly compatible with each other than for any other pair of countries. Third, for these countries it has proved feasible to formulate monetary sectors which take into account the most important international monetary linkages. In the case of the U.S. economy, it has been generally possible to sterilize external flows of capital, and control domestic monetary and financial conditions. Conditions in the United States, in turn, have tended to dominate monetary and financial conditions in Canada, so the two economies can be treated as a single system largely independent of the rest of the world. In the RDX2 model, Helliwell and his associates have formulated an elaborate financial sector to incorporate linkages between the U.S. and Canadian economies. Thus, in contrast to the other studies, Helliwell's study has succeeded in explaining national monetary conditions by explicitly treating monetary linkages between the countries in his system.

Even with these special advantages, it was a formidable task for Helliwell and his associates to bring the coupled system to the stage where it is functioning as well as it is. That they have been so successful is a clear indication that it is possible to perfect linked econometric models of several countries to the level where conclusions based on them are as reliable as those from the best national models. We are all well aware of the difficulties and uncertainties associated with numerical estimates of the behavior of an economy based on an econometric model, even a very good one like RDX2. Subject to the same difficulties and uncertainties, the day when we shall be using these linked econometric models for stabilization purposes will not be too far away.

IV. Special Case Studies

The papers in preceding parts of this volume are primarily concerned with western industrialized countries, although the LINK system includes

less developed parts of the world and the socialist countries in a somewhat cursory manner. Some would contend that this focus on western industrial countries is entirely appropriate arguing that socialist countries with central economic plans do not have economic fluctuations, and that the problems of less developed countries are not those of cyclical fluctuations but of production bottlenecks and supply constraints. While there may be some truth in these propositions, the reality cannot be quite as simple as it suggests. Unless the central planning is absolutely perfect, and capable of responding to all unforeseen contingencies effortlessly, there will be occasions, even in centrally planned economies, when the production and final demands do not match. And certainly less developed countries must also experience difficulty in managing the level of final demands in such a way as to utilize fully the available resources and to maintain external balance. In what follows, Bajt and Behrman examine the nature of short-run economic fluctuations and policies to deal with them in centrally planned economies and less developed countries, respectively.

Aleksander Bajt investigates patterns of instability in the socialist countries through a series of quite distinct analyses. His first analysis centers on the question of which sectors in the socialist economies are responsible for generating medium-term cycles. He concludes on the basis of correlations between the rates of growth of investment and sectoral output that most instability arises from investment cycles generated by the planning process itself. The investment cycles, however, have declined in importance as planners have gained experience over the past two decades. The second analysis deals with short cycles, especially in Yugoslavia, which according to Bajt have been less important in the socialist economies than in the west. Finally, in the last section, the author tests a theory for the Yugoslav wage structure explaining intertemporal movements in relative wages across industries. The last analysis bears on the question of wage inflation in the socialist countries.

In his discussion of this paper, Richard Portes points out that the author has failed to discuss stabilization policy as it relates to economic relationships between socialist countries. Portes notes that the foreign trade sector may be important in transmitting fluctuations in expenditure from one country to another.

Jere Behrman observes that previous analyses of less developed economies have focused more on questions of growth than on short-run stabilization problems. In view of the difficulties which stabilization problems pose for the LDCs, however, interest recently has grown in the design and use of stabilization models analagous to those designed for developed countries. Behrman outlines the basic building blocks of a short-term macroeconomic model, comparing each sector within the model to its counterpart for a developed country. He shows that the determination of wages and employment is different in economies with both traditional and modern sectors, and that the investment and government sectors have distinct characteristics in economies with substantial foreign and public sectors. Finally, he emphasizes the potentially destabilizing role which the

foreign sector can play in economies dependent on critical raw materials, intermediate goods and capital imports.

Hansen criticizes Behrman for suggesting that the focus of aggregate demand stabilization is in the modern sector. Countries at the pre-industrial level may experience severe stabilization problems leading to inflation and balance-of-payments difficulties. With regard to the larger question of designing models for the less developed countries, Hansen suggest reliance on Walrasian-type models of individual markets where hard data exist in preference to the aggregate macro models common to developed countries. The Walrasian models permit more detailed specification of the manner in which policy instruments or exogenous disturbances affect the individual markets.

Japan is a special case. The structure of its economy and the government policies guiding its development appear to be different from those for other industrialized countries and are not well known to economists in the United States and Europe. Yet, because it is very large and it has grown very much faster than other countries, the impact of the behavior of the Japanese economy on world economic conditions is very substantial, creating an impression that some of the instability of the world economy before the Arab oil embargo was caused to some extent by the behavior of the Japanese economy.

Tatemoto* attempts to clarify the role played by the Japanese economy in the world and in particular the implications of the economic policies of the Japanese government on world economic conditions by reviewing the development of the 1960s. Tatemoto asserts that macroeconomic policy in Japan is better characterized as growth policy than as stabilization policy inasmuch as monetary and fiscal policy have been employed largely to affect the long-run growth path of the economy rather than to minimize fluctuations around the growth trend. In general, Japanese policy-makers have pursued an "easy money with surplus budget" policy, with occasional alterations in monetary policy to correct an external payments imbalance.

Tatemoto maintains that it is not very useful to distinguish between export- and investment-led growth in the Japanese context. He notes that, although part of investment was induced by exogenous shifts in export demand, a considerable amount of investment reflected a government policy of attempting to anticipate growth in export demand. Thus Japanese exports and investment are fundamentally interrelated.

Tatemoto rejects the notion that rapid Japanese growth was a cause of world economic instability observing that the total elasticity of Japanese exports with respect to import demand in the rest of the world is exactly twice the eleasticity of Japanese imports with respect to Japanese GNP. Thus, he concludes that Japan's large balance-of-payments surplus after 1968 was due to an *insufficiently high* Japanese

*Professor Tatemoto was unable to attend the conference. His paper was summarized by Mr. Krause.

growth rate (or to an excessive growth in import demand in the rest of the world). Although he faults Japanese policy for not having revalued the yen sooner, he asserts that it should not be criticized for stimulating excessively rapid growth.

In his comment on Tatemoto's paper, Lawrence Krause suggests that the Japanese government's consistent underestimate of the growth rate was itself a means of increasing the growth rate. Because the official estimates were used to estimate tax revenues for the purpose of balancing the budget, the government, in fact, was able to accrue a surplus which could be distributed as investment incentives to encourage growth. From an examination of the behavior of export prices, Krause concludes that Japanese growth *was not* export-led from 1960-68, but that it was export-led from 1968 through 1971 when the Vietnam-induced price inflation in the United States may have been the dominant factor. Krause closes by questioning whether the elasticity of Japanese exports with respect to import demand in the rest of the world should be regarded as a fixed parameter. Regarding it as endogenously determined, Krause asserts that investment-led growth and the consequent expansion of industrial capacity yielded the high Japanese export elasticity. In this sense, Krause believes that while the rapidity of Japanese growth may not have been a cause of world instability, the unbalanced structure of Japanese growth may have been a destabilizing factor.

With regard to export-led growth versus investment-led growth, Akihiro Amano suggests that the multiplier impact of a change in investment expenditure is smaller than that of an equal change in export demand in a fixed exchange rate system. He notes that this is especially true in Japan where empirical estimates indicate that the long-run export multiplier is several times larger than the investment multiplier. Amano suggests that the most serious problem Japanese growth has caused for the rest of the world has been one of the adjustment to payments imbalances. He believes, however, that greater exchange rate flexibility will reduce adjustment costs and enable the rest of the world to better share the fruits of Japan's rapid economic growth.

There are many questions of international economic stabilization policies which none of the papers in this volume addresses, and even for those questions with which this volume is concerned, no participant at the conference would claim to have definitive answers. Nevertheless, by bringing together several diverse strands of research activities, all of which are aimed toward the ultimate objective of more effective stabilization of international economic activities, we hope that this volume will provide some perspective of where we are, and that it will serve as a useful guide for economists and policymakers in highlighting where work is most needed in order to improve the performance of international stabilization policies.

Stocks and Flows in International Monetary Analysis

William H. Branson*

I. *Introduction*

The model of international capital movements as a stock-adjustment phenomenon has become common in the international economics literature since the mid-1960s. This view was implicit in the early work of Mundell (1963), and has since become explicit in the work of Khouri and Porter (1972), Girton and Henderson (1973, 1974), and Herring and Marston (1973), to cite only a few examples. Early econometric work using the stock-adjustment view took income and interest rates as given and determined capital movements endogenously. Examples of this are Branson (1970), and the studies cited there. More recent studies, both theoretical and empirical, have included interest rates as endogenously determined, with the "real" sector of the economy and monetary policy variables taken as exogenous. Examples of this are the two-author papers cited just above. In this paper I build the stock-adjustment view into a simple theoretical model with the "real" sector endogenous, studying flow and stock equilibria in an ISLM model with foreign assets.

At any point in time, the allocation of a given wealth portfolio across foreign and domestic assets is a stock equilibrium problem. If a variable exogenous to this problem changes, it creates a stock adjustment as the portfolio is rebalanced. In addition, the change may alter the rate of accumulation of foreign assets, which is the allocation of saving to these assets. Thus a change in an exogenous variable will have a "stock-shift"

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*This paper is an extension of Branson (1972, part III), which was written during my 1972-1973 visit to the Institute for International Economic Studies, Stockholm University. I am indebted to my colleagues there for helpful comments.

effect as existing portfolios are rebalanced, and a "continuing-flow" effect, as the flow of saving into foreign assets is altered. Most of the existing literature has studied the stock-shift effect; there has been little analysis of the continuing-flow effect, presumably because the flow of saving depends importantly on the real sector. The signs of the two effects are not necessarily the same, as this paper shows. For example, an increase in "the" foreign interest rate (or world rate in a small-country model) will cause a stock-shift capital outflow as domestic portfolio balancers buy foreign securities. But the subsequent rise in domestic interest rates may reduce income and saving sufficiently that the continuing rate of accumulation of foreign assets is reduced. This is the type of paradoxical result that appears when the "real" sector is endogenized.

In section II below I describe a three-asset "textbook" ISLM model with trade and a fixed exchange rate. I include a non-traded domestic asset, "equities," both for realism and for interest. Without any degree of freedom for domestic interest rates there is no story to tell. The instantaneous-flow equilibrium solution of the model, with all stocks held constant, is summarized in Figure 1 and Table 4 of section III, which shows the effects of changes in exogenous variables on instantaneous-equilibrium values of the domestic interest rate r_k, income y, and holdings of foreign securities S. These are stock-shift effects.

Continuing-flow effects on capital movements, and implications for the balance of payments in instantaneous equilibria are discussed in section IV. Table 6 in section IV summarizes stock-shift and continuing-flow effects of monetary and fiscal policy. In section V the movement of the instantaneous-flow equilibrium to a full stock equilibrium is discussed. This section is an extension of the results in Blinder-Solow (1974) and Branson (1974b) to an economy with trade and capital movements. Finally, in section VI extension to a flexible-rate system is discussed.

The principal results of the analysis are the following.

1. With a non-traded asset in the system, monetary policy in an open economy has an effect on the rate of return on domestic assets in the short run, and can be used to stimulate or depress output.

2. An increase of a given amount ΔH in the monetary base by the Central bank in an open economy leads to a smaller increase in holdings of foreign securities in the short run: $\Delta S < \Delta H$. Thus not all of the monetary expansion flows out through the balance of payments.

3. With the real sector endogenous *and* a negative transactions demand for foreign securities, the *sign* of the stock-shift effect of monetary policy on holdings of foreign securities is in principle not clear, but the sign of the continuing-flow effect is clear.

4. An expansionary fiscal policy action will yield a stock-shift capital inflow (sales of S), but the sign of the continuing-flow effect is unclear.

The model studied here has a long-run stationary equilibrium and a constant (exogenously fixed at 1.0) price level with real output y free to adjust along an infinitely elastic supply curve. This corresponds to

Friedman's (1970) characterization of "the" Keynesian model.[1] I would rather describe it as an analysis of equilibrium on the demand side of the economy with a given price level. A further step in the analysis would be to introduce a supply side and price flexibility, and to study a full equilibrium model. It would be trivial to assume a positively sloped supply schedule $P = P(y)$, $P' > 0$ and go through the results obtained here adding price terms and then substituting them out using $dP = P'dy$. On the other hand, introducing a complex price expectations mechanism would greatly complicate an already difficult problem.[2]

II. *A Three-Asset Model with Trade and Capital Movements*

The model studied in this paper begins with a "textbook" ISLM specification with asset equilibrium (LM) equations that extend the analysis of Metzler (1951) and Tobin (1969) to include a foreign asset, and a commodity-flow (IS) equation that includes foreign trade. There are three assets in the model: money M, capital K, and foreign securities S.[3] Since I want to discuss open-market operations in this framework, I follow Metzler in assuming that there exists a stock of equities that are the ownership rights to the capital stock K, and that the ownership of this capital stock is distributed between the private sector and the government. The government owns K^g, leaving $K - K^g$ owned by the private sector. Then open-market operations are a swap between privately owned assets $K - K^g$ and money M, with an expansionary open-market operation being an increase in M and an increase in K^g, and with privately owned equities decreasing by the change in K^g.

Asset Equilibrium — the LM Sector

In the model, domestic asset-holders have demand functions for three imperfectly substitutable assets: K (equities), S (foreign securities) and M (money). Each of these symbols represents the nominal (= real) value of the stock of these assets in private portfolios.[4] The sum of these asset values is private-sector wealth, W. The demand for each asset is a function of the rates of return r_k and r_s, and income y. The latter is included

[1] See Dornbush (1973) for an analysis of a full-employment model that is roughly analogous to the one discussed here.

[2] It is interesting, though, to put a common trend given by the growth of the labor force plus productivity into the system and to reinterpret the results in terms of deviations from that trend. This is done in Branson (1972, part VI) using the wage-price inflation model sketched by Warren Smith (1970) and analyzed by Robert J. Gordon (1969, 1971).

[3] A list of symbols and their definitions is given in Table 1.

[4] I am ignoring capital gains, whose inclusion would complicate the analysis without adding anything to the results. For a similar model with capital gains, see Branson (1972, section III).

to represent the transactions demand for money, which I assume has a fixed zero rate of interest. The demand functions can be written as:

$$\frac{K - K^g}{W} = F^k(r_k, r_s, y); \quad (1)$$

$$\frac{S}{W} = F^s(r_k, r_s, y); \quad (2)$$

$$\frac{M}{W} = F^m(r_k, r_s, y). \quad (3)$$

Table 1

Symbols and Definitions

Assets

- K — real capital stock measured at production cost.
- K^g — capital stock owned by the government.
- M — stock of outside money in constant dollars.
- S — stock of domestically held foreign securities.
- W — private sector wealth in constant dollars.
- r_k, r_s — financial market rates of return on equities and foreign securities.
- $q(K)$ — profit rate on new investment.

Flows

- y — income and output in constant dollars.
- s — saving.
- i — real investment.
- g — government purchases.
- x — exports.
- m — imports.
- ϕ — tax function.
- e — exchange rate in units of domestic currency per unit of foreign exchange.

Operators

$\dot{X} \equiv dX_t/dt$; a dot over a variable denotes time rate of change.

$$f_i \equiv \frac{\delta f(X_1, \ldots, X_n)}{\delta X_i};$$

a subscript to a function denotes its partial derivative with respect to the relevant variables including functions of one variable.

All stock and flow variables have a time subscript that is omitted (assuming it is understood) in the text.

With wealth fixed, the sum $F^k + F^s + F^m = 1$. This implies that the partial derivatives of the F distribution functions with respect to each of their arguments sum to zero. Further, I assume that f^k_k ($\equiv \delta F^k/\delta r_k$), F^s_s, and F^m_y are positive, and all other partials are negative. Since the partials with respect to each argument must sum to zero, this means that $F^k_k \geqslant -F^s_k, -F^m_k$; $F^s_s \geqslant -F^k_s, F^m_s$; $F^m_y \geqslant -F^k_y, F^s_y$.

To use this model to study the questions at hand, I assume that equities K are non-traded assets, and that domestic asset-holders face an elastic supply of foreign securities S at a fixed interest rate r_s. Domestic asset-holders must hold the given stock of K but are free to trade between M and S. Any purchases of S implicitly reduce domestic reserves by that amount. These assumptions yield the two-part wealth, or balance sheet, constraint:

$$W = K - K^g + H \quad (4)$$

where

$$H = M + S. \quad (5)$$

One can imagine domestic asset-holders having an initial endowment of K and H, and then trading some of H for S to equilibrium.

Substitution of (2) and (3) into (5) yields

$$H = W \cdot F^s(r_k, r_s, y) + W \cdot F^m(r_k, r_s, y). \quad (6)$$

The two portfolio balance equations (1) and (6) are constrained by (4), so they contain only one independent equation determining r_k, given K, K^g, H, r_s, and y. The discussion below focuses on (1).[5]

With the foreign securities rate fixed in the world market (the small country assumption), the financial sector is recursive. Equation (6) or (1)

[5]Here Walras' Law is being applied separately across the stock-equilibrium equations. This is appropriate in a continuous-time model in which reallocations of existing stocks can take place instantaneously, but accumulation (saving) takes time. On the separate application of Walras' Law to the stock and flow equations, see May (1970).

can be solved for r_k, and then equation (2) can be solved for S, with no feedback onto r_k.

To study the effects of changes in K, K^g H, r_s and y on r_k in the financial sector, totally differentiate (1) to obtain the LM curve:

$$\text{LM: } WF^k{}_k\, dr_k = (1 - F^k)(dK - dK^g) - F^k dH - WF^k{}_s\, dr_s - WF^k{}_y\, dy. \tag{1'}$$

Equation (1') gives the results of changes in each of the right-hand variables holding the others constant, on r_k. The changes in stock variables K, K^g and H are "helicopter" changes, including wealth effects. An open-market operation, holding wealth constant, is represented by $dK^g = dh$.

These "helicopter" changes in wealth must be interpreted carefully in the analysis that follows. They are not events that could occur instantaneously in any actual economy that includes the usual accounting identities. For example, K cannot increase except by an integral of saving and investment, and H here cannot increase except through an integral of government deficit. The "helicopter" changes are thought experiments in which we compare, strictly, speaking, two economies that are exactly alike in structure and in the value of all but one exogenous variable, at one point in time, to see the effect of a difference in the one exogenous variable. Since the differentiated system formed below in equation (8) is linear, the helicopter changes can be viewed as separating the effects of two sides of an asset exchange, as in the analysis of open-market operations. In addition, the effects of the helicopter changes in Table 4 below are an important part of the analysis of the stock equilibrium system discussed later in Section V.

The coefficient of dr_k is positive, as is the coefficient of dy, giving the positive slope of the LM curve in Figure 1. The coefficients of dK and dr_s are positive, and that of dH is negative. These give the direction of the effect of a change in each variable, shifting the LM curve in Figure 1 (+ is up).

The net effects of changes in K, K^g, H, r_s and y on holdings of foreign securities S can be obtained by totally differentiating (2) and substituting (1') for dr_k:

$$dS = [F^s + (1 - F^k)\frac{F^s{}_k}{F^k{}_k}](dK - dK^g) + [F^s - F^k\frac{F^s{}_k}{F^k{}_k}]\, dH + W\,[F^s{}_s - \frac{F^k{}_s F^s{}_k}{F^k{}_k}]\, dr_s + W\,[F^s{}_y - F^k{}_y\frac{F^s{}_k}{F^k{}_k}]\, dy. \tag{2'}$$

The coefficient of K depends on substitutability among K, S and M in portfolios. The condition is

$$\frac{dS}{dK} \gtrless 0 \text{ as } \frac{S}{S+M} \gtrless -\frac{F^s{}_k}{F^k{}_k}$$

The coefficient of dr_s can be rewritten as $(F^s{}_s F^k{}_k - F^s{}_k F^k{}_s)/F^k{}_k$. This is positive because $F^s{}_s > -F^k{}_s$ and $F^k{}_k > -F^s{}_k$. The coefficient of dy is negative; to increase transaction balances, foreign securities are sold.

The coefficient of dH in equation (2') is between zero and unity. This coefficient can be rewritten as

$$1 > \frac{S}{W} - \frac{K}{W}\left(\frac{F^s{}_k}{F^k{}_k}\right) > 0.$$

The fraction in parenthesis is between zero and minus one, making the whole expression positive, but less than unity because $S/W + K/W = 1 - M/W \leq 1$. This is one interesting implication of this financial-sector model with non-traded asset and less-than-perfect substitutability. With y fixed, less than all of an increase in H flows into S, leaving the domestic private sector holding some increase in M as a result.

To study the effects of open-market operations, we can set $dK^g = dH$ in (1') and (2'), and $dK = dr_s = dy = 0$. The result for r_k is

$$\left.\frac{dr_k}{dH}\right|_{dK^g = dH} = -\frac{1}{WF^k{}_k} < 0.$$

For S we have

$$\left.\frac{dS}{dH}\right|_{dK^g = dH} = -\frac{F^s{}_k}{F^k{}_k} < 1.$$

The effect on S of an open-market increase in H is less than unity but may be greater or less than the earlier effect of a "helicopter" increase of the same amount.

The effects of changes in the variables exogenous to the financial sector on r_k and S from equations (1') and (2') are summarized in Table 2. Note that there the S effects are *shifts* in a given stock of wealth as a response to changes in exogenous variables — one-shot capital movements.

Table 2

Effects on r_k and S in the LM Sector

Endogenous Variable	Exogenous Variables					
	y	K	K^g	H	r_s	dK^g=dH
r_k	+	+	—	—	+	—
S	—	?	?	1>>0	+	1>>0

Commodity-flow Equilibrium: The IS Sector

The LM sector yields equation (1) in the variables r_k and y, for given values of K, K^g, H, and r_s. The other equation jointly to determine r_k, y is the familiar commodity-market flow equilibrium condition:

$$s(y - \phi(y), W) + \phi(y) + m(y, e) = i(r_k, K) + g + x(e) \qquad (7)$$

A few comments on the functions in (7) may be useful. The saving function makes saving dependent on disposable income and wealth with $s_y > 0$ and $s_w < 0$. I assume that the government returns its dividend earnings to the public as a lump-sum taxable transfer, so that the tax base is national income. The investment function represents producers' decisions to buy additional capital goods depending on the relation between the profit rate on new investment q(K) and the rate of return r_k that they are required to pay savers to lodge equity issues in their portfolios as in equation (1). Thus the investment function is given by

$$i = i(q(K) - r_k); \quad i(0) = 0; \quad i' > 0.$$

Here the profit rate on investment q is a decreasing function of K so that

$$\frac{\delta i}{\delta K} = i'q' < 0, \text{ and } \frac{\delta i}{\delta r_k} = -i' < 0.$$

Thus the investment function can be rewritten in the form.

$$i = i(r_k, K); \quad i_{rk} = i' < 0$$
$$i_k = i'q' < 0.$$

Exports depend on foreign demand and the exchange rate e, which is given in home currency per unit of foreign exchange so that $x_e > 0$. Imports depend on income and the exchange rate; $m_y > 0$ and $m_e < 0$.[6]

We can think of the IS equation as determining y, given values for the other variables. Substitution of the wealth definition from (4) into the saving function, and total differentiation of (7) yields the IS equation.

$$\text{IS: } dy\,[s_y(1-\phi_y) + \phi_y + m_y]dy = i_r dr_k - s_w dH$$
$$+ (i_k - s_w)dK + s_w dK^g + dg + (x_e - m_e)de.$$

The coefficient of dy is positive, and that of dr_k is negative, giving the slope of the IS curve of Figure 1. The signs of the other coefficients are

[6] The sign of m_e implicitly assumes that the price-elasticity of import demand is greater than unity in absolute value. If this is the case, an increase in the exchange rate will result in a drop in home-currency expenditure on imports, with the drop in import quantity dominating the terms-of-trade effect.

summarized in Table 3, giving the direction of shift of the IS curve (+ is out) when one of the variables changes. The only uncertainty is the effect of an increase in the stock of capital on equilibrium y, given r_k. An increase in K tends to reduce investment directly by reducing the marginal productivity of capital relative to r_k and it also tends to reduce saving due to the increase in private-sector wealth; the balance is unclear. An increase in K^g holding K constant, reducing privately owned equities, has only the negative wealth effect, stimulating saving.

Up to now, I have not discussed the balance of payments or the exchange rate regime in any detail. This discussion is postponed to section IV, after the internal short-run equilibrium is discussed in section III. For the moment, I assume a fixed exchange rate, with sufficient reserves to finance deficits. The alternative of flexible rates will be discussed in section VI.

Table 3

Effects on y in IS Sector

Endogenous Variable	Exogenous Variables						
	r_k	K	K^g	H	g	e	$dK^g = dH$
y	—	?	—	+	+	+	0

III. *Instantaneous Flow Equilibrium with a Fixed Exchange Rate*

The IS equation and the LM equation determine equilibrium values for r_k and y given H, K, K^g, r_s, g, and e, as shown in Figure 1. The r_k, y combination, in turn, determines the stock of domestically held foreign securities through (2). Following Blinder-Solow (1974), we can interpret y(t), $r_k(t)$ as an *instantaneous moving equilibrium*. The equations (1) and (7) adjust r_k and y to values where (a) savers are willing to hold existing stocks of assets in their portfolios, and (b) desired saving plus imports plus tax revenue equals desired investment plus exports plus exogenous g. This is not, of course, a long-run equilibrium position because non-zero values of s, i and $[g - \phi(y) + x(e) - m(y, e)]$ in instantaneous equilibrium continuously change wealth, the capital stock, and the composite money stock H = M + S.

To obtain the effects of changes in the stock variables, and in g and e, on instantaneous equilibrium income and interest rate the LM and IS total differentials can be combined:

A

$$\begin{matrix} \\ \text{LM:} \\ \\ \text{IS:} \end{matrix} \begin{bmatrix} -WK_y^k & -WF_k^k \\ s_y(1-\phi_y)+\phi_y+m_y & -i_r \end{bmatrix} \begin{pmatrix} dy \\ dr_k \end{pmatrix} =$$

B

$$\begin{bmatrix} -(1-F^k) & 1-F^k & F^k & WF_s^k & 0 & 0 \\ i_k - s_w & s_w & -s_w & 0 & 1 & x_e - m_e \end{bmatrix} \begin{pmatrix} dK \\ dK^g \\ dH \\ dr_s \\ dg \\ de \end{pmatrix}$$

The sign patterns of the coefficient matrixes A and B are as follows:

$$\begin{bmatrix} + & - \\ a_{11} & a_{12} \\ + & + \\ a_{21} & a_{22} \end{bmatrix} \begin{pmatrix} dy \\ dr_k \end{pmatrix} = \begin{bmatrix} - & + & + & - & & \\ b_{11} & b_{12} & b_{13} & b_{14} & 0 & 0 \\ ? & - & + & & & + \\ b_{21} & b_{22} & b_{23} & 0 & 1 & b_{26} \end{bmatrix} \begin{pmatrix} dK \\ dK^g \\ dH \\ dr_s \\ dg \\ de \end{pmatrix}$$

with the a_{ij} and b_{ij} coefficients representing the entries in (8). The determinant of A is positive. Inversion of A and solution for dy, dr_k give the sign pattern of effects of changes in exogenous variable shown in Table 4. The first two rows of Table 4 gives the effects of changes in the exogenous variables on y and r_k. The third row of Table 4 gives the effects

[7] Inversion of A gives

$$\begin{pmatrix} dy \\ dr_k \end{pmatrix} = \frac{1}{|A|} \begin{bmatrix} a_{22} & -a_{12} \\ -a_{21} & a_{11} \end{bmatrix} \begin{bmatrix} b_{ij} \end{bmatrix} \begin{bmatrix} dK \\ dK^g \\ dH \\ dr_s \\ dg \\ de \end{bmatrix}$$

for dy, dr_k.

of changes in the exogenous variables on domestic holdings of foreign securities S in the short run. Again these are "stock-shift" effects. The entries in the third row are obtained from the S total differential equation (2'), which already includes effects on S through r_k, plus the results in the y row of Table 4. As before, the system is recursive, with no feedback from S to y, r_k with H fixed. This implicitly assumes short-run sterilization of monetary flows.

Table 4

Effects of Changes in H, K, K^g, r_s, g and e on y, r_k, S in Instantaneous Equilibrium

Endogenous Variables	Exogenous Variables						
	K	K^g	H	r_s	g	e	dK^g=dH
y	?	?	+	—	+	+	+
r_k	?	—	?	+	+	+	—
S	?	?	?	+	—	—	?

Table 4 shows the effects of changes in the stock variables and in exogenously determined r_s, g and e on the short-run instantaneous equilibrium values of r_k, y, and S. The entries in the table give the signs of the results of a *comparative-static* analysis of the instantaneous flow equilibrium. This analysis changes each exogenous variable in turn and solves for the change in r_k, y and S, holding all other exogenous variables constant. This is equivalent to observing, for example, two different economies that have the same structure and history, including the same H stock, and differ only in the current value of g — the *instantaneous* rate of flow of government purchases — and determining the resulting differences in r_k and y. This is not, strictly speaking, the same as *period analysis*, in which we would ask what happens if we change g at one point in time. In that analysis we would have to change either H or K^g too, to allow for the initial impact of financing the additional government purchases.

Effects on r_k and y

The sign pattern in Table 4 follows from those in Tables 2 and 3, which give the direction of shift of the IS and LM curves of Figure 1 as the exogenous variables change. For example, an increase in H shifts LM down (— sign in Table 2) and IS out due to the wealth effect on saving

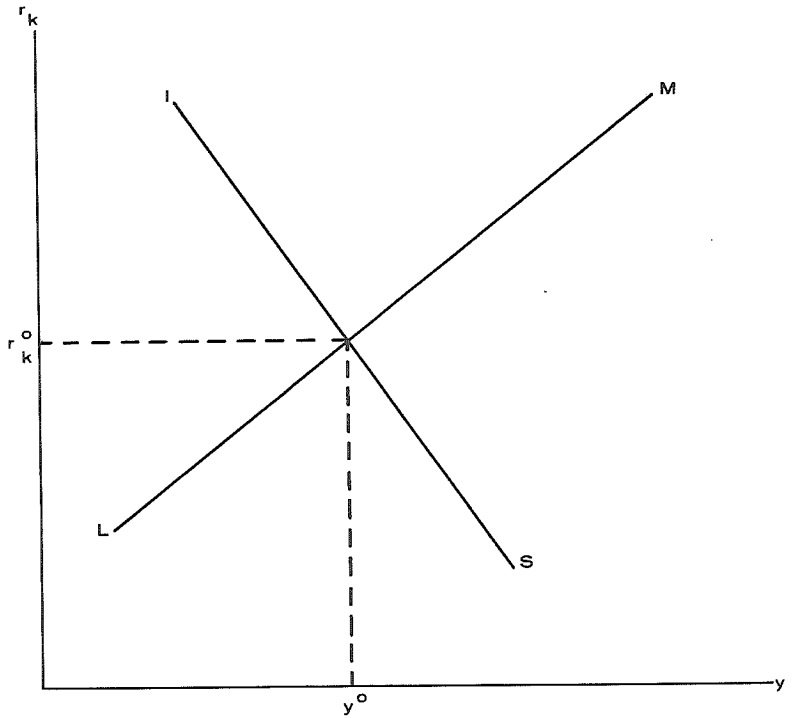

Figure 1

ISLM DETERMINATION OF INSTANTANEOUS FLOW EQUILIBRIUM r_k, y

(+ sign in Table 3). The net result is an increase in the instantaneous equilibrium value of y, but an uncertain effect on r_k. Open-market operations have a clear effect on both because they have no initial wealth effect.[8]

[8]In equation (8), setting $dK^g = dH$ and the other exogenous changes equal to zero, multiplying through B, yields

$$\begin{pmatrix} dy \\ dr_k \end{pmatrix} = \frac{1}{|A|} \begin{bmatrix} a_{22} & -a_{12} \\ -a_{21} & a_{11} \end{bmatrix} \begin{pmatrix} dH \\ 0 \end{pmatrix}.$$

The signs of the effects of expansionary open-market operations are those of a_{22} and $-a_{21}$.

The entries for r_k and y in the K column depend on which way the IS curve is shifted by a change in K. If the saving effect were very large relative to the direct investment effect through i_k, dr_k/dK would be positive and dy/dK negative. If the direct investment effect dominated, both would be uncertain.

Stock-shift Effects on S

The S row in Table 4 gives the effects of changes in the short-run exogenous variables on the stock of foreign securities S held by the domestic private sector, given existing wealth. These differ from the S effects shown in Table 2 in one important way. Table 2 gives asset (LM) sector effects on S, holding real variables, represented by y, constant.[9] Table 4 includes the IS curve and simultaneous determination of y, allowing for additional effects on S through the transactions demand for money.

The signs of the S row in Table 4 can be obtained from equation (2′) which is the S row in Table 2, combined with the y effects in Table 4. To be precise, the effect of a change in K, K^g, H, r_s, g or e on S is given by the sum of the coefficient of that variable in (2′) and the inner product of the A and B matrixes in (8) that give the change in y following the change in the exogenous variable.

When any of the stock variables changes, the effect on S, *holding y constant,* is given in Table 2. But in all cases, when the IS sector is introduced so that y is allowed to vary, transactions demand effects on S (people trading S for M to increase transactions balances) appear, and sometimes work against the asset-market effects.

For an example of this complication, consider the effect of an expansionary open-market operation, $dK^g = dH$, on S in instantaneous short-run equilibrium. Earlier, we saw that holding y constant, in the asset sector

$$\left.\frac{dS}{dH}\right|_{\substack{dK^g = dH \\ dy = 0}} = -\frac{F^s_k}{F^k_k},$$

which is between zero and unity. But with y also increasing, there is an increase in the transactions demand for money, creating an offsetting pressure to sell S in order to acquire M. This is given by the product of the dy coefficient in (2′) and the y effect of an open-market operation in Table 4.[10] Thus the effect on S of the open-market operation when the real sector is included is given by

[9]This is the world of Branson (1974b), Khouri-Porter (1972), Girton-Henderson (1973), and Herring-Marston (1974).

[10]From footnote 1, this effect is given by

$$\left.\frac{dy}{dH}\right|_{dK^g = dH} = a_{22} = -i_r > 0.$$

$$\left.\frac{dS}{dH}\right|_{dK^g = dH} = -\frac{F^s_k}{F^k_k} + \frac{W}{|A|}[F^s_y - F^k_y \frac{F^s_k}{F^k_k}](-i_r) \; .$$

(+ — +)

The first term is the pure asset-market effect; the second is the transactions demand effect. The two work in opposite directions, and the outcome is unclear. In general, if a change in a stock variable leads to an increase in S in the asset markets alone (Table 2), but also tends to increase y once we bring in the IS sector, the net result for S is unclear. This is the source of the uncertainties about signs in the S row of Table 4.

This is another result emerging from the comparative-static analysis of the instantaneous flow equilibrium system. *If* foreign assets S have a negative income-elasticity of demand (because they are substitutes for money in transactions balances), *then* the stock-shift effect of changes in the exogenous asset variables on S becomes unclear. This ambiguity does not appear (a) if one analyzes the asset sector alone, holding y constant, or (b) if demand for S is independent of the level of income.

IV. *Capital Movements and the Balance of Payments*

In addition to the stock-shift effects on holdings of foreign assets, a change in any exogenous variable will also change the underlying *rate of accumulation* of these assets, $\dot{S}$, at any point in time. This is the amount of the current rate of saving, $s = \dot{W}$, that is going into foreign assets

The distinction between this *continuing-flow* effect and the *stock-shift* effect (see Branson, 1970) is illustrated in Figure 2. There I show the path of S through time to point t_i, when some exogenous variable is changed as in Table 4.

The *stock-shift* effect on S is given by the vertical jump from S^0_i to S^1_i. This is the effect (assuming it is positive) in Table 4. In addition, there is an effect on the *slope* of the S path, $\dot{S} \equiv dS/dt$, at t_i. This is the difference between the dashed $\dot{S}_i$ tangents in Figure 2; it is the *continuing-flow* effect, which is the subject of this section.

The Flow of Saving into Foreign Securities

The rate of accumulation of foreign securities $\dot{S}$ is the continuing flow of saving into S. With a given S/W ratio in the asset distribution equation (2), the flow $\dot{S}$ is given by

$$S = s(y - \phi(y), W) \cdot F^s(r_k, r_s, y) \; ,$$

where saving $s(\cdot) \equiv \dot{W}$, the rate of growth of wealth. Thus the effect of a change in any exogenous variable on the instantaneous rate of flow $\dot{S}$ will depend on its effect on the rate of saving and on the S/W ratio, given by

$$d(S/W) = F^s_k \, dr_k + F^s_s \, dr_s .$$

These effects are summarized in Table 5.

The r_k row in Table 5 is simply brought forward from Table 2.

Table 5

Effects on the Rate of Accumulation of S in the LM Sector

Endogenous Variables	Exogenous Variables: K	K^g	H	r_s	$dK^g = dH$
r_k	+	—	—	+	—
S/W	—	+	+	+	+
s	—	+	—	0	0
$\dot{S}$	—	+	?	+	+

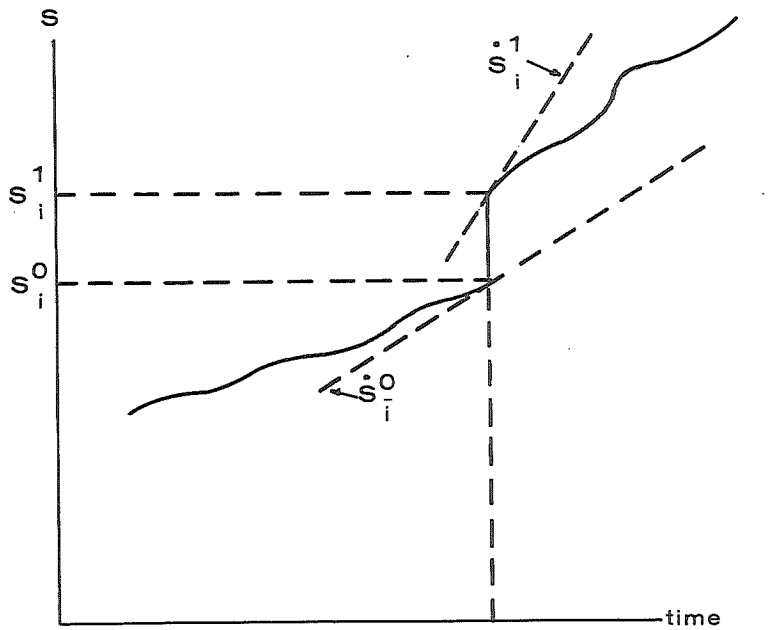

Figure 2

STOCK-SHIFT AND CONTINUING-FLOW EFFECTS ON S AND $\dot{S}$

The S/W row comes from the expression for d(S/W) just above. The effect of a change in r_s is clear because from (2') $dr_k/dr_s < 1$, and $F^s{}_k > -F^s{}_s$. The effects on saving s are simply the wealth effects, since y is held constant. The $\dot{S}$ row just combines the two above it; the only ambiguity comes with a "helicopter" increase in H, which increases S/W but reduces the rate of saving.

Comparison of the bottom row of Table 2 which gives the stock-shift effects on S in asset markets alone, and the $\dot{S}$ continuing-flow row in Table 5, shows that the two have unambiguously the same sign in response only to changes in r_s and open-market operations. Fortunately, these are probably the most important cases. In the others — the "helicopter" changes in assets — wealth effects on s and on the denominator of S/W lead to ambiguities.

In the model specified in equations (1) — (3), adding an endogenous IS sector muddies the $\dot{S}$ results in two ways. First, changes in income affect the rate of saving. This would be the case regardless of the particular LM specification. Second, the transactions-demand substitution for money affects S/W. This is an undesirable result of the specification of (1) — (3). It is reasonable to expect an increase in y to result in a *stock-shift* sale of S to acquire M, but it is probably not reasonable to expect it to cause a decrease in the proportion of *continuing* saving going to S, as long as y stays constant at its new level. The increase in y from one level to the next should not yield a continuing accumulation of M for transactions purposes.

To avoid this implication, the asset equations could either be specified to exclude S from transactions demand altogether, eliminating the ambiguity for both S and $\dot{S}$ effects, or specified in the form

$$S/W = F^s (r_k, r_s, y/W),$$

following Tobin (1969). In a model so specified, endogeneity of y would cause $\dot{S}$ ambiguities only through the saving function.

Unfortunately, income effects on saving, when the IS sector is made endogenous, are sufficient to make the S signs of all the variables in Table 5 except open-market operations ambiguous. The first row of Table 4 gave the effects of changes in the exogenous variables on income y in instantaneous flow equilibrium. Since $\delta s/\delta y > 0$, these signs are also the income effects of changes in those variables on the rate of saving. Since the signs of K and K^g are ambiguous in Table 4, so is the direction of the effect of those variables on the rate of saving and on $\dot{S}$ in flow equilibrium. A "helicopter" increase in H increases both wealth and income, with an ambiguous effect on saving. An increase in r_s increases S/W, but by raising r_k it reduces investment, income, and the rate of saving. Thus even the sign of the effect of r_s on $\dot{S}$ is ambiguous in instantaneous flow equilibrium although the stock-shift effect $dS/dr_s > 0$.

The effect of an expansionary open-market operation on the stock of S in Table 4 was rendered ambiguous by the transactions demand substitution. If we assume that this has no effect on continuing accumulation of S, then the sign of an open-market operation on $\dot{S}$ is clearly positive; it increases the rate of saving and it increases S/W.

Two exogenous flow variables are included in Table 4 but not in Table 5: g and e. An increase in either increases both y and r_k (an outward shift in IS). Both result in a stock-shift decrease in S in Table 4. But their effects on $\dot{S}$ are ambiguous, since the rise in r_k reduces S/W, but both increase the rate of saving through y.

This is a third important point uncovered by making the stock-flow distinction in analyzing capital movements. *A fiscal-policy increase in g will result in a stock-shift inflow of capital, but its effect on the continuing rate of accumulation of foreign assets is unclear.* The unique positive effect of an expansionary fiscal policy on the capital account assumed, for example, by Fleming (1962) holds only for the stock-shift effect.

A summary of the effects of changes in monetary policy (open-market operations) and fiscal policy (changes in the rate of government purchases) on the capital account is given in Table 6. If foreign assets are substitutable for money when transactions demand changes, then the transactions effect makes the stock-shift sign of open-market operations ambiguous when the real sector (symbolized by y) is endogenous. But monetary policy has the usual effect on the *rate of accumulation* of foreign assets. On the other hand, expansionary fiscal policy yields a stock-shift capital inflow, but an ambiguous effect on the continuing rate of accumulation. Thus the use of policy instruments to influence the capital account should depend on whether one is aiming for a reserve target (stock-shifts) or a balance-of-payments targets (continuing-flow).

Table 6

Effects of Open-market Operations ($dK^g = dH$) and Fiscal Policy (dg) on S and $\dot{S}$.

Effect on	Policy Action	
	dg	$dK^g = dH$
S(stock shift)	—	?
$\dot{S}$(rate of flow)	?	+

Balance-of-Payments Effects and Reserves

With a fixed exchange rate, extension of these results to the balance of payments — the flow rate of accumulation of reserves — is easy. Expansionary monetary or fiscal policy increases the instantaneous equilibrium value of y in Table 4. This reduces the trade surplus (or increases the deficit). In Table 6, we see that the continuing-flow effect on the capital account is ambiguous in the dg case, and produces an increase in the rate of capital outflow in the monetary policy case. Thus the effect of fiscal policy on the rate of accumulation of reserves is ambiguous but the effect of monetary policy is clear. This is the familiar result from Fleming (1962) but for somewhat different reasons. It also supports the use of monetary policy for external balance defined as a zero rate of accumulation of reserves.

On the other hand, with foreign securities in the transactions demand picture, an expansionary fiscal policy gives a stock-shift increase in reserves (reduction of S), while the sign of monetary policy is ambiguous.

Finally, it is interesting to note that a shift in the monetary-fiscal policy "mix" has the same sign for both stock-shift and continuing-flow effects. Consider, for example, a combination of expansionary fiscal policy and tighter monetary policy that leaves income, and thus the trade balance, unaffected in instantaneous equilibrium. The g increase gives a stock-shift inflow, and the reduction in K^g and H reduces the continuing rate of accumulation. If the ambiguous signs in Table 6 are not attached to quantities larger than are the unambiguous signs, changes in the mix work the same way on both stocks and flows in short-run instantaneous equilibrium.

V. *Stock Adjustment and Full Stock Equilibrium*

The short-run instantaneous equilibrium system can be viewed as a mechanism that adjusts y and r_k so that *ex ante* saving and investment, and the government and trade surpluses, balance as required by the commodity-flow equilibrium condition, equation (7). This equation can be rewritten in the following form:

$$s(y - \phi(y), W) = i(r_k, K) + [g - \phi(y) + x(e) - m(y, e)] . \qquad (9)$$

The rate of change of the money stock held by the private sector, M, is the sum of the government budget deficit and the trade surplus, less purchases of foreign securities:

$$M = g - \phi(y) + x(e) - m(y, e) - S . \qquad (10)$$

On the assumption of money-finance of both the budget deficit and the balance-of-payments surplus (the Central Bank exchanges domestic H for net foreign exchange earnings at the fixed exchange rate), equation (10) just says that M is the sum of the budget deficit and the payments surplus.[11]

Equation (9) can be rewritten as

$$s = \dot{K} + \dot{H} = \dot{K} + \dot{M} + \dot{S} . \qquad (11)$$

Saving is accumulation of new assets by the economy's consumers/portfolio balancers. Investment is the supply of new capital stock and the sum of the government and trade balances is the supply of new H, which portfolio balancers distribute between M and S.

Thus one way to view the usual commodity-flow equilibrium condition is as a mechanism that aligns savers' desired accumulation of new assets with their supply by investors, government, and the foreign sector. In the instantaneous equilibrium described above, non-zero values will be determined for these rates of change, and the resulting changes in stocks drive the instantaneous equilibrium from one point to the next. It is a moving equilibrium, hopefully moving toward a stable-stock equilibrium. Since the economy is in instantaneous equilibrium at all times, condition (11) holds at all times. Thus we can focus on the adjustment equations driving K and H, since the instantaneous-equilibrium mechanism will maintain *ex ante* saving equal to $\dot{K} + \dot{H}$. Also, if there is a stock equilibrium solution in which $\dot{K} = \dot{H} = 0$, short-run flow equilibrium will ensure that saving is also zero. The stock-adjustment equations for H and K carry the economy from a position of unbalanced portfolios to the balanced long-run growth path of the neoclassical models of Johnson (1966), Tobin (1965), and Foley-Sidrauski (1971), opened to trade and capital movements.

Table 4 above gives the signs of the partial derivatives of the *reduced-form* equations for r_k, y, and S, dependent on the exogenous values of the stock variables, r_s, g, and e. Thus r_k and y can be written as functions of these exogenous variables:

$$\begin{aligned} r_k &= h^1 (K, K^g, H; r_s, g, e) ; \\ y &= h^2 (K, K^g, H; r_s, g, e) . \end{aligned} \qquad (12)$$

These are the implicit *reduced-form* equations of the *structural model* represented by the IS and LM curves. The signs of the partial derivatives of h^1 and h^2 are the first two rows of Table 4.

With both the rate of government purchases and government holdings of equities fixed, the rate of change of H is given by the sum of the budget deficit and the trade surplus:

$$\dot{H} = P[g - \phi(y) + x(e) - m(y, e)].$$

[11]Note that here I implicitly assume no sterilization of the payments balance by open-market operations.

Since the price level is held constant throughout, it can be set at unity. With the exchange rate e fixed at its stock-equilibrium value, and substitution of the reduced-form expression for y in (12), the H stock-adjustment equation can be written as

$$\begin{aligned}\dot{H} &= g + x(e) - \phi(y) - m(y, e) \\ &= g + x(e) - \phi(h^2(K, K^g, H; r_s, g, e)) \\ &\quad - m(h^2(K, K^g, H; r_s, g, e)) .\end{aligned} \tag{13}$$

The rate of change of the capital stock (= value of equities in this model) is investment. With K^g constant, the rate of change of the capital stock held by the private sector is the same as the rate of change of the entire stock, K. The equation for K is

$$\dot{K} = i(r_k, K) = i(h^2(K, K^g, H; r_s, g, e), K), \tag{14}$$

again substituting for r_k from (12).

Given the values of the policy variables K^g and g, the fixed exchange rate e, and the foreign interest rate r_s, the two equations (13) and (14) are first-order differential equations in H and K. We can ask if this system has a stock equilibrium solution H*, K* where $\dot{H}$ and $\dot{K} = 0$, and if this solution is stable. If it is, we can study the comparative statics of the stock equilibrium, and contrast these results to the instantaneous-flow equilibrium of Table 4. These exercises are worked through in Branson (1974a), with an earlier discussion in Branson (1972). Here I will just summarize the results.

The existence of a stable long-run equilibrium in H and K is intuitively plausible. If, in an initial instantaneous equilibrium there is positive investment, this increases K and tends to raise r_k, reducing investment. If income is sufficiently low that $[g + x - \phi(y) - m(y)]$ is positive, $\dot{H}$ is positive and income rises, reducing the budget deficit and the trade surplus. Thus the system is likely to move toward the stock-equilibrium K*, H* described by setting $\dot{H}$ and $\dot{K} = 0$ in (13) and (14). In Branson (1974a), the stability by such a stock equilibrium is proved.

In stock equilibrium, from (13), $\dot{H} = 0 = g - \phi(y) + x(e) - m(y, e)$. To solve for the fixed exchange rate that is consistent with stock equilibrium, we can first set $g - \phi(y) = 0$ and solve for the y* value that balances the budget. Then with that y* value we can set $x(e) - m(y^*, e) = 0$ and solve for the e* value that balances trade. With both the budget and trade balanced in stock equilibrium, private sector portfolio-balancers allocate the fixed stock of $H(\dot{H} = 0)$ between M and S, so that in equilibrium $\dot{S} = 0$ and the balance of payments is also zero.

Since an equilibrium condition here is $g - \phi(y) = 0$, the "multiplier" between stock equilibria is just $1/\phi_y$, a result familiar from Oates (1966) and McKinnon (1969). Fiscal policy changes in g or the shape of ϕ will affect equilibrium y. Monetary policy has no effect unless it is combined with fiscal policy. Between stock equilibria, the money supply (H here) is

endogenous; the effects of open-market operations in the short run are undone by stock adjustment of the money supply. These results are by now standard in the literature on stock and flow equilibria. For more detailed analysis, see Branson (1974a).

To summarize, the stock equilibrium H*, K* is probably stable. As opposed to the usual short-run results of Table 4, between stock equilibria fiscal policy influences the level of income y and monetary policy only affects the stock of reserves. Thus in the instantaneous short-run equilibrium, open-market operations change the flow equilibrium value of the balance of payments, as well as y. When the system returns to stock equilibrium, at the original value of y, the balance of payments is again zero, but the integral of the non-zero payments balances in the interval is the effect on reserves.

VI. *Flexible Exchange Rates*

In the model described in this paper, allowing the foreign exchange market to determine the value of the exchange rate so that the balance of payments B (= $\dot{R}$, the rate of change of reserves) is zero:

$$B = \dot{R} = x(e) - m(y, e) - \dot{S} = 0 , \tag{15}$$

simply allows the exchange rate to track the instantaneous r_k, y solution to the full stock equilibrium e* value with no effect on H from external influences. To obtain a more complicated, and more realistic, result, we would have to add speculative capital movements and leads and lags on trade payments to the story. This could be done, but not in this paper.

Within the confines of the present model, capital movements (purchases or sales of foreign securities S) respond only to interest rates and transactions demands. As policy variables change, there are stock-shift and continuing-flow responses, dS and $d\dot{S}$, and as H and K move toward stock equilibrium, both responses are combined in the data being generated.[12]

In stock equilibria, a flexible rate will take on the same e* value as the fixed rate of section V. In fact, the e* from section V is the fixed-rate value that policy-makers would set by asking what value would a flexible rate take on in stock equilibrium. Thus the stock-equilibrium solutions for K*, H*, y*, e* are the same as in the fixed-rate case of section V, as shown in Branson (1974a). The additional wrinkle compared with that paper is that here private-sector portfolio-balancers can split H between M and S, where in the previous paper with no capital movements $H \equiv M$.

The difference between the fixed-rate case of sections II — V and the flexible-rate case is in adjustment out of stock equilibrium. When the economy is not in stock equilibrium, the stock of money in private sector portfolios is changing. In the fixed-rate case, the equation for $\dot{M}$ was

[12]This makes it very hard to separate stock-shift and continuing-flow responses empirically. I know of no study that has succeeded in doing so to date.

$$\dot{M} = g - \phi(y) + x(e) - m(y, e) - \dot{S},$$

with $\dot{H} = \dot{M} + \dot{S}$. When the economy is out of equilibrium in this case, both the budget deficit and the balance-of-payments surplus feed the domestic money stock.

In the flexible-rate case, e adjusts in instantaneous equilibrium to insure that

$$x(e) + m(y, e) - \dot{S} = 0.$$

In this case, when the economy is out of equilibrium, $\dot{M} = g - \phi(y)$ alone. Only the budget deficit feeds the domestic money stock. This has the implication that income will fluctuate more in the flexible-rate case then in the fixed-rate case. In the latter, a change in income affects $\dot{M}$ through both tax revenues and imports. In the flexible-rate case, income influences $\dot{M}$ only through tax revenues, so that for a given change in the money stock moving toward stock equilibrium, a bigger deviation of income from its stock equilibrium value is required.

This discussion of the flexible-rate case is necessarily sketchy. I have worked out the results fully in Branson (1974a) for a model with no foreign asset and no capital movements. But the introduction of capital movements, with the value of the exchange rate being determined by both continuing flows and discontinuous stock shifts, raises some analytical problems that are yet to be solved.

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Discussion

Giorgio Basevi

1. I divide my comments on Branson's paper into two parts. First, I shall locate what I believe are weak spots in his analysis, while keeping mine within the same overall framework and set of assumptions as Branson. Second, I shall suggest some directions toward which the model could be extended and possibly improved. I hope that on both grounds my criticism may contribute to further development and application of a line of macro-model building into which Branson's series of recent papers brilliantly fits.

2. My first comments, as just said, are kept within the same set of assumptions and analytical framework that Branson uses. Within it, the paper could be improved on four points, that I am going to present in a subjectively decreasing order of importance.

2.1. Branson's model does not incorporate into the analysis the flow of services on foreign securities (r_s S, in his notation). These should appear both in the clearing condition for the goods and services market (equation (7)), and in the equilibrium budget condition of the foreign sector (i.e., the balance of payments, equation (17)). The same omission is apparent in the equilibrium budget condition of the private sector (equation (11)). Of course, these services should be treated as export receipts when the net stock of S is positive, and as import payments when it is negative (i.e., the private sector is a net debtor vis-a-vis the foreign sector).

This assimilation to exports and imports of goods, however, is not allowed in Branson's model, where net exports (x-m) are only the function of income and the exchange rate. Adding services to the net trade account, would make it also a function of the interest rate on foreign assets (r_s) and of the other variables that determine the stock of foreign assets (r_kW). It is obvious, and well-known from the literature,[1] that this addition will introduce interesting patterns of reaction of the balance of payments to, among other things, policy-induced changes in domestic rates of

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[1]See, for example, Willett and Forte (1968).

interest, particularly with respect to the contrast between stock-shift and continuing-flow effects. It is not difficult to add this important feature to Branson's model, and I suggest that it should be done, given the emphasis he rightly puts on the distinction between the short- and long-run effectiveness of monetary and fiscal policies.

2.2 The present form of Branson's model explicitly does not take into account capital gains due to interest rate changes. This is done in another paper by Branson,[2] and it seems not to affect the conclusions significantly. There is, however, a form of capital gains (or losses) that Branson does not consider in that model, nor in this one, and that should in my opinion be included, since (contrary to the one due to interest rate changes) it introduces an additional variable into the function determining portfolio allocation. It also affects the same market clearing condition and budgetary constraints involved in the correction suggested above.

I am referring to exchange rate changes, which affect both the capital value and the flow of interest payments that originate from foreign assets, when these are denominated in foreign currency. The practical difficulty here is that S is a net credit or debit position, which results from an aggregate of assets denominated both in domestic and in (various) foreign currencies. However, in line with the small country assumption of the model, it would not be too unreal to assume that the whole of S, and its accompanying interest flows, are denominated in foreign currency. Thus, when the exchange rate (e) changes, the r_s S element to be included in equation (7), (11) and (18) should also change, and it would of course change the capital valuation of S in the portfolio allocating functions and in wealth definitions. However, this correction, which seems to me necessary for completeness, would not affect Branson's conclusions in this model, since he is not interested in the effects of devaluation, but mainly works within fixed exchange rates, or flexible rates set at the long-run level of equilibrium.

2.3. Still on capital gains, I believe that consistency should be preserved even when simplification is performed. Thus, while disregard of capital gains on S (except for those due to exchange rate changes) could be justified by assuming that S are very short-term assets, the same cannot be claimed for equities on real capital assets. The problem of market valuation of K cannot and should not be avoided, since there is no other way except through the price of an equity that the market for these assets can adjust, when, in the short run, the real stock of capital (K) and its marginal efficiency are given while r_k changes.[3]

2.4. The model is cast in terms of positive rates of saving and hence of positive $\dot{K}$, $\dot{S}$, and $\dot{M}$. Yet income (y) is supposed to stay constant through time when at the equilibrium level. It would be preferable to state clearly whether the economy is in a stationary state or on an equilibrium growth path.

[2]Branson (1972).

[3]This feature is well underlined in a recent paper by Steinherr (1973).

3. My second set of comments tries to indicate possible modifications or extensions of the model that might render it more useful for the understanding of real phenomena.

3.1. In many cases when in the model exogenous changes have ambiguous effects on endogenous variables, the culprit is the negative income elasticity of the demand for foreign assets. Branson indicates a possible alternative whereby the ratio y/W would be an argument of the allocating function. Another possibility, with perhaps more empirical content, would be to consider that while money (M) is demanded for internal transactions, foreign assets (S) are partly demanded to finance external transactions (e.g., commercial credit). This would suggest, for example, making M/W and S/W functions of the ratio between exports and income, such that

$$M/W = F^m (r_k, r_s, y, e/y)$$

$$S/W = F^s (r_k, r_s, y, e/y)$$

with $F^s_{e/y} > 0$ and $F^m_{e/y} = - F^s_{e/y}$

An alternative along the same line would be to consider that implicit in the model there are really four assets - the fourth one being foreign money (international reserves) - and to allow for a private demand for it as part of the portfolio allocation process, while these modifications might not reduce the number of ambiguous cases in the comparative statics exercises on the model, they would make more acceptable, by mitigating its effects, the idea that transactions demand for money must be satisfied by reducing holdings of foreign assets, regardless of the foreign trade flows that higher income is inducing and of the degree of openness of the economy. In fact, this approach would assume that the relative allocation of wealth between M and S (or between domestic and foreign money) is a function both of the business cycle effect on foreign trade (and its financing needs), and of the structural degree of openness of the economy.

3.2. Branson's model is the latest in the stream of contributions that are known to international-trade theorists as the "portfolio approach" to balance-of-payments theory. This approach, as Branson recalls, owes much to Tobin and has been applied to balance-of-payments analysis at the empirical no less than at the theoretical level. Branson himself has contributed much to overcoming the stock-flow controversy on capital movements with his empirical work. However, the theory of portfolio allocation promulgated by Tobin loses much of its interest if it is reduced to a world of certainty and costless adjustments. Indeed, the empirical studies that led to the "new view" of capital movements put most of their accent on two essential elements of the portfolio approach, namely the uncertainty attached to returns on various assets, and the cost of reallocating a given portfolio. This first problem is typically dealt with by making use of the mean-variance model, while the second problem is dealt with

through various schemes of partial adjustment in portfolio decisions. Obviously, introduction of these essential features of the portfolio approach would make the model cumbersome and possibly destroy the simplicity of its conclusions. I venture, however, that what would be lost in terms of definiteness would be gained in terms of empirical relevance.

3.3. Since I have taken the easy path of suggesting extensions of the model, let me conclude on a more critical tone by saying that Branson's model is disappointing for the inability, in its present form, to give answers to some of the main empirical problems currently hanging over our economies. I am referring to the problem of price inflation and the induced shifting in the allocation of wealth by portfolio holders trying to get away from money and other depreciating assets. I am also referring to the danger that a sudden crisis in the Eurocurrency market and/or the financial markets of the main industrial countries might provoke rapid deflation of some components of real wealth held by non-Government sectors, with induced effects on saving and real expenditure. Of course this would require complicating the model through the inclusion of price expectations in the wealth-allocating functions, through the enlargement of the number of assets assumed, and through the considerations already referred to under 2.2. Yet I believe that this is exactly what models like Branson's should have, since their emphasis on the importance of wealth and its allocation would be of little help if they could not be used to explain how sudden inflation and deflation of real wealth in the actual world occur and how they affect economic activity.

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National Autonomy of Stabilization Policy

Jørgen H. Gelting

Several economists, especially Norwegian, Swedish, and French, have in recent years contributed similar, essentially simple, yet highly useful models to the analysis of international economic interdependence and domestic price structure.[1] In rough outline the principal, common ideas of the models are as follows. Assuming substantially unrestricted international commodity trade and fixed rates of exchange, prices on the domestic market of a country of internationally traded goods — both exportables and importables — are exogenous variables relative to the national economy. The national economy is viewed as composed of two sectors, the competitive or exposed sector producing for the domestic market and/or the world market in competition with foreign producers; and the sheltered or shielded sector comprising producers, who are not similarly exposed to direct foreign competition.[2] Even in small, open economies like those of the Scandinavian countries where foreign trade is relatively large the shielded sector is appreciably larger than the exposed sector. From the level of internationally determined prices combined with the level of productivity in the exposed sector the wage level in that sector is derived. Assuming further the wage level in the exposed sector to govern that in the shielded sector — or more simply but less realistically, assuming the labor market to be one homogeneous market — prices in the shielded sector are governed by wages and productivity in that sector. Since recorded productivity usually grows at a higher rate in the exposed sector than in the shielded sector, not only the wage level, but also output prices of the latter sector will follow rising trends if world market prices and exchange rates remain constant.

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[1]Aukrust (1970); Courbis (1971); Edgren et al. (1973); Ringstad (1972).

[2]The public sector may be conceived either as part of the shielded sector or as a separate, third sector.

The principal use for which the Swedish model by Edgren, Faxen, and Odhner (EFO) was designed, was the analysis of the development over time of wages and prices, the model serving to delineate a "main course" for wages, residual incomes (profits) and prices, the development of international prices (translated into domestic currency) of tradables and productivity in the exposed sector defining the margin available for increases of domestic incomes in general and wages in particular. In this way the model may serve as a guide to income policies.

Actually, of course, there can be no sharp and immutable dividing line between the exposed sector and the shielded sector — tourism for one thing prevents that. The main point is not that the dividing line is blurred, but rather that its position is a function of the ratio of wages to prices, introducing an element of circularity into the model. Similarly, the subdivision by commodities of the exposed sector into net exporting and net importing subsectors will depend on the ratio of wages to prices. As a guide to income policies the model can lead to specific recommendations only if target values of the level of employment and the balance-of-payments position are specified.

Increasingly during the post-war period the stabilization problem in the industrialized countries has changed its character from that of stabilizing the level of domestic economic activity by counteracting alternating expansionary and contractionary influences of both domestic and foreign origin towards that of eliminating or at least dampening and containing an almost permanent and apparently growing inflationary pressure. The EFO model may prove useful in the analysis of inflation and in particular in bringing out the different course of events, when on the one hand domestic inflation tends to exceed inflation abroad, and when on the other hand the main inflationary impetus is received from abroad through the rise in the prices of tradables.

Further, the EFO model and especially its expansion to a fairly complete macroeconomic model in the French version have been used for the analysis of the effects of alternative combinations of monetary and fiscal policies on the level of economic activity and the balance of payments, leading to conclusions which in part deviate sharply from those of traditional Keynesian analysis. In this respect work on the model has been combined with analysis by Mundell and others[3] of the implications of international capital movements for the international propagation of activity changes and the effectiveness of monetary and fiscal policies under fixed and flexible exchange rates.

A distinctive feature of the Courbis model is that it integrates the main ideas of the Aukrust and EFO models in a larger macroeconomic model. The Phillips relation plays a central role in an essentially very simple way. The theory of price formation is identical to that of the EFO

[3]Mundell (1963) (1968); Prachowny (1973). An important early paper stressing the distinction between exposed and shielded sectors is McKinnon (1963).

model except that prices of tradables are not considered entirely exogenous, but as (moderately) rising functions of the trade deficit. Investment decisions are governed by the targets of entrepreneurs relating to financial structure implying in particular an upper limit to leverage. This constraint is of major importance for the investments of the exposed sector, selling in markets where prices are largely determined from abroad.

No elaborate calculations are required to see that on the above assumptions total employment is not, except for the short run, governed by total demand. Even an increase in public expenditures, directed primarily towards the shielded sector will not lastingly raise total employment. There will occur a temporary rise in employment which, however, through the Phillips relation narrows the gap between prices and wages in the exposed sector and decreases the flow of internal funds available to finance investment in that sector. Thus, the final result of the increased demand for the output of the shielded sector will be a re-allocation of employment from the competitive to the shielded sector, rather than an increase in total employment. At the same time the balance of payments on current account must deteriorate. Actually, the model implies a kind of natural or equilibrium level of unemployment, determined by the rate of productivity growth and the rate of inflation imported from abroad, and based on a stable Phillips trade-off.

The recent development of the Danish economy provides a pertinent illustration of the working of the model. During the early part of the post-war period balance-of-payments difficulties — partly due to a weak export structure — induced the authorities to pursue policies restricting total demand and maintaining unemployment at a relatively high level. In consequence wages rose rather less than in other OECD countries, while at the same time the initially small exports of manufactures expanded at a high rate. Thus, the industrial structure and the commodity mix of exports changed appreciably, resulting in a favorable shift in the relationship between domestic activity and foreign balance: when in the early part of the 1960s domestic economic activity rose towards the full employment level the balance of payments on current account deteriorated much less sharply than would have been expected on the basis of the experience of the early 1950s. However, from about the middle of the 1960s the trend changed. Expanding public expenditures and residential construction became the leading elements in the growth of total demand and both investment and employment in manufacturing tended to stagnate. Wages now rose more rapidly than in other OECD countries and profit margins in the exposed sector narrowed. Thus, resources were drawn from the exposed into the shielded sector and the balance of payments on current account moved increasingly into deficit.

Briefly stated then, a principal conclusion from the Courbis model is that in an open economy where the firms of the exposed sector may be considered price takers (i.e., quantity adjusters to in the main exogenously given prices) domestic demand management in general and fiscal policies

in particular are not in the long run effective as instruments to achieve high employment.

The Courbis model assumes an international mobility of factors sufficiently low to justify ignoring factor movements to and from abroad, and neither labor nor capital movements are taken into account in the model. Earlier — somewhat different — non-Keynesian conclusions were reached by Mundell[4] on the basis of the assumption of perfect international mobility of capital.

The Mundell model does not distinguish between a competitive and shielded sector and thus can not serve to analyze structural changes in the economy in the way the Courbis model can. Like the traditional Keynesian the Mundell model is a short-run static model supplemented, however, with a somewhat impressionistic account of a dynamic adjustment process. Under fixed exchange rates fiscal policy has an impact on domestic employment, but the propagation of this activity change to abroad through demand effects may be more than neutralized by the effects of the immediate propagation abroad of a tendency for interest rates to change. Monetary policy on the other hand would have no effect on employment, but only lead to a change in exchange reserves. Under flexible exchange rates the tables are turned. Any effect of fiscal policy on employment is neutralized through a change in the balance of trade in response to changing capital movements, whereas monetary policy now will be effective by inducing a change in the rate of exchange.

The assumption of perfect capital mobility implying equality of national interest rate levels and perfect synchronization of their movements is in general rather unrealistic. In the following we shall sketch a model which takes into account the distinction between exposed and shielded sectors and the imperfect mobility of capital. To simplify matters we shall — unless otherwise stated — assume that world market prices of tradables are exogenous, so that the domestic price level of tradables varies in direct proportion to the rate (in domestic currency) of foreign exchange.

The notation used and the equations of the model are as follows:

P_T, P_N : domestic prices of tradables and non-tradables, both initially equal to 1.

A_T, A_N : volumes of domestic private absorption for consumption and investment of tradables and non-tradables.

G_T, G_N : volumes of government absorption of tradables and non-tradables.

Y_T, Y_N : domestic output of tradables and non-tradables.

[4]Mundell (1963).

$Y = Y_T P_T + Y_N P_N$: total money income.

B : volume of net exports, in general initally = 0.

i : rate of interest.

K : capital exports, in general initially = 0.

$$Y_T = A_T + G_T + B \tag{1}$$

$$Y_N = A_N + G_N \tag{2}$$

$$K = BP_T \tag{3}$$

The notation deviates little from that used in the model presented by Prachowny (1973), which, however, assumes perfect mobility of capital and therefore suppresses the constant domestic rate of interest. In the present model the rate of interest is considered a policy instrument on par with G_T, G_N and P_T (representing the rate of exchange).

Equation (l) states the equality of total demand and total supply on the commodity market of the exposed sector. Total output equals domestic absorption plus the balance on current account. Equation (2) similarly states the equality of shielded sector demand and supply. Equation (3) states the equilibrium condition that the balance on current account equals capital exports which are assumed to be a function only of the domestic interest rate level, the interest rate abroad assumed constant. The derivative of K with regard to i, which is of course negative, is generally assumed to be finite.

A main difference from the Prachowny model concerns the way in which credit policy is dealt with. In the Prachowny model perfect mobility of capital is assumed and interest rate policy is therefore out of the question, the rate of interest being tied to the world level. In contrast to the Prachowny model the present model does not explicitly introduce a liquidity function. Since capital mobility is generally assumed to be less than perfect the rate of interest may be varied, and we assume a degree of technical perfection of monetary management which allows us to consider the rate of interest an economic policy instrument. Our model may then be viewed as an economic policy model which includes three groups of instruments: the rate of exchange, the rate of interest, and the levels of government expenditures for tradables and non-tradables, representing fiscal policy. It is, of course, a matter of definition whether one says that unchanged credit policy implies an unchanged quantity of money or an unchanged rate of interest. In any case, if the rate of interest is maintained constant in face of an economic expansion, credit volume must have expanded.

We manipulate the model in the following way: we substitute K for B in (1) and differentiate equations (1) and (2) totally, which gives us two

equations in five variables: ΔP_T (representing also the change in the rate of exchange), ΔP_N, ΔG_T, ΔG_N and Δi. We may then arbitrarily choose three variables and solve for the remaining two, one of which will always be ΔP_N. Assuming the equality of marginal and average propensities to spend we then have:[5]

$$Y_{TPT}\Delta P_T = A_{TPT}\Delta P_T + A_{TPN}\Delta P_N + A_{Ti}\Delta i + A_{TY}(Y_{TPT} - Y_N)\Delta P_T + A_{TY}(Y_{NPN} + Y_N)\Delta P_N + \Delta G_T + K_i\Delta i \quad (4)$$

$$Y_{NPN}\Delta P_N = A_{NPT}\Delta P_T + A_{NPN}\Delta P_N + A_{Ni}\Delta i + A_{NY}(Y_{TPT} + Y_T)\Delta P_T + A_{NY}(Y_{NPN} - Y_T)\Delta P_N + \Delta G_N \quad (5)$$

To simplify the writing out of results, the following symbols are introduced:

$$Z_T = (1 - A_{TY})Y_{TPT} - A_{TPT} + A_{TY}Y_N$$

$$Z_N = (1 - A_{NY})Y_{NPN} - A_{NPN} + A_{NY}Y_T$$

$$X_T = A_{TY}(Y_{NPN} + Y_N) + A_{TPN}$$

$$X_N = A_{NY}(Y_{TPT} + Y_T) + A_{NPT}$$

Note that for plausible values of the partial derivatives

$$Z_T, Z_N > X_T, X_N > 0.$$

The model specification is admittedly rather unsatisfactory in several respects, in particular regarding investment and capital exports as functions of the rate of interest. However, these shortcomings are hardly fatal since in general only the signs of the derivatives A_{Ti}, A_{Ni} and K_i are crucial to the results.

We shall consider the following pure cases: 1) constant rate of exchange and simultaneous variation of the rate of interest and government absorption of tradables or non-tradables; 2) adjustable rate of exchange combined in turn with variation of (a) the rate of interest or (b) government absorption of tradables or non-tradables, other instruments remaining constant.

It is assumed throughout in the discussion of the model that wages are constant and that unemployed resources are available.[6]

[5]As pointed out by the discussant, Professor Stanley Black, in the original version of this paper equations (4) and (5) did not account adequately for income effects. In response to this criticism amendments have been made here.

[6]In short, internal balance is assumed. Many modern textbook expositions identify full employment and internal balance. This highly misleading language would never have been adopted if men were robots.

1) Exchange rate constant, i.e., $\Delta P_T = 0$
(Instruments: fiscal and credit policies)

$$\Delta Y_T = 0$$

$$\Delta Y_T = \frac{A_{Ni}\Delta G_T - (A_{Ti} + K_i)\Delta G_N}{-X_T A_{Ni} - Z_N(A_{Ti} + K_i)}$$

$$\Delta Y_N = Y_{NPN}\Delta P_N$$

$$\Delta i = \frac{Z_N\Delta G_T + X_T\Delta G_N}{-X_T A_{Ni} - Z_N(A_{Ti} + K_i)}$$

2a) $\Delta G_T = \Delta G_N = 0$
(Instruments: credit policy and exchange rate)

$$\Delta P_T = \frac{X_T A_{Ni} + Z_N(A_{Ti} + K_i)}{Z_T Z_N - X_T X_N}\Delta i$$

$$\Delta P_N = \frac{Z_T A_{Ni} + X_N(A_{Ti} + K_i)}{Z_T Z_N - X_T X_N}\Delta i$$

$$\Delta Y_T = Y_{TPT}\Delta P_T$$

$$\Delta Y_N = Y_{NPN}\Delta P_N$$

2b) $\Delta i = 0$, hence $\Delta B = 0$
(Instruments: fiscal policy and exchange rate)

$$\Delta P_T = \frac{Z_N\Delta G_T + X_T\Delta G_N}{Z_T Z_N - X_T X_N}$$

$$\Delta P_N = \frac{X_N\Delta G_T + Z_T\Delta G_N}{Z_T Z_N - X_T X_N}$$

$$\Delta Y_T = Y_{TPT}\Delta P_T$$

$$\Delta Y_N = Y_{NPN}\Delta P_N$$

We consider first the fixed exchange rate case. When the price of tradables is assumed exogenous and wages are constant, total output of the exposed sector is also constant. None the less, a change in G_T will change total output and income. If more of the exposed sectors' output is absorbed by the government, net exports must decline. Then, to maintain balance-of-payments equilibrium the rate of interest must rise, depressing domestic investment. The deterioration of the trade balance is modified by

a decrease in domestic investment demand for exposed sector goods at the same time as output for investment of the shielded sector is reduced. This decline in output would not occur if the international mobility of claims was perfect since in that case the domestic rate of interest would not rise.

Even for small industrialized countries the assumption that prices of importables and — especially — exportables are purely exogenous is hardly realistic. Let us then introduce an interdependence between B and P_T such that $BP_T < 0$ and, to simplify matters, assume that in the initial position $B = 0$. In this case an increase in government absorption of exposed sector output will increase that sector's output and price. B, however, must decline, so that again the rate of interest must be raised in order to maintain equilibrium in the balance of payments. But price and output of the shielded sector now receive the impact of two opposite forces: increased demand due to higher prices and output in the exposed sector will tend to raise shielded sector output, while the higher rate of interest will reduce investment demand for the output of the shielded sector. Thus output of the shielded sector may either rise, fall, or remain unchanged.

If in the initial position B is not zero, but negative and large, shielded sector output will fall, because the impact of a higher rate of interest will predominate. If on the other hand B is positive and large (and the sensitivity of B to P_T small) the trade balance may improve, the rate of interest fall and output of the shielded sector rise.

Returning to the assumption of exogenous exposed sector price, let government absorption of shielded sector output increase. This will increase shielded sector output, and in consequence domestic demand for the unchanged exposed sector output will increase. Thus, less is left for net exports and B will decline. Again, the rate of interest must rise, which, however, by restricting investment demand for the output of the exposed sector moderates the deterioration of the trade balance. It follows that the rise in the output of the shielded sector will be the larger, the larger is the sensitivity of capital movements and of investment demand for exposed sector goods with regard to the rate of interest.

It will be seen then that when the international mobility of capital is less than perfect, fiscal expansion (under a fixed exchange rate) must be accompanied by a higher interest rate in order to preserve the balance-of-payments equilibrium. However, assuming unemployed resources to be available, increased government demand for shielded sector output will be more effective in raising total output than increased demand for exposed sector output, which may in fact lead to a decline in total output.[7] But in the long run (with which the model is not adequate to deal) this difference

[7]It follows that with exchange rate fixed and constant interest rate total output may be raised by combining an increase in government demand for non-tradables with a decrease in demand for tradables. In several countries, during the depression of the 1930s and in the early post-war period, considerable attention was given to such expenditure switching leading to a decline in the overall propensity to import.

in effectiveness may diminish or evaporate altogether as increased total employment and in consequence higher wages deteriorate the competitive position of the exposed sector along the lines set out in the Courbis model.

Next we consider those cases where adjustment of the exchange rate is added to policy instruments.

If fiscal policy is unchanged and credit is expanded sufficiently to reduce the rate of interest, demand for the output of both sectors will rise. To preserve the balance-of-payments equilibrium the price of foreign exchange in terms of domestic currency must be raised, so as to adjust to both the increase in capital exports (fall in capital imports) and the effect on the current balance of the increase in domestic activity. In particular for a debtor country that has accumulated considerable foreign indebtedness the sensitivity of the capital balance may confine the possible decline in interest rate levels within quite narrow limits. The scopes for increase and decrease in the domestic interest rate may be distinctly asymmetric. This does not imply a restriction on the scope for increasing domestic activity by changing the exchange rate. But it does restrict the share of domestic investment in the increase of output.

Also in this case we may take into account the possible interdependence of trade balance and price (in foreign exchange) of tradables. The proportionate rise in the domestic price of tradables will then be less than the proportionate rise in the rate of foreign exchange accompanying the reduction of the rate of interest.

If credit policy is neutral in the sense that the rate of interest is kept constant, fiscal expansion will have a multiplier effect as in a closed economy, since the rate of foreign exchange must rise sufficiently to keep the current balance equal to the, by assumption, constant capital flow. Here then it makes a big difference whether perfect mobility of capital is assumed or not. Under perfect mobility of capital any current account deficit will be financed at a constant rate of interest, and increased government absorption of tradables will be neutralized by a deterioration of the current balance. (Increased government absorption of non-tradables will, however, increase price and output of the shielded sector.) But under less than perfect mobility of capital fiscal expansion through increased government demand for tradables will increase total output even on the assumption that the quantity of money is kept constant, the monetary authorities refusing to accommodate an increased demand for transaction balances. A rise in the rate of interest will in this case limit, but not entirely prevent a rise in output, since the rise in the interest rate will occur only if output increases. Thus government demand is met partly from a fall in B, partly from increased output.

As appears from the above discussion the effects of changing government expenditures may differ greatly according to whether the expenditure change in question concerns expenditures for tradables or non-tradables. The practical importance of this distinction is, however, somewhat limited. In most countries government demand for the output of the

shielded sector accounts for by far the major part of total government demand for goods and services. This holds also in particular for government investment expenditures which without excessive welfare loss may be varied considerably for purposes of economic stabilization.

Fiscal policy in the shape of tax changes and changes in transfer expenditures act by changing domestic private absorption. As, however, in most countries, even small ones, the shielded sector may be judged to be far larger than the exposed sector, it remains true that in general the primary real impact of fiscal policy will be preponderantly on the shielded sector. Main exceptions concern various policies specifically designed to control particular categories of demand as, for instance, investment taxes. Thus the natural main scope for fiscal action is in fields where income effectiveness of such action is large.

Leaving aside our simple model we may point to total employment, the balance of payments and the price level as the targets generally judged to be of most concern to stabilization policies. Destabilizing impacts may be received from abroad or arise domestically. Destabilizing impacts from abroad may concern primarily the current or the capital account of the balance of payments.

If a change in economic conditions abroad takes the form of a fairly uniform rise in all prices, without any pronounced changes in relative prices or in total activity abroad, the matter is at least in principle quite simple, since appropriate variation of the rate of exchange will stabilize domestic prices and leave total activity unchanged. Alternatively, if the rate of exchange is kept constant, the inflation abroad will be transmitted to the domestic economy. This, however, need be no cause for concern if the point of view is accepted that domestic inflation is harmful only in so far as it proceeds at a higher rate than abroad and thus prevents the maintenance of external equilibrium.

Traditionally, the principal harmful effects of inflation have been summarized under these headings:

(1) If inflation is allowed to proceed for a protracted period of time, it will tend to accelerate, culminating in the destruction of the monetary system in galloping inflation.

(2) A redistribution of income from wages to profits is supposed to lead to a more unequal distribution of personal incomes.

(3) A redistribution of incomes from creditors to debtors will occur.

(4) The allocation of resources will be distorted due to the stimulus to investment provided by inflation, and finally

(5) If domestic inflation proceeds at a higher rate than abroad the balance of payments on current account must move increasingly into deficit as long as a constant rate of exchange is maintained — which will of course be possible only for a limited time. Further, the distorting effect on allocation must here be progressively intensified as deviating rates of inflation at home and abroad imply continuing changes in price-wage structure.

However, in recent years it has been claimed[8] that if inflation proceeds in step in all countries — or rates of exchange are appropriately adjusted — and if further the rate of inflation is correctly anticipated, neither the allocation effects nor the redistributional effects will occur. Postwar experience would appear to be that inflation rather than redistributing income from wages to profits does the opposite. And as to both the redistribution from creditors to debtors and the distortion of resource allocation neither should take place if inflation is correctly foreseen, since in that case the rate of interest will adjust to the rise in prices, so that creditors will be compensated for the fall in the value of money, and the comparison of present and future prices will not be distorted. However, experience hardly confirms that inflation — and particularly rapid inflation — is in general fully reflected in a rise in market rates of interest.

Furthermore, the above argument neglects the impact of the income tax, which ignores the distinction between that part of interest payments which compensates for the fall in the value of money and the part which is true income. If in non-inflationary conditions the equilibrium rate of interest gross of tax is 6 percent and thus net of 50 percent income tax is 3 percent, then to obtain the same real rate of interest at 10 percent inflation, the market rate should rise to 26.6 percent, equivalent to 13.3 percent net of tax, which will leave a real rate of return of 3 percent. Assuming the 50 percent tax rate to apply to both creditor and debtor, the relative real positions of the two parties is left unchanged if 10 percent inflation is accompanied by rise in the market rate from 6 to 26.6 percent. More generally, assuming the rise in the market rate to compensate fully for inflation, the elasticity of the market rate with regard to the tax rate t will be $t/1-t$.

In the case of the return from investment in real capital as distinct from financial investment the position is affected by the principles of most countries' income tax laws of prescribing deduction for tax purposes of depreciation based on historical investment costs rather than costs adjusted for subsequent inflation. This principle imposes no extra real tax burden due to inflation, if the turn-over period of capital is so short that all costs may be treated as current costs. Equally, there will be no excess burden due to inflation in the extreme opposite case of investment in non-depreciating real assets. Assuming the money return from the asset to rise over time at the general rate of inflation neither real net returns nor capital value will be affected. But the real after-tax return from an asset depreciating over several accounting periods will suffer a decline due to the failure of depreciation allowances to adjust to the inflationary rise in investment costs. The reduction in the real rate of return will be an increasing function of both the rate of inflation and the tax rate. If owners, like tax authorities, suffer from money illusion, consumption will rise to the detriment of real savings.

[8] Johnson (1963).

Note the different time profiles of the yields from financial investments and investments in real capital. In the absence of inflation and at a rate of return (interest) of 6 percent a perpetual bond of $1,000 market value yields a constant $60 per year to which at 10 percent inflation corresponds a rate of interest of 16.6 percent, so that the constant annual yield from a bond of $1,000 market value amounts to $166. In the case of investment in non-depreciating real capital, on the other hand, both the annual yield and the capital value will rise at the rate of inflation without any change in the instantaneous ratio of the current yield to the capital value. At a constant rate of inflation and real rate of interest the nominal market value of the bond will remain constant and thus decline in real terms; the bondowner must reinvest part of his receipts from the bond in order to keep intact the real value of his capital. As mentioned above, an income tax of 50 per cent will require a rise in the bond rate to 26.6 percent, if in spite of 10 percent inflation the real rate of interest is to be maintained at 3 percent after tax. The introduction of taxation requires no corresponding increase in the return from real assets. The 50 percent tax cuts each annual yield of the rising sequence in half, so that the rate of profit net of tax becomes 13.3 percent, corresponding to a real rate of return of 3 percent adjusted for 10 percent inflation.

The different time profiles of yields due to inflation from financial and real assets create difficulties, especially for the financing of long-term investments in fields where leverage normally is high, such as housing, and where consequently in the early life of the real asset the payments required to service debt may greatly exceed current gross profits. The effect is to lengthen the average period of the net cash flow from such projects and presumably increase the risk and reduce the attractiveness of long-term investments. This may be part of the explanation why market rates of interest fail to adjust fully to inflation, so that the real rate of interest becomes close to zero or even negative for investors liable to income tax. A further main explanation is that pension funds and other tax-exempt institutions account for a large part of the demand side of the capital market.

The discrimination against investment in depreciating real capital is in many countries counteracted by permitting exceptionally rapid depreciation and by other devices conferring preferential tax treatment on rapidly growing firms with a high rate of investment. In consequence, an important net result of heavy personal and corporate income taxation in an inflationary economy will be discrimination between, on the one hand, stagnant or slow-growing firms and, on the other hand, rapidly expanding firms which get an added interest in continued expansion and investment as a means to keep down the burden of taxation. As their higher tax burden must hold down the capital value of the slow growers, mergers into and take-overs by the more progressive firms are promoted.

The idea that long-term inflation will tend to accelerate into hyper-inflation is an old one. Until recently most economists would probably have

denied the existence of any such strong tendency, let alone necessity, for inflation to accelerate. However, inflationary developments of the last few years may have raised new doubts and the theoretical discussion was certainly greatly stimulated by Milton Friedman's address at the 1967 annual meeting of the American Economic Association.[9] Here, commenting on the Phillips curve, he spelled out the thesis that there is only a temporary, but not a permanent, trade-off between wage inflation and unemployment. This propostion, if correct, is of course highly relevant to the question of the existence of a well-defined macroeconomic equilibrium. In the so-called new microeconomics a great many theoretical models for the labor market have been constructed. Common to most is the idea that at each point in time contracts are based on wage and price expectations, which in excess demand disequilibrium are repeatedly revised upwards due to the positive feedback from wages to total demand. Though not always stressed, this feedback is a crucial element in the cumulative inflationary process, marking the decisive difference between markets to which partial analysis is or is not adequate. However, the behavior of dynamic models is so notoriously sensitive to even minor variations in assumptions that prospects appear rather dim for reaching convincing results through theoretical analysis. Beginning with Solow's investigation[10] a great many attempts have been made by regression analysis to clear up the question of the influence of price expectations on the course of wages, using mostly some variant of the adaptive expectations hypothesis. Overwhelmingly such analyses have given the negative result that the influence of price expectations has been less than required for verification of at least a crude version of the hypothesis put forward by Friedman — who, however, explicitly stressed the delays in the learning process. More specifically, in regression equations of the form

$$w = F(u) + a\,p$$

(where w and p are rates of wage and price increases, and u unemployment — or some other variable or combination of variables thought to represent adequately the degree of excess demand in the labor market) the coefficient "a" has generally been found to be considerably less than one — mostly about one-half. However, the value of the evidence depends upon the correctness of the equation specification. Price expectations are relevant, but presumably their influence may already be accounted for through the excess demand function into which they must enter as arguments. With obvious symbols we may write the wage adjustment equation as follows

$$w = k(D(W, P, \ldots) - S(W, P, \ldots))$$

[9]Friedman (1968).

[10]Solow (1969).

the elasticities of demand with regard to W and P being appreciably higher than those of supply. It is certainly not evident that in this equation prices or the rate of price increase should appear independently outside the demand and supply functions. In any case, since excess demand must be influenced by price expectations, these as additional independent variables cannot be assumed to express the full influence of price expectations.[11]

That world market prices of all tradables change in the same proportion, so that the terms of trade remain constant, is rather exceptional. For a small open economy the real income effect of a change in the terms of trade may easily be equivalent to normal annual productivity growth. The most troublesome case is that where a deterioration of export markets is accompanied by a decline in the terms of trade. The adjustment to a lasting change of this kind will reflect that foreign trade has become less advantageous. Supposing the adjustment to be made by exchange depreciation, the depreciation should typically result in a decline in the proportion of foreign trade to domestic output computed at constant prices. In the absence of exchange rate adjustment a deterioration of the terms of trade, say through a rise in prices of imports, may in the first instance be supposed to lead to a decline in the current balance — which must be matched by an increase of domestic investment relative to savings, brought about presumably mainly by an increase in inventory investment. But if the deterioration of the terms of trade gradually leads to an economic contraction, investment would normally decline more than savings and the current balance must improve correspondingly, mainly by a fall in the volume of imports. However, in an inflationary climate and at high

[11]To illustrate the point, simulation runs have been performed on a fairly simple, dynamic two-sector model. In one sector cost-plus-pricing is the rule and the production function is linear; in the other sector firms are pricetakers and the production function is decreasing returns non-linear. In each period production is decided in the first sector on the basis of past sales, unsold stocks in hand at the beginning of the period, and the rate of interest (to represent the influence of credit on investment) in the previous period. In the pricetaker sector production decisions are based on past prices (to represent price expectations) and wages for the coming period. Production decisions combined with specified demand functions determine actual sales in the cost-plus-sector (and thus unsold stocks at the end of the period) and prices in the pricetaker sector. Wages are determined with a one-period lag by a pure Phillips relation lacking any independent price variable. A random element was included both in the wage equation and in the production function of the pricetaker sector. From an initial equilibrium the model was conducted through a number of simulation runs by irregular cyclical variations in exogenous money supply. Because of the fairly important random element in the wage equation the results of the runs gave, of course, only an imperfect correlation between wage changes and unemployment in the preceding period. Further, the price of the good produced by the pricetaker sector (and thus the price level as a whole) would necessarily vary largely in sympathy with total income, production and employment. In consequence, changes in wages tended to conform — with a one-period lag — to changes in prices, so that in a regression analysis the rate of price increases would show up as a significant influence on the increase in wages — in spite of the fact that prices and their changes do not enter the wage equation.

levels of activity, the sharp rise in import prices may well stimulate total demand further, so that the deterioration of the current balance is matched by larger domestic investment. The economic consequences of the international rise in oil prices may in different countries provide examples of both types of development. In any case, if the terms of trade deteriorate through a rise in prices of imports, an evident conflict arises between the targets relating to price stability on the one hand and employment and the balance of payments on the other.

The stabilization problem may be quite complicated in the case of an international Mengenkonjunktur and in particular of a decline in international economic activity. The maintenance of the volume of exports and thus of output in the exposed sector will require an increase in the country's share of export markets which in turn may require a decline in export prices in terms of foreign exchange. While in the long run a small industrialized country's exports may be presumed to be determined mainly by supply factors, in the short run demand factors assume major importance. Under an international recession price elasticities of demand for producers' goods and in particular investment goods may be relatively low, so that the practical chances of maintaining the volume of exports and their purchasing power in terms of imports could be distinctly poor.

Since by definition the primary domestic impact of disturbances from abroad to the current balance will be on the exposed sector, whereas the main field of impact of fiscal policy is on the shielded sector, it follows that in the short run fiscal policy can achieve little more than neutralizing the secondary effects of the disturbances from abroad. Whether it will in fact prove possible through fiscal action to prevent a decline in activity and incomes to spread from the export industries to the rest of the economy, will under fixed exchange rates depend on the exchange reserves and credit facilities available for financing the increased deficit on current account which expansionary fiscal action calls forth. Under clean float — flexible exchange rates without official market intervention — the financing of a current deficit by drawing down exchange reserves is by definition excluded. It does not follow, however, that the exchange rate will depreciate so as to re-establish the position on current account since speculative capital imports may counteract the depreciation of the exchange rate and in the limiting case prevent it entirely — in general a highly improbable outcome, however, if effective domestic policies designed to maintain income and employment are pursued. But that the monetary authorities should entirely abstain from intervention in exchange markets is neither probable nor advisable. Assuming the temporary character of the adverse developments in foreign markets and the availability of sufficient foreign exchange resources, the optimal exchange rate policy would presumably be directed towards maintaining the ratio of exposed sector to shielded sector prices approximately at pre-recession levels.

The most troublesome case of a disturbance from abroad impinging on the capital account of the balance of payments is a reduction of the

possibilities of borrowing abroad, forcing a decline in capital imports to an economy that has become geared to current account deficits and capital imports. Evidently, without reducing employment the current account deficit can only be reduced if the rate of exchange is depreciated or other measures are taken which impinge directly on the current balance.

One might expect economic instability to be more pronounced in small industrial countries with a relatively large foreign trade than in the larger countries. But this is in fact not what one finds,[12] the most obvious, but hardly sufficient explanation being that in countries with a large foreign trade the marginal propensity to import is also high.

As the relative size of the public sector and government intervention has expanded, the course of economic events has increasingly become dependent upon government policy. The very growth of the public sector has contributed to the rising trend of inflation due to the stronger demand effect of real expenditure than of taxes.

It has often been claimed that a large public sector promotes economic stability, partly because public expenditure is presumed not to be subject to similar fluctuations in demand and activity as the private sector, partly because of fiscal drag or built-in-stability due to high marginal tax rates. But when inflation accounts for the major part of the rise in total income, fiscal drag is greatly weakened by the rise in wages and prices, causing public expenditure to rise and thus counteracting the increase in tax revenues.

Confronted with disturbances from abroad an economy combining a flexible exchange rate with inflexible wages would react in much the same way as an economy with flexible wages and a fixed exchange rate. But in the face of domestic excess demand or supply the two economies would react very differently, the flexible wage tending to equate demand and supply in the labor market at the same time as the current account moves towards deficit or surplus, whereas the flexible exchange rate would tend to maintain the foreign balance, but enhance disequilibrium in the labor market. Paradoxically, flexible exchange rates are becoming the fashion at the time when high levels of employment decrease the elasticity of domestic supply and inflation increases the flexibility of wages.

[12]Lundberg (1968).

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Discussion

Stanley W. Black

Professor Gelting's paper provides us with three topics today: a review of recent work on the "Scandinavian" model of inflation, a digression on some effects of inflation on the domestic economy, and a model of monetary and fiscal policy in a small, open economy.

Let me begin with his digression on inflation, which questions some recent views on the desirability of "living with inflation." His primary focus is on the ways in which income taxes affect the adjustment of interest rates to inflation. As Professor Gelting points out, under inflationary conditions the income tax exaggerates the required increase in the before-tax return on fixed value claims that will yield a given after-tax return. With no tax, the return would merely have to rise by the expected rate of inflation to compensate for the loss in real value. I should like to point out that if the losses in real value were tax-deductible, this would still be true. It is the non-deductibility of real capital losses that requires the before tax yield to rise by the expected rate of inflation divided by one minus the tax rate. Much of this increased return must be saved in order to avoid a reduction in real wealth, as has also been argued by William Poole.

Professor Gelting argues that the elasticity of the before tax yield with respect to the tax rate is $t/1-t$. This result depends on the assumptions that all returns are taxable and that none of the opportunity cost of capital is deductible from the income tax. More generally, let the tax rate be t, the percent of returns on investment that are taxable be v, and the percent of cost of capital that is deductible be x. Then one can show that the elasticity of the before tax return with respect to the tax rate is

$$\frac{(v - x)t}{(1 - xt)(1 - vt)},$$

which is positive or negative as the taxable fraction of returns is greater

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or less than the deductible fraction of costs ($v > \text{or} < x$).[1] The case emphasized by Gelting has $x = 0$ and $v = 1$, as in personal earnings on financial investments or business earnings on equity capital. But for mortgage-financed housing, $x > v$ and the market yield can fall with a rise in the tax rate, since the deduction becomes worth more.

Passing on to his discussion of the Phillips curve, I would disagree with Professor Gelting's claim that the rate of price increase should not appear independently outside the demand and supply functions of labor. Wage changes can be regarded partly as a response to existing disequilibrium in the labor market, as Gelting views them, and partly as a response to shifts in the location of the equilibrium wage rate, as prices and productivity change.

Let me now return to the main point of Professor Gelting's paper. The model he presents marries the Mundellian analysis of monetary and fiscal policy to the Scandinavian assumptions of fixed terms of trade. He is thus responding to a challenge recently put by our Chairman "to combine 'structuralist' and monetarist models of inflation for open economies by showing the interdependence between the markets for money, credit, commodities, services, and labor, considering the influence on domestic prices of international price changes and the different rates of productivity increase in various sectors."[2]

To place this work in context, let me briefly mention the major strands of work on the small, open economy. The earliest contributions were the "Australian" models of Swan, Salter, and Waterman. These models focused on the consequences of fixed terms of trade for policies aimed at expenditure-switching and expenditure-reducing to achieve internal and external balance. The capital account was not emphasized, but the two-sector model of tradable and non-tradable or home goods was adopted. Then we have the "Canadian" models of Robert Mundell with their emphasis on capital flows and the differences between monetary and fiscal policy. Prachowny's recent article combines the "Australian" analysis of tradable and home goods with the Mundellian policy framework.

The third major strand of work is the Scandinavian model, begun by Aukrust in Norway and extended in Sweden and France. This model has focused on the supply side of the economy, rather than on demand factors, and has drawn out the implications of fixed world market prices for wages and prices in a small, open economy. The Aukrust model uses the price side of a Leontief system to show the effects of changes in wages, external prices, and productivity on profits in the various sectors of the economy. Clearly, monetary and fiscal policies play no role in such a theory.

[1] Let the before tax return be Q and the before tax cost of capital be R. Then after taxes, $(1 - vt)Q = (1 - xt)R$, whence $Q = \frac{1 - xt}{1 - vt}R$. The result follows by differentiation.

[2] Assar Lindbeck "Reseach on Internal Adjustment to External Disturbances: A European View," in C. F. Bergsten, *The Future of the International Economic Order* (Lexington, 1973) p. 66.

But Courbis has grafted the Aukrust incomes policy model onto a macroeconomic demand framework. As I understand Courbis' model, he uses a modified Aukrust model as a breakeven condition to determine wages and domestic prices, given external prices, productivities, and investment requirements. The Phillips curve then implies the employment level and aggregate supply that is compatible with wages as given by foreign prices. Imports are a residual. As pointed out by Gelting, in such a model the main effects of monetary and fiscal policy are on the trade balance rather than employment. An increase in aggregate demand spills over onto imports, since output is given by costs and profits. A shortcoming is the assumption of capital immobility, certainly not very acceptable in today's world of Eurocurrency markets.

Professor Gelting takes Prachowny's version of a Mundellian model as his basis for analysis and, at least implicitly, criticism of the Courbis model. Before proceeding to discussion of his results, I would like to draw attention to the ways in which Prachowny's model is not up to the burden it is being asked to carry. First, as noted by Gelting, the assumption of rigid money wages cannot accommodate the Phillips curve analysis of the Courbis model. A closer approximation would be full employment with completely flexible wages, so that the reallocation of resources between sectors would be more explicit. Secondly, the "structuralist" element of the model bears at best a distant resemblance to the Aukrust model. The problem is that the cost functions assumed for traded and non-traded goods depend not on wages and productivity, as in a Leontief production function, but on quantity produced, as in the neoclassical theory of production. Thus the independence of costs from demand factors characteristic of the Scandinavian model has been lost. Perhaps that is a good thing, but at the same time the focus on wages, profits, and productivity has also been lost. As a result, Gelting's model is more monetarist than structuralist, although the supply side does play a role.

The main assumptions of the model are as follows: (1) world market prices of exportables and importables are fixed, as are the terms of trade, so that the domestic price of tradables varies with the exchange rate; (2) unemployed resources exist in both the tradable sector and the non-tradable goods sector; (3) money wages are constant; (4) fiscal policy can take the form of purchase of either tradables or non-tradables, with the latter more likely; (5) capital is less than perfectly mobile; (6) no reserve movements occur, since balance-of-payments disturbances are resolved either by monetary policy to affect capital movements or by flexible exchange rates; (7) the central bank controls the interest rate; (8) government spending is fixed in real terms, rather than in money terms; and (9) the demand functions for domestic absorption of tradables and non-tradables are defined in *nominal* terms, even though the absorption variables are originally defined in real terms. The first four of these assumptions are taken over from Prachowny, but the latter five are new. Incidentally, variable interest rates raise the problem of wealth effects on saving, excluded by assumption from Prachowny's model.

Given these assumptions, Gelting first shows the effects of stabilization policies under pegged and flexible exchange rates. Then he discusses policy response to various disturbances, such as imported inflation or recession, change in terms of trade or in access to foreign capital.

The main conclusions on stabilization policy are interesting, but not too surprising. Under pegged exchange rates, monetary policy is shackled to the balance of payments even when capital is not perfectly mobile, because of the avoidance of reserve movements. Under flexible rates, monetary policy can affect both internal and external balance. Fiscal policy, especially with respect to non-traded goods, can affect output under both regimes. But it is more effective under flexible rates, since interest rates do not have to be raised to equilibrate the external accounts.

These results can be shown in the following two diagrams. Figure 1 refers to the case of a pegged exchange rate and thus a fixed price for tradable goods. In the market for tradable goods, shown by the curve TT, a rise in the price of non-tradables will increase demand and cause a fall in the balance of trade. These effects must be offset by a rise in the interest rate, leading to an upward sloping TT. In the market for non-tradable goods, a rise in price will usually reduce demand and increase supply, requiring a fall in the interest rate to maintain equilibrium, for a downward-sloping NN curve. An easier fiscal policy directed toward either market will cause a shift in the relevant curve in the direction of the arrow. In both cases the balance of payments will tend to deteriorate, requiring a tight monetary policy. The effect on total output depends on what happens to the price of non-tradables. A purchase of home goods will raise total output, while purchase of tradable goods will reduce it. In Prachowny's case of perfectly mobile capital, the TT curve is horizontal and does not shift if the government buys tradable goods.

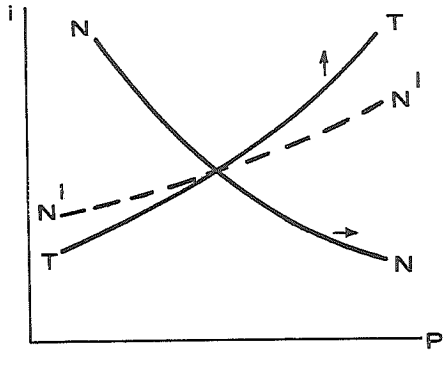

Fig. 1. PEGGED EXCHANGE RATE

In the case of a flexible exchange rate, both domestic prices can vary, and the relevant curves are shown in Figure 2. Fiscal expansion would shift the relevant curve in the direction of the arrow, depending on which type of goods were purchased by the government. In both cases output rises and the exchange rate depreciates. Monetary policy, which is now free to follow its own way, will cause *both* curves to shift opposite to the arrows as interest rates rise. The effects of imported inflation or recession and other external disturbances can be studied in these diagrams by shifting the TT and NN curves in the relevant direction. Gelting's discussion of disturbances proceeds *outside* of the model, since inelastic foreign demand and changes in the terms of trade violate assumptions of the model.

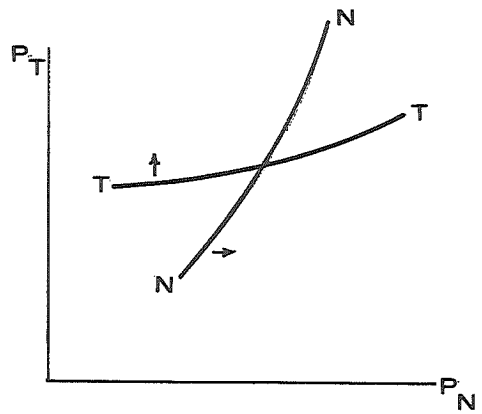

Fig. 2. FLEXIBLE EXCHANGE RATE

This picture of Gelting's model is, however, subject to one qualification. By defining demand functions in nominal terms and fiscal variables in real terms, Professor Gelting has left the model vulnerable to some potentially troublesome income effects. His equations (4) and (5) contain terms A_{NPN} and A_{TPT} that can be either positive or negative since they include the effects of a price increase on the value as well as the volume of demand. Thus the coefficients he calls Z_T and Z_N can be negative, because of the income effects of higher prices. Inflation raises the money incomes of producers, who will spend the increase just like an increase in real income. These income effects can conceivably outweigh the substitution effects of the price increases and cause the curves of Figures 1 and 2 to have different slopes. For example, we could have the curve N'N' in Figure 1, which remains stable as long as TT is steeper. Here an increase in government purchases of tradable goods would lower the price of non-tradables, leading to a *decrease* in demand for non-tradables because of

the strong income effect. Then interest rates would have to fall, leading to an outflow of capital and a trade *surplus*! Similarly, both curves in Figure 2 could slope in the opposite direction. Presumably, these possibilities should be ruled out by assumption.

A final interesting case discussed by Gelting is the effects of a variable world price of tradables, under pegged exchange rates. In this situation fiscal expansion will raise the price of tradable goods and deteriorate the trade balance. Since capital flows must meet the change in the trade balance, the interest rate must rise or fall depending on the change in the *value* of the trade balance, which can go either way. Regardless of the effect on the interest rate, it should be noted that the *volume* of trade must decline.[3]

I believe that this sort of policy model has substantial usefulness in exploring the nature of choices open to the small, open economy. Professor Gelting has my thanks for a very stimulating paper. Nevertheless I would like to emphasize the need for modifying the assumptions concerning the use of exchange reserves and hence monetary policy under pegged exchange rates. It is doubtful that monetary policy has the freedom under flexible rates that he assumes. Also I believe a full employment model would be better equipped to test in a comparative static framework the conclusions of dynamic models including a Phillips curve. An alternative is a *truly* dynamic model with a Phillips curve, as in the recent paper by Scarfe in *Oxford Economic Papers*. If a Phillips curve is to be used, presumably wage changes should depend *both* on unemployment and on productivity growth, as in the Swedish model by Edgren, Faxen and Odhner. And what about a Leontief production structure? That would seem much closer to the Aukrust framework.

[3]Since $B(P_T)P_T = K(i)$, $di/dP_T >$ or < 0 as initial $B >$ or $< -B'P_T > 0$. But $dB = d(K/P_T) = B' < 0$.

International Monetary Reform and the Stabilization Problem

J. Marcus Fleming

Introduction

When the assignment to write about international monetary reform and the stabilization problem was accepted, it was hoped that by the time this paper had to be submitted the main features of a comprehensive and well-balanced reform of the international monetary system would have been determined.

Unfortunately, things have not worked out that way. The reform proposals, as set forth in the Outline of Reform[1] accompanying the report which the Committee of Twenty, at its final meeting on June 13, 1974, approved for submission to the Governors of the Fund, fall into three categories, differing in the degree of approval which they have received from the Committee. Part I of the Outline indicates the general direction in which the Committee believes the international monetary system "could" evolve in the future. It consists, in the main, of a broadly worded statement of principles, with a brief presentation of alternative solutions for some of the main problems. Part II of the Outline sets out the steps which the Committee is agreed should be taken immediately. It adopts certain of the principles of Part I, sometimes in modified form, as suitable for immediate application, approves certain institutional changes, calls for certain matters to be studied, and asks that draft amendments of the Articles of Agreement be prepared on certain topics. Finally, the Outline contains several Annexes, with illustrative schemes and operational detail relating to various aspects of Part I. These have been prepared by the Chairman and Vice-Chairmen of the Deputies, but have not been approved by the Committee.

At this point, it appears likely that the reform of the international monetary system will be a long drawn out, piecemeal affair which may

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[1]See *IMF Survey*, June 17, 1974.

take any one of a number of different shapes. Nevertheless, it is of interest to ask what may be the consequences for stabilization and stabilization policies if the reform in fact proceeds along one or other of the lines of possible development sketched out in the Outline. The present paper will focus on these aspects of the reform which are germane to these objectives.[2]

What is the meaning of "stabilization" in such phrases as "stabilization problems," "stabilization policies"? Stabilization seems to be a complex, multi-dimensional concept. It may refer to prices, to output, to employment. In the case of prices it may imply constancy in the price level or in the rate of increase of prices. In the case of output and employment it implies steadiness in the rate of growth, but one would usually add "at a satisfactory level."

The main ways in which international economic arrangements could contribute to stabilization in any country in the senses described above would be through their effects on (i) the attainment by national governments of a level of aggregate demand that appears optimal in view of the existing trade-off between full employment and price constancy in the country concerned, (ii) the terms of that trade-off, and (iii) the stability of demand for the products of particular industries, especially in the foreign trade sector.

The aspects of the international monetary reform that appear most relevant to the generation of such effects are (a) the international liquidity regime, (b) arrangements with respect to long-term disequilibrium in international payments, and (c) arrangements with respect to short-term disequilibria.

Supply of International Liquidity

(a) *Relevance to stabilization*

The supply of international liquidity is of importance for stabilization insofar as it affects the demand management policies of national governments. Most academic economists, who tend to look upon international liquidity in general and unconditional liquidity (monetary reserves) in particular as analogous to private domestic liquidity and money, respectively, would probably see the main significance of international control over the creation of international liquidity as lying in this sphere. It is doubtful, however, whether this is so, particularly for conditional credit facilities but even for reserves. Except possibly in circumstances of deep depression it would not occur to any monetary economist that the supply of money should be increased for the purpose of increasing the

[2]More comprehensive treatments of reform issues will be found in a speech by Mr. Jeremy Morse, Chairman of the Deputies, at Williamsburg on June 7, 1974 entitled "The Evolving Monetary System" (see *IMF Survey*, June 17, 1974) and in another paper by the author entitled "Reflections on the International Monetary Reform" (IMF: DM/74/63 dated June 27, 1974).

real liquidity of individuals rather than to affect demand; on the contrary, the faster money was issued, the lower would be the stock of real liquidity. In the international sphere, however, though enhanced reserves and reserve growth probably exercise some positive influence on demand, particularly in deficit countries, this influence is indirect and unlikely to be strong. Of greater importance are likely to be, for example, an enhancement of real reserve ease, with a consequential relaxation of restrictions on imports and capital exports, an increase in exchange stability in the face of short-term payments imbalances, and a tendency for the value of currencies to rise more, or fall less, relative to reserve assets — tendencies which, according to circumstances, might improve or worsen the adjustment process. In a previous paper[3] I have sought to justify the assumption that increases in the money value of reserves lead to increases in real reserves on the grounds that governments have demand management targets from which they are not easily swayed. But the answer depends partly on the size and openness of the economies concerned; the smaller and more open the economy the more the monetary model becomes applicable to the reserve problem also.

(b) *Reform proposals*

It has always been one of the functions of the Bretton Woods system to ensure the provision of an adequate but not excessive supply of international liquidity. From the beginning members of the Fund were entitled to draw on Fund resources within certain limits to meet balance of payments deficits provided that they adopted appropriate corrective policies enabling them to undertake repayment within a short period of years. This is sometimes called "conditional liquidity." Unconditional or freely disposable liquidity, in the form of gold or foreign exchange reserves, however, was not subject to any kind of international control; its supply as measured in currency equivalent depended on impersonal economic forces determining (a) gold production and consumption, (b) the balance of currency devaluations and revaluations relative to gold, (c) the payments deficits of reserve currency countries, and (d) the willingness of other countries to hold their reserves in currency form. These forces, though not entirely unfunctional, were far from giving rise to an optimal supply of reserves. With the establishment of the Special Drawing Account of the Fund in 1969, however, the supply of unconditional liquidity also began to come under a measure of international control. The Fund was now in a position to relieve any reserve stringency that might exist by creating and distributing among its members in proportion to their quotas a new international fiduciary reserve asset, the SDR. This asset derived its value, ultimately, from the obligation of participating countries to purchase it, if designated to do so, for convertible currencies, at a fixed price,

[3]"Reserve Creation and Real Reserves," *International Reserves — Needs and Availability*, International Monetary Fund (Washington, D.C.), 1970 pp. 521-52.

namely, parity with the U.S. dollar. Since, however, the SDR was simply added to pre-existing types of reserves, the supply of which continued to be determined by unregulated economic forces, it could do little, despite the theoretical possibility of canceling SDRs, to prevent an excessive expansion of total world reserves. Such an excessive expansion did, in fact, take place, as a result of the enormous payments deficit of the United States, over the years 1970-73.

When the wholesale reform of the system came to be studied in 1972, one of the principal objectives was to achieve a better control over the supply of reserves. The most radical suggestion for achieving this objective was the proposal to establish a system of mandatory asset settlement. Under that system reserve centers, as well as other countries, would settle their payments supluses and deficits by the transfer or receipt of reserve assets. This contrasts with the Bretton Woods system of "on demand" convertibility under which a reserve center might lose reserves by conversion in amounts greater or less than its deficit. Two main mechanisms for achieving asset settlement have been considered: (l) a centralized settlement system under which any net increases in a country's reserve liabilities would be redeemed through a periodic transfer of SDRs from the reserve center to countries designated by the Fund and any net decline in reserve liabilities made good by the Fund acquiring and holding claims on the reserve center in exchange for newly created SDRs, or conceivably by a transfer of reserve currency to centers designated by the Fund; and (2) arrangements under which each country — or at least all the main ones — would demand conversion of any accruals of currency acquired in intervention and reconstitute any balances used for intervention. Those adhering to this strict line of thought would permit variations in the liability financing of payments deficits, and the associated variations in the holding of reserve claims on countries or on international institutions only when these took place under internationally approved credit arrangements.

Another school of thought, strongly represented in North America, put less emphasis on a tight control over global liquidity or reserves and more emphasis on the need for a flexible response to variations in the need for international credit. This led them to advocate a system of "on demand" convertibility (rather than asset settlement) in which conversion need not take place if both parties were agreeable to waive it and, indeed, would not be allowed to take place if the creditor had accumulated gold and SDRs up to a "holding limit" to be prescribed for each country. Reserve centers would be protected against net declines in their own reserves, if they so desired, by a centralized settlement system, such as that described above, but the main protection against an excessive growth in the currency reserves of other countries would lie in an improved mechanism of adjustment which would check disequilibrium at an early stage. These differences have not been resolved in the Outline of Reform,[4] though

[4]Outline, paragraphs 20 to 22, and Annexes 5 to 7.

certain compromise arrangements have been suggested in Annexes 5 and 6 of that document.

Even if it had been possible to agree on a reasonably tight system of asset settlement, with no more than a moderate degree of flexibility, the effectiveness of international control over reserve supply would have continued to be threatened from another side, namely, from changes in the effective currency-equivalent of existing gold reserves. Though it has not proved possible to agree on any solution to the problem of gold valuation, all of the solutions proposed in the Outline[5] have in common that they would permit the sale of monetary gold to the market at market prices, so that the effective value of gold reserves would be much higher than their nominal value and would, moreover, be liable to fluctuate substantially. The proposals differ in that some of them would permit gold to be bought by central banks at market prices from other central banks, or even from the market, thus tending to withhold monetary gold from the market and promote still further increases in the effective value of reserves. It seems likely that no proper control over international reserve supply will be possible until monetary gold has been completely segregated from the market and is once more transferred at a conventional price or, more probably, until all national gold reserves have been surrendered to the Fund in exchange for SDRs created for the purposes.

Stabilization and Longer-term Payments Disequilibria

(a) *Relevance to stabilization*

Let us now consider the bearing on stabilization problems of the reform discussions insofar as they relate to international payments disequilibria and their correction.

International disequilibria are likely to give rise to significant stabilization problems less through their existence as such than through the disturbing manner in which they come into existence or through the way in which they are handled by governments. Broadly speaking, international arrangements regarding payments disequilibria will contribute to stabilization insofar as:

(i) they inhibit official actions which disturb both international equilibrium and also internal stability in other countries;

(ii) they discourage official actions which, while tending to correct international disequilibrium, are disturbing to stability in other countries;

(iii) they mitigate other shocks, disturbing both to international equilibrium and domestic stability, which national economies receive from abroad;

(iv) they facilitate effective policy responses to destabilizing developments, whether arising from foreign or domestic sources, by making such responses compatible with international equilibrium; and

[5]Outline, paragraph 28.

(v) they mitigate the failure of stabilization policies by spreading the effects of autonomous disturbances as widely as possible among countries.

As we shall see in considering shorter-term disequilibria, arrangements that are good from standpoint (iii) are generally bad from standpoint (v) and vice versa — a circumstance which enhances the importance of the other criteria.

It is useful for practical purposes though somewhat arbitrary, to retain the distinction between "fundamental" and non-fundamental disequilibria which plays an essential part in the par value system of the Fund's Articles, and which may be interpreted in practice as a distinction between disequilibria relating to periods comprising at least four years, and shorter-term disequilibria arising from cyclical or shorter-term influences. These disequilibria may be expressed overtly in movements in reserves or official financing, or may be suppressed by restrictions or other measures that distort or deflect international transactions. Interestingly enough, the distinction between fundamental and other disequilibria is nowhere explicit in the reform proposals contained in the Outline, but is implicit in several of them, such as (a) the retention of a system of par values, changes in which require the consent of the Fund, presumably on the basis of existing criteria related to fundamental disequilibrium,[6] (b) a provision that capital controls will not be used to maintain inappropriate exchange rates,[7] (c) the use of a structure of reserve levels — symptomatic of the persistence of overt disequilibrium — to help indicate the need for adjustment action,[8] and (d) a suggestion that graduated pressures should be applied to countries in large *and persistent* imbalance.[9] Indeed, one might say that the major part of the reform proposals is concerned with various aspects of the process of bringing about adjustments to these longer-term disequilibria.

Per contra, longer-term international disequilibria probably constitute less of a threat to stabilization under present conditions than shorter-term ones. Their main importance in this context would arise (i) if they were precipitated by aggressive action on the part of governments, particularly through competitive exchange alterations, through the introduction of import or export restrictions, or through regulated increases in export prices, (ii) if deficit countries responded to difficulties in financing their deficits by an undue restriction of aggregate demand, (iii) if reserve accrual by surplus countries led to expectations of exchange appreciation and hence an influx of funds too large to be offset by the monetary system, or (iv) if fundamental disequilibria were corrected only at longish intervals by large and sudden exchange rate adjustments involving disturbances in the competitive conditions of industries in different countries.

[6]Outline, paragraph 11.

[7]Outline, paragraph 15.

[8]Outline, paragraph 6 and Annex 1.

[9]Outline, paragraph 10.

(b) *Reform proposals*

The reform proposals achieve little advance on the Bretton Woods system — or rather on the post-World War II system with respect to monetary, commercial, and commodity policy — in dealing with (i), (ii), and (iii) above. They are, by contrast, largely focused on achieving improvements with respect to (iv), and on achieving such improvements not only for countries in general but for reserve currency countries in particular.

As regards (i), under the post-World War II system, countries were required not to engage in competitive exchange depreciation, not to alter their exchange rates without the concurrence of the Fund, not to restrict imports except to meet temporary balance-of-payments difficulties, and not to restrict current payments except with the concurrence of the Fund. International agreements affecting prices and trade in primary commodities were, according to certain principles adopted by resolution of the ECOSOC, to be made under arrangements in which decision-making powers were shared between producers and consumers. Not too much attention was devoted to all of this in the early stages of reform discussions, and all that Part I of the Outline asserts is "a strong presumption" against the use of controls on current account transactions for balance-of-payments purposes, and the United States would like to subject all such restrictions to the consent of the Fund. However, acting out of a desire to forestall the danger of an epidemic of restrictions in the wake of the oil price increase and under the prodding of the United States, the Committee of Twenty envisaged, under "Immediate Steps," the issuance of an invitation to countries to pledge themselves, for a period of two years, not to introduce current account restrictions for payments purposes without a finding of justification by the Fund. The possibility of an amendment to Fund Articles giving permanent force to this pledge was also envisaged.

As regards (ii) and to some extent (iii), the problem was dealt with under the Bretton Woods system by the application of a regime of temporarily fixed par values, adjustable in case of fundamental disequilibrium, with the consent of the Fund.

As a result of experience in the inter-war period, it was accepted that to entrust the correction of fundamental disequilibria to market forces while maintaining fixed exchange rates might involves either chronic depression in deficit countries or recourse to restrictions on trade and payments. It was therefore regarded as permissible, though not mandatory, for a country to react to fundamental disequilibrium by maintaining demand and employment and adjusting its par value.

In practice, the Fund did not regard exchange rate adjustment as the only means of meeting fundamental disequilibria. Indeed, it was expected that small disequilibria could be corrected or prevented from appearing by cautious demand management policies — which might mean no more than refraining from inflation in an inflationary world — exchange devaluation being reserved as a weapon of last resort to deal with disequilibria which somehow or other had been allowed to grow too large.

This approach to dealing with basic disequilibria by means of demand policy punctuated at longish intervals by fairly substantial discrete exchange devaluations worked not badly for quite a long time after the devaluations of 1949, except in some hopelessly inflationary less developed countries where Fund officials were very soon pressing the governments concerned to give up their unrealistic fixed rates and keep adjusting their exchange rates or allowing them to float, more or less *pari passu* with the rise in domestic prices and costs. For industrial countries and the stabler primary producers, however — with the significant exception of Canada — exchange rate changes were few and far between during the 1950s and much of the 1960s. In a generally expansionary environment, and with the United States presenting the rest of the world with a fairly continuous payments surplus, most countries were able to stay in line by a relatively mild manipulation of domestic demand.

As time passed, however, the system of the adjustable peg began to attract increasing criticism on the part first of academic economists and then of officials also. It was alleged that the system led to undue delays in making adjustments, that the delays led to speculative crises, and that the crises led to adjustments which, when they came, were excessive. It seemed fairly obvious, with benefit of hindsight, that the devaluations of 1949 had been too large. Moreover, the world economic environment was changing in ways that tended to accentuate the weaknesses of the system. In the first place cost-push factors were becoming more important relative to demand-pull factors in the causation of inflation. This meant that whereas previously differences in rates of inflation could be curtailed or made compatible with payments equilibrium at a relatively small cost in terms of unemployment, later on these differences, whether arising from differences in labor aggressiveness, in productivity growth, or in degree of money illusion, became more and more difficult to control by demand management and thus had increasingly to be offset by exchange rate alteration. Secondly, the tremendous increase in the international and intercurrency mobility of capital not only had great importance for the cyclical behavior of payments balances but also magnified the volume of speculative funds that were liable to shift between countries and currencies in response to changing expectatations. These developments made it necessary to change exchange rates more often and increased the penalties of stubbornness and procrastination in this regard. This lesson was driven home by the defeat, in 1967, of the long struggle to defend the parity of sterling and by the adjustments which took place in the following years in France, Germany, and Canada.

The bulk of academic opinion had by this time turned against the par value system and in favor of floating rates, or more or less automatic crawling pegs, geared either to reserve changes or to changes in market rates within the permitted margins. In 1970, when the Executive Board of the Fund examined "The Role of Exchange Rates in the Adjustment of International Payments," it rejected both of these solutions. They rejected the crawling peg largely because it would be responsive to short-run and

not necessarily to underlying or fundamental disequilibria, and because they thought that national authorities might in fact refuse to be bound by the automatic indicators, and either refuse to allow the rate to crawl or insist on its jumping. I think they were right and that the crawling peg in any of the imperfect forms in which it might conceivably have been accepted would have been as apt as the par value system to generate disequilibrating capital flows. Floating rates were rejected for essentially similar reasons — because rates would be unduly affected by temporary and speculative factors, because governments would insist on intervening in the market and their interventions would be difficult to subject to international control, and because exchange fluctuations would be damaging to international trade. But it was acknowledged that there might be a case for temporary floating under international surveillance as a way of making a transition from one par value to another. In general, the Executive Directors reaffirmed their belief in the par value system, but urged that par value changes, while remaining linked to fundamental disequilibria, should be made more promptly, in which case they would be likely to be smaller and more frequent. In other words, par value changes were no longer regarded as an instrument of last resort.

The events of 1971 — the recognition that the United States was in fundamental disequilibrium, the run on the dollar, the abandonment of dollar convertibility, the upward floating of the yen and several European currencies, and the restoration of parity relationships on a provisional basis, with wider margins and an inconvertible dollar — all these seemed to focus attention on two new problems of basic adjustment: (i) that of ensuring that the U.S. dollar, like other currencies, could be adjusted downward when necessary, and (ii) that of ensuring that currencies of countries in payments surplus adjusted upward as readily as those of countries in deficit adjusted downward.

These preoccupations were reflected in the 1972 Report on the "Reform of the International Monetary System" by the Executive Directors of the Fund.

Despite the shake-up which the par value system had received in 1971, the 1972 Report reaffirmed the validity of that system and made little advance over the 1970 Report in its attitude towards slightly wider margins of fluctuation around par, and the possible desirability of legitimizing temporary floats designed to facilitate the transition between one par value and another. It did, however, lay much more emphasis on countries' obligation to change their par values when in fundamental disequilibrium, and on the need to maintain continuous surveillance over the structure of exchange rates of the principal countries so as to facilitate appropriate adjustment of relative rates. It suggested, in this connection, (a) that the Fund might be given a power of initiative to suggest changes in rates, or at least the need for measures of some sort to correct fundamental disequilibria, which it did not have in the Bretton Woods Articles, and (b) that use might be made of objective statistical indicators to create a presumption of the need for adjustment.

The problem of giving the United States greater freedom to adjust to fundamental disequilibria had to be approached indirectly in the 1972 Report since, of course, the United States had always had the formal right to devalue its currency if in fundamental deficit. The problem was to ensure that the United States was not shielded from the need to make such adjustments by its ability to finance its deficits through the expansion of reserve liabilities to other countries, and that other countries did not frustrate its actions by continuing to peg their currencies to the dollar at the old rate. The problem of preventing liability financing by the United States was clearly connected with the problem of establishing international control over the expansion of world reserves and was tackled, as explained earlier, by the suggestion to establish arrangements for asset financing including the setting up of a substitution facility. The problem of preventing the frustation of U.S. adjustments by the actions of other countries was tackled, partly by the emphasis on intensified and more synoptic surveillance of exchange rate adjustment, and partly by the suggestion, advanced in the 1972 Report for the first time, that the system whereby all the principal and many of the lesser countries pegged their currencies to the U.S. dollar by market intervention in dollars, should be replaced by a more symmetrical system of intervention.

In the later stages of the reform discussions, when they came under the auspices of the Committee of Twenty, the idea of symmetrical intervention, at least among the principal currencies, gained increasing favor, initially in the form of multicurrency intervention, though later support developed, particularly among less developed countries, for intervention in terms of SDRs. The Outline[10] comes out for a "more symmetrical" intervention system, and gives both varieties of it an airing in Annex 3. It seems likely that if and when there is a return to par values, it will take the form of a symmetrical, probably multicurrency, intervention system, so far, at least, as the principal currencies are concerned.

The idea of multicurrency intervention is that the issuers of all the main currencies would undertake to maintain symmetrical margins around parity against each other and to defend these margins by standing ready to buy and sell indefinite amounts of each other's currencies. Market intervention within the margins would be possible but would be subject to rules and restrictions including the need to get consent of the issuer of the intervention currency. Currency balances thus accumulated would normally be settled by the transfer of SDRs or other reserve assets, but whether this should be mandatory or not has been a matter of dispute. Nonparticipating countries would defend margins around parity against some or all participating currencies by intervening in one or more of them.

The alternative system of SDR intervention has been less well worked out. Countries, or at least the principal countries, would defend margins against each other's currencies by standing ready to buy and sell SDRs

[10]Outline, paragraph 12.

against domestic currency at margins half as great as the currency margins. The SDRs would be transferred between central banks only, but the transactions would be arranged through commercial banks operating to make an arbitrage profit.

The point of these proposals, apart from making it possible for reserve centers to enjoy a margin of fluctuation around par as wide as that enjoyed by other countries, was to make it easier for the dollar to float without interference, and for other currencies to maintain a unified structure of par values among themselves, if at any time under the reformed system the United States should be unable to maintain convertibility.

Two other aspects of the reform discussions are of importance in connection with the adjustment of basic disequilibria. First is the increasing emphasis that has been placed, in response to American insistence, on the use of statistical reserve indicators in the concept of adjustment and the surveillance of the adjustment process. In Part I of the Outline the maintenance of reserves within agreed limits is presented as an aim either coordinate or identical with the avoidance of protracted disequilibria.[11] Whether these limits, and the indicators that measure them, are flow limits or stock limits is in principle left open in Annex 3, and the language used in paragraph 7 to characterize situations of imbalance ("there has been a disproportionate movement in official reserves") suggests a flow criterion. Nevertheless, the only indicator system worked out in any detail (in Annex 3) relates to a stock indicator. These indicators, or at least the disproportionate movements of reserves which they indicate, are to be used, along with other procedures, to trigger the examination of particular country imbalances, and are to be taken into account by the Fund in assessing the need for adjustment and in considering the application of financial pressures. In the immediate future (part II of the Outline) reserve indicators will be used only on an experimental basis, and any finding as to a "disproportionate movement of reserves" will be in the light of reserve objectives to which the countries in question have agreed. There is an obvious difficulty here in that reserve levels reflect past rather than present or future disequilibria, but the argument is that the fear of pressures and penalties arising if reserves get too far out of line will provide an incentive for the application of corrective policies at an earlier stage.

The other development arising in the course of the reform discussions was the recognition of floating under Fund authorization and surveillance as a legitimate way of life for countries in "particular situations," and no longer as a doubtful expedient for temporary use in moving from one par value to another. It is not surprising that this alternative to the par value regime should be offered in the first (1973) version of the Outline at a time when the quasi-par value system set up at the Smithsonian Agreement of December 1971 had broken down, the dollar and the European "snake" were floating relative to each other, and many countries — Canada, the United Kingdom, Italy — were floating independently. In the last

[11]Outline, paragraph 4(b).

stages of the reform discussions, as is indicated below, interest focused on the question of establishing rules of international good behavior for floating currencies, and the big question was whether these would have to be confined to the encouragement of defensive and discouragement of aggressive intervention or whether intervention and other balance-of-payments policies could be evaluated in relation to some broad notion of when the medium-term equilibrium exchange rate of a floating currency might be presumed to be. If the latter approach should be possible, it would allow something to be saved of the distinction between longer- and shorter-term payments imbalances and the measures of adjustment appropriate to each.

Stabilization and Shorter-term Payments Disequilibria

(a) *Relevance to stabilization*

The arrangements discussed under the monetary reform for dealing with short-term payments imbalances have a more intimate connection with the stabilization problem than those dealing with more fundamental disequilibria. By short-term imbalances I am including not only those of a seasonal or speculative but also of a cyclical character. Of course, certain speculative instabilities are themselves by-products of delays in adjusting to more fundamental disequilibria and would be reduced by any success the reform proposals might have in improving the process of adjusting to those more basic disequilibria. However, there remain many causes for temporary payments imbalances, some of them connected with the vagaries of commodity prices, others with the increasing importance of internationally mobile funds, others with disparate timing of cyclical developments of the differential impact of stabilization policies in different countries.

The last-mentioned cases are of particular theoretical interest from the standpoint of stabilization. In the interest of general demand stability, arrangements for dealing with international disequilibria should be such that factors tending to transfer demand pressures from one country to another are as far as possible offset, that inflationary or deflationary tendencies arising in particular countries from causes outside the control of national authorities are spread as widely, and therefore as thinly, as possible over the world rather than being confined to the country where they arise, but that as much as possible of the effect of inflationary or deflationary measures undertaken by national authorities should be retained at home rather than being dissipated abroad. The first of these propositions is obvious. The second rests on the assumption that random inflationary or deflationary shocks, if rendered small in any one country by being spread, are as likely to be welcome as to be unwelcome, both at home and abroad, and if unwelcome are the more easily counteracted for being small. The third proposition rests on the assumptions (a) that any stabilizing action by national authorities is likely to be appropriate to the circumstances of the country in question, (b) that since such action may involve costs and difficulties, economic or political, the incentive to undertake such policies will be greater if the demand effects are, so far as possible, kept within the national territory, and (c) that since the outside world may be deviating from stability in the same direction as, or in the opposite direction from, the country whose government is adopting the policy in question, it is uncertain whether any demand effects that spill over into foreign territory will exercise a stabilizing or a destabilizing influence there.

Now, the three main types of arrangements that have been advocated in various combinations for dealing with short-term payments imbalances are: (1) official financing including reserve movements and official borrowing, (2) the gamut of measures designed to influence private capital flows, comprising capital restrictions, dual markets, fiscal market intervention, and even Mundellian fiscal/monetary mixes, and (3) floating exchange rates.[12] We shall consider the comparative effects under these three types of arrangements of (i) localized changes in autonomous demand conditions, (ii) demand shifts between the products or securities of one country and the products or securities of another, and (iii) the application for anti-cyclical demand management policies.

Suppose an increase in the incentive to invest in A, to which the authorities respond by maintaining constancy in domestic credit extended by the banking system, in tax rates, and in public expenditure. Investment, income, consumption, and demand for foreign trade goods will rise in A. Under fixed exchange rates imports also will increase and the trade balance will most probably deteriorate, thus dampening the boom. Demand for money in A will increase and interest rates will rise. Because of this, and possibly as a direct result of the rise in A's profit rate, investable funds will be attracted into A from non-A. If the international mobility of these funds in response to interest differences is low, A's overall balance of payments will deteriorate; if it is high, the overall balance will improve. In the former case there will be a net decline, in the latter case a net increase in A's money supply, with a corresponding dampening or reinforcing effect on the boom. In either case the imbalance will be financed through reserve flows or official credit operations.

Non-A will derive from the improvement in its balance of trade a stimulus to demand, corresponding to the dampening of the boom in A. If A's overall balance of payments deteriorates, and that of non-A correspondingly improves, an additional stimulus to demand in non-A will come from the expansion in non-A's money supply; the rate of interest in non-A may even decline. If, however, the mobility of funds is such that A's balance of payments improves, non-A's money supply will tend to deteriorate, and its interest rates to rise; in the extreme case, as Mundell has shown,[13] these rates may rise so much that the decline in investment and

[12]Trade restrictions are not considered here since, though still sometimes used for temporary balance-of-payments equilibration, their use is widely condemned on the grounds of resource allocation. Perhaps capital restrictions should be similarly condemned, but so far they have not been.

[13]R. A. Mundell, *International Economics*, (London: Macmillan Co., 1968), p. 265.

consumption in non-A outweighs the improvement in the foreign balance, leading to a decline in income.

In brief, under fixed rates, booms and slumps tend to spread elsewhere — and be weakened at home — through the current account. Whether this spreading and weakening effect is counteracted or reinforced through the overall balance and the money supply depends on the international mobility of capital funds. Where such mobility is very high indeed, a boom in one country may exercise a net depressing effect elsewhere, even in the absence of anti-cyclical measures in the boom country.

Now, suppose that A, while maintaining fixed exchange rates, keeps its balance of payments in equilibrium by various measures to alter or deflect the flow of capital between A and non-A without affecting aggregate demand. In that case the boom in A will affect incomes in A and non-A solely through the effect on the trade balance and not at all through any flow of reserves and transfer of money supply from A to non-A (if capital mobility is below the critical point at which, in the absence of capital-flow-deflecting measures, the deterioration of A's current account would have been exactly balanced by the improvement in its capital account) or from non-A to A (if capital mobility is above that point). These measures thus tend, under conditions of high capital mobility, to ensure that booms and slumps originating in any country will spread more to other countries, and develop less strongly at home, than under a system of official financing.

Finally, suppose A's currency to be floating freely in such a way as to prevent any net imbalance in payments from emerging; such floating, like the capital-flow-deflecting measures described above, will prevent any impact on the money supply either in A or in non-A as a result of reserve changes.

Effects on the current account, however, will be different in the two cases. Under floating rates a cyclical increase in the incentive to invest in A will cause the value of A's currency to rise or fall according as capital mobility exceeds or falls short of the critical point referred to above. Those writing about these problems in the early post-war period generally assumed a degree of mobility lower than this critical point and therefore assumed that local booms would be more firmly bottled up under floating than under fixed rates.[14] Nowadays, however, it is more frequently assumed that capital mobility would exceed the critical level, at least among industrial countries, so that A's exchange rate would be more likely to rise than to fall.

On this assumption, and assuming the exchange rate to exercise immediately its full effect on the balance of trade, the autonomous expansionary tendencies in A would cause A's trade balance to deteriorate more, and its income to rise less, under a floating than under any kind of

[14]It is noteworthy, however, that some writers in the 1930s, notably Haberler (*Prosperity and Depression*) and Williams (*International Monetary Organization and Policy*,1936), were aware of the possibility of either outcome.

fixed rate regime, even one in which an influx of reserves was prevented by capital-flow-deflecting measures. For corresponding reasons the expansionary effect of A's boom on incomes in non-A would be stronger under floating than under fixed rates. Cyclical conditions would thus tend to spread from country to country even more strongly under floating than under fixed rates.

Price/cost effects and terms-of-trade effects would operate in the same direction. Foreign trade prices would rise more in A and less in non-A under floating than under fixed rates with possible repercussions on wage push and on inventory accumulation in the two areas. A's terms of trade would probably be better, non-A's worse, under floating than under fixed rates. All these factors would tend to damp down the expansion in incomes and prices in A, accentuate them in non-A.

These conclusions may, however, be modified when two simplifying assumptions are removed. In the first place, speculative capital outflows from A to non-A may be generated by expectations of a future decline in the value of A's currency, stimulated by the current deterioration in A's trade balance. Bearish expectations for the longer run would not necessarily be irrational, because the non-speculative capital inflow attracted to A by its prosperity would be likely to be reversed at a later stage of the cycle while some of the trade effects might be more permanent. If such speculative effects were important they might even be strong enough to cause the value of A's currency to decline rather than to rise. In this event the boom in A would give rise to less, if any, deterioration in A's trade balance under floating than under fixed exchange rates; as described in the early post-war analyses, floating rates would tend to bottle up and thus accentuate the boom in A and to reduce or prevent its spread to non-A. Unfortunately, there is little evidence of any systematic relationship connecting the relative demand pressures in different countries and the direction of reserve flows between them under fixed rates, so that it is difficult to say whether boom conditions are more likely to give rise to exchange appreciation or exchange depreciation under floating rates.

The second assumption that requires qualification is that the change, in whichever direction, in A's exchange rate will immediately exercise its full effect on the trade balance. In reality it may take up to three years to these effects to manifest themselves in full: the price effects, which are favorable in the case of revaluation, unfavorable in the case of devaluation, appear first; the quantity effects, which are favorable in the case of devaluation, unfavorable in the case of revaluation, and which in the longer run outweigh the price effects, take longer to appear. The value effects, which are a combination of the two, will therefore be "perverse" in the first six months to a year and become favorable only later. This means that in the more normal case in which a boom in A leads to an appreciation of A's exchange rate under floating rates, the dampening effect of the appreciation in incomes in A will at first be absent — though the dampening *price* effects will be present from the start — and will manifest

themselves only after a time lag which may be quite significant in the context of a cyclical fluctuation.

For both of these reasons, then — the vagaries of exchange rate speculation and the time lag of the current account effects of exchange rate alteration — it is very difficult to make any simple statement about the likely effects of floating versus fixed rates on the extent to which a localized boom in A will be bottled up in A or spread to non-A.

A less ambiguous picture emerges as regards the relative effects of the different systems of correcting payments imbalances on demand stability within countries when the disturbing cause lies in temporary international switching of demand among countries or in localized variations in supply rather than in localized variations in demand. For example, suppose a temporary switch in demand from the products of non-A to the products of A leading, under fixed rates with official financing, to an improvement in A's current account vis-à-vis non-A, and a rise in income and interest in A, and fall in non-A. Interest arbitrage, and possibly expectations of a rise in the value of A's currency, will promote a flow of capital from non-A to A which, unless offset, will add to the rise of income in A and fall in non-A. The application of capital-flow-deflecting measures to keep payments in balance by promoting an outflow of capital could obviate the transfer of money from non-A to A and the secondary transfer of incomes arising therefrom. But a freely floating exchange rate will do still better since it will, from the start, tend to prevent not only money transfer effects, but also the inflationary price effects which would otherwise occur in A and after a time lag will also restore something close to the original current account balance between A and non-A.

The comparison is less favorable to floating rates if the disturbing factor should be one which tends to bring about a deterioration in A's, and improvement in non-A's, capital account. Here the deflationary effect in A and inflationary effect in non-A are mediated through the decline in the supply of money alone — there is no trade balance effect, Thus, capital-flow-deflecting measures to the extent that they are effective would provide complete protection against the transfer of demand pressure. A floating exchange rate in A, while it would provide equal protection against monetary disturbances, would after a time tend to bring about inflationary income effects in A and deflationary ones in non-A through the improvement in A's balance of trade.

Floating rates appear to have a clear advantage with respect to the efficiency of demand management policies, at least so far as monetary policy is concerned. Let us, however, first consider the effects of a change in budgetary policy, conceived of as a variation in public expenditure or in tax rates, the volume of domestic credit extended by the banking system being held constant. The effects of changes in budgetary policy on the balance of payments will be very similar to those of changes in the incentive to invest. Increases in public expenditures or declines in tax rates will lead to a deterioration in the trade balance and an improvement in the capital

account which may go so far as to involve under fixed rates an influx of reserves and a rise in the supply of money. The bearing of different systems of balance-of-payments management (fixed rates, fixed rates with capital-flow-influencing measures, floating rates) on the demand effects of their policies will thus be very similar to their bearing on the demand effects of changes in the incentive to invest. To the — somewhat doubtful — extent to which floating rates would permit a greater dissipation or wider spreading of deflationary or inflationary tendencies originating in A than fixed rates, the same would hold true of deflationary or inflationary changes in budgetary policy; but what would be a merit of floating rates in the case of an autonomous demand tendency would be a demerit in the case of an act of policy.

It is when demand management for stabilization purposes takes the form of a change in monetary policy — i.e., of changes in bank credit and money supply — that the full advantages of floating rates appear. For example, under fixed rates without capital-flow-deflecting measures the effects of expansionary monetary policy will be partly (at the limit, almost entirely) dissipated over the world at large through an adverse shift in the balance of payments on capital account, reinforced (to the extent that the expansion of money supply nevertheless continues to be localized at home) by an adverse shift in the current account. Under fixed rates, backed by measures to influence capital flows in an equilibrating direction, reserves and money supply will no longer leak abroad, but the domestic effect of the expansionary monetary policy will nevertheless be weakened (to the same extent as expansionary fiscal policy in the same circumstances) by an adverse shift in the balance of trade. Under floating rates, however — and this is true, in some measure, so long as capital is not completely immobile internationally — not only will there be no leakage of reserves and money, but the decline in the value of the currency resulting from the tendency of capital to flow out will eventuate, after a time lag, in an improvement in the balance of trade. Even in the short run the price effects of depreciation will probably provide some speculative stimulus to demand. Thus, monetary policy will have an effect on the domestic economy under floating rates that is not only stronger, whether for expansion or contraction, than it would have under any other balance-of-payments regime, but even stronger than it would have been in closed economy.

This last-mentioned fact raises a possibility that the domestic effect of monetary policy under floating rates may be deemed excessive since it involves an opposite effect on the rest of the world, so that if non-A should happen to be suffering from the same inflationary or deflationary malady as A, A's monetary policy may worsen non-A's situation. Monetary policy under floating rates may even be considered to be a "beggar-my-neighbor" policy. It is better, however, not to include it in this category. True beggar-my-neighbor policies, such as the application of trade restrictions for demand management reasons, are those which, *if generalized*, would harm

all countries without moving either the world level or the international distribution of demand in the desired direction. If, however, the world is suffering generally from inflation, the general adoption of national deflationary policies under the incentive provided by the feature of floating rates that we have been examining would obviously shift the level of world demand in the desired direction. Nevertheless, it cannot be denied that the operation of stabilizing monetary policy in A under floating rates may have disturbing effects both on general demand and on the stability of foreign trade goods industries in non-A before the governments in the latter area have time to react. If, as suggested below, excessive divergencies of floating rates from their medium-term norm are resisted by market intervention and capital-flow-deflecting policies, countries will be protected against undue shocks from their neigbors' monetary policies.

Comparing the different international payments regimes with respect to various aspects of relevance to the stabilization problem — their effect in dampening autonomous localized demand fluctuations, in offsetting disturbances directly affecting the balance of payments, and in strengthening the domestic impact of demand management policies — we see that floating rates have considerable merits in the two last-mentioned respects provided that countries are willing to give sufficient weight in demand management to monetary policy. If capital is highly mobile and speculation not too strongly geared to the current account, floating rates may come off best in the first-mentioned respect also. Measures to influence capital flows in an equilibrating sense, to the extent they can be made sufficiently watertight and flexible, seem to provide a second-best solution in most circumstances, and a first-best remedy for disturbances that are confined to the capital account. The qualification, however, is of vital importance, since in practice it has seldom been possible to check large speculative movements without changing the rate of exchange. To this favorable verdict for floating rates, however, there is one big qualification, relating to the time lag with which exchange rate variation exercises its effects on trade quantities and hence on incomes. Because of this lag the desired effects on incomes may not appear at the time when they are most useful for stabilization purposes.

Such advantages as the system of floating exchanges may have from the standpoint of general demand stabilization may be bought at a price in terms of the stability of particular foreign trade industries and occupations. This is particularly the case where exchange rates vary in response to local booms and slumps and to variations in monetary policy response to such booms and slumps. The time lag in the current account effects of exchange rate variations, together with short-term speculative capital flows evoked by the movement of rates, tend to intensify such rate fluctuations and the consequential instability in foreign trade industries. This provides a certain justification even from the stabilization standpoint in seeking to set limits, through intervention and capital-flow-deflecting policies, to the fluctuations that would otherwise take place under free floating.

(b) *Reform proposals*

Generally speaking, the tendency of the reform discussions has been to rely increasingly on exchange rate variation as the appropriate instrument for dealing with temporary payments imbalances. In this, official opinion may be said to have followed in the wake of events.

It has already been mentioned that attempts have been made in the reform, largely on the initiative of the United States, to institute a tighter control over restrictions on current transactions and payments for balance-of-payments purposes, i.e., even those designed to meet temporary disequilibria in the balance of payments.

In the Bretton Woods Articles restrictions on capital transactions were fully permitted to all members and might indeed be required of a member as a condition for the continued use of Fund resources. In the Outline such controls are still permitted, but they are hedged round by certain qualifications, such as that they should not be used for the purpose of maintaining inappropriate exchange rates or, more generally, of avoiding appropriate adjustment action, that they should be applied without excessive administrative restriction, and that they should not be retained longer than needed.[15] This presumably implies that capital restrictions should not be employed either permanently or temporarily in a disequilibrating sense. In the course of the reform discussions, a good deal of attention was paid to the various ways in which temporary payments imbalances arising out of disruptive short-term capital movements could be handled. In the course of this examination, capital exchange markets, forward exchange market intervention, payments controls, regulation of the external position of banks and other enterprises, the international coordination of monetary policies, and other measures for influencing capital flows were studied, but no concrete agreement as to the employment of these measures in an equilibrating sense was arrived at, or even attempted. However, under the guidelines which the Fund has adopted for the management of floating exchange rates the use of such measures will be subjected, in principle, to encouragements and restraints analogous to those applicable to exchange market intervention having the same effects on exchange rates. This means, broadly speaking, that capital-flow-deflecting measures having an equilibrating tendency in the short run will be encouraged, those having a disequilibrating effect restrained.

As regards official financing, one of the traditional ways of coping with temporary payments disequilibria, the attitude of the Outline is a balanced one. On the one hand, asset settlement arrangements, to the rather limited extent to which they are adopted in the Outline,[16] tend to cut off a source of easy financing for issuers of intervention currencies in the form of the non-conversion by other countries of accruing balances in

[15]Outline, paragraph 15.

[16]In paragraph 20 and Annex 5.

their currencies. On the other hand, credit facilities are approved particularly as a means of meeting disequilibrating capital flows, and the Fund is adjured to establish new facilities as necessary especially for countries without sufficient access to existing facilities.[17] The reform discussions, however, never did get to the point of formulating concrete proposals as to the nature of any new credit facilities that might be established to deal with shorter-term fluctuations. Apart from formal credit facilities, Annex 6 contains a suggestion, originally advanced by the United States, that each country should be assigned a primary asset holding limit which would force countries whose surpluses accumulated beyond a certain point to extend credit to the issuers of intervention currencies, which — under the multicurrency intervention system at any rate — would be deficit countries.

The main practical contribution made by the Outline towards the solution of the problem of short-term imbalances probably lies in the permissive attitude adopted towards various types of exchange rate flexibility. The Outline provides[18] that margins of exchange rate fluctuation around parity should no longer be fixed by the Articles of Agreement, but should be variable by decision of a qualified majority. The margins envisaged in the illustrative Annex 3 are of the order of magnitude of those set up by the Smithsonian Agreement, namely, 4-1/2 percent above or below parity as between pairs of currencies. But whereas, under that Agreement and under the par value system in general, the margin effectively available to the United States as the issuer of the ultimate intervention currency was only half of that available to countries pegging on the dollar, this discrepancy is to be resolved, under the reformed system, by the adoption of a more symmetrical intervention system.[19]

Most important of all the changes suggested in the Outline in the direction of exchange flexibility is the proposal to enable the Fund to authorize floating exchange rates in what are called "particular situations."[20] What "particular situations" are has not been defined, but they have been understood to include not merely temporary floating as a technique for changing from one par value to another, or floating to accommodate differential rates of inflation, but also floating in situations of the Canadian type where the potentiality for large variations in the capital account makes the balance of payments under fixed rates particularly uncertain. With the rise of Euro-currency markets and other channels for international capital flows the condition of most of the industrial countries and some of the primary producers also has been rapidly approximating

[17]Outline, paragraph 21.

[18]Outline, paragraph 12.

[19]For details, see Outline, Annex 3.

[20]Outline, paragraph 13.

the Canadian model. Thus, though in theory the reformed system as envisaged in the Outline would be based on par values, the possibility obviously exists for the continuation of floating on a widespread scale.

As already indicated, it has not been contemplated that floating would be authorized only if it were of the perfectly clean variety. On the contrary, intervention in certain circumstances would be allowed and even encouraged. Short-term payments imbalances would thus be handled by a combination of exchange rate variation and reserve use, which is a form of official financing. The precise way in which these techniques would be combined would, of course, depend to a large extent on the policies of individual countries, but also presumably to some extent on any rules or guidelines for the management of floating exchange rates that might be adopted internationally. The Executive Directors of the Fund with the blessing of the Committee of Twenty have adopted certain guidelines that would be applicable in present circumstances of generalized floating and which, it is hoped, may provide a basis for rules that would be applicable to individual floaters under a reformed system.[21]

There have been broadly two views on the nature of appropriate intervention policies for the conduct of a floating exchange rate. On one view a country should confine itself to smoothing out rate fluctuations from day to day or week to week and to slowing down somewhat market tendencies of longer duration ("leaning against the wind"). On another view the authorities should have a concept of the normal exchange rate over the medium term, i.e., over a period of the order of, say, four years, and should offer increasing resistances, through market intervention and other balance-of-payments policies, the farther the actual exchange rate diverges from this norm. Under both of these approaches, particularly the second, it is the currency's effective rate (i.e., its rate vis-a-vis a relevant average of other currencies) rather than its rate vis-a-vis the intervention currency that is important. In determining the amount of intervention to be undertaken under either of these approaches, account can be taken of the level of the country's reserves related to some estimate of its needs. There have, however, been differences of view between countries with respect to the amount of attention that should be paid to this consideration which is, of course, linked to the more general question of the role of a structure of reserve norms in the adjustment process.

Under a system in which market intervention (other than day-to-day smoothing) and capital-flow-deflecting measures were confined to "leaning against the wind," balance-of-payments variations of a cyclical kind would be contained or dealt with, as under "clean" floating, almost entirely by exchange rate variations. Under a system of exchange management oriented towards the medium-term normal rate, cyclical fluctuations would

[21]See Outline, paragraph 13, Annex 4, and Fund Press Release No. 74/30 of June 13, 1974 on the subject of Guidelines for the Management of Floating Exchange Rates; all in *IMF Survey*, June 17, 1974.

be dealt with only partly in this way and partly through reserve movements or capital-flow-deflecting policies, while more fundamental disequilibria, to the extent they did not respond to demand management or incomes policies, would be corrected through the gradual shifting of the norm around which market exchange rates would fluctuate. This last solution, which might be described as a "a crawl with soft margins," appears to me greatly preferable on a number of counts. Nevertheless, any system of managed floating which goes beyond a mild "leaning against the wind" involves considerable dangers. There is no guarantee that the exchange rate targets of countries will be compatible with each other or with any reasonable concept of international equilibrium. Ambiguities arise as to the nature of such a reasonable equilibrium, particularly with regard to the legitimacy of current account targets achieved by different means.

The Guidelines, in the tentative form in which they have in fact emerged, strike something of a compromise on this issue. Countries are permitted but not required to resist rate movements; however, they may be "encouraged" by the Fund to resist a movement away from which the Fund considers to be a reasonable estimate of the normal rate, and not to resist a movement towards such a norm. Countries are required not to act aggressively (i.e., not to force the rate to move in any particular direction) unless both the country and the Fund consider this to be in the direction of the normal rate.

Another issue has been the extent to which the criteria applicable to exchange market intervention should apply also to capital-flow-deflecting measures, such as capital restrictions, forward exchange intervention, and monetary policies. In the Guidelines as they have emerged the same criteria have been applied to both types of action on exchange rates.

The system of exchange rate management envisaged in the Guidelines, being in a sense a mixture of fixed and floating rates, may create some problems for stabilization policy in that it calls for a mixture of fiscal and demand management policies that will be none too easy to apply in practice. Broadly speaking, so long as exchange rates are somewhere in the vicinity of a reasonable estimate of the medium-term norm a country should respond to any expansionary or recessionary tendencies by the combination of monetary and fiscal policies that would be appropriate to a closed economy. As the exchange rate diverges from such a normal zone, however, increasing emphasis should be placed in the determination of monetary policy on the objective of international equilibrium, and fiscal policy should take over correspondingly more of the responsibility for stabilization. In view of the slowness with which exchange rate movements evoke equilibrating forces in the current account, and the possible weakness of equilibrating speculation in the capital account, it would be prudent not to overestimate the extent to which floating, thus limited, will free monetary policy for the task of domestic stabilization.

Discussion

Peter B. Kenen

Discussants are appointed to prevent premature consensus at the conference table. I am therefore duty-bound to discover reasons for disagreeing with Marcus Fleming, even though I much admire the manner in which he has discharged a difficult assignment and concur in most of his conclusions. I shall dwell on three points at which his argument seems inconclusive or inconclusive. First, he does not sufficiently emphasize the control of inflation as a dimension of stabilization policy. Second, his views on international liquidity and reserve creation appear to contain an inconsistency or, at the very least, an ambiguity. Third, his extended comparison between fixed and flexible exchange rates is based upon premises that many observers, including highly placed government officials, do not accept.

Early in his paper, Fleming draws attention to the implications of international monetary arrangements for the trade-off between full employment and price stability. Unhappily, he does not return to the point, to ask whether fixed or flexible exchange rates are more conducive to the reconciliation of those two aims. Furthermore, his comments on stabilization evoke preoccupations of an earlier decade; his argument is cast in terms resembling those that he and Robert Mundell made famous in the early 1960s. Domestic policy is aimed at stabilizing output or employment, not the price level.

The defect, if it be one, is not unique to Fleming's paper. We do not know about the dynamics of inflation. We know even less about the processes by which price fluctuations are transmitted from one country to another, or about the manner in which alternative exchange-rate regimes affect these processes. We link our national models by trade matrices, emphasizing real flows, not by describing participation in fully specified world markets, emphasizing global price determination.

The primitive state of our thinking on these questions is dramatized by some of the mistakes we make and is perpetuated by our use of naive theories. The most common and egregious error is the one that was

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broadcast — but literally — a few years ago, when a prominent economist who also held high public office assured the American people that devaluation of the dollar would not add significantly to inflationary pressure in the United States. Foreign trade, he explained, is still very small in relation to U.S. gross national product. We have learned to our dismay, however, that an economy's propensity to import inflation is different from its propensity to import unemployment. It depends on the size of the tradable-goods sector, not on trade volume itself. A country that exports one bushel of wheat connects the domestic price of wheat to the world price. A country that imports one automobile connects the prices of domestic cars to the prices of imported cars (although the connection may not be as strong as with an undifferentiated product like wheat).

Our theories are naive because they are static and abstract from asymmetries in economic behavior. Textbooks tell us that flexible exchange rates can insulate a country from foreign price trends and, obversely, can protect the world as a whole from inflation in one country. They analyze the short-term dynamics of inflation and currency markets using the long-term comparative-statics of purchasing-power-parity theory. Yet even when we set aside capital mobility, the subject which Fleming treats so thoroughly in the later sections of his paper, we cannot be sure that a flexible exchange rate will move at the pace — and to the extent — required to offset divergent trends in national prices. We forget, among other things, that an inflation in one country does not arise spontaneously. It reflects the presence of excess demand, and because markets do not leap to new equilibria, excess demand will spill directly into international markets, raising world prices, before it is checked by movements in exchange rates.

I am especially concerned about our ignorance of mechanics and dynamics in the foreign-exchange markets. What little we know now about J-curves and such should tell us that merchandise trade does not respond rapidly to changes in prices, including changes in exchange rates, so that the movements in exchange rates required to clear the currency markets in the short run are different from those that would compensate perfectly for divergent movements in national prices. The problem is compounded when capital is mobile, and there is need to modify Fleming's analysis to take account of differences in the speeds with which investors react to interest rates and traders react to prices. If, for example, the fastest effect of easier money in the United States is to cause a capital outflow, the sequence of events under flexible exchange rates may be somewhat different and less satisfactory than the one which Fleming and others have described. Because the adjustment of merchandise trade to a depreciation is apt to be long-lagged, the advent of easier money and the resulting capital outflow could cause a very large depreciation of the dollar, with immediate inflationary implications for the United States. Only later, after trade volume has responded to the large depreciation, will we see the improvement in the trade balance and the stimulus to output we usually

associate with the combination of easier money and flexible exchange rates. To assume any other evolution is to make some strong assumptions concerning the ability and willingness of speculators to stabilize foreign-exchange markets.

Finally, we cannot ignore the virtual certainty that changes in exchange rates will exacerbate inflationary trends. A country that imports some of its wage goods is likely to suffer a more rapid increase in money wages, accelerating its inflation, when its exchange rate depreciates as a consequence of rising prices for domestic output. And a country that exports a wage good — wheat for example — could encounter a similar problem. I am somewhat skeptical, moreover, of models and arguments which treat symmetrically the domestic price effects of depreciation and appreciation. For reasons that reside in business behavior and in political processes, not only in the stubbornness of trade unions, a depreciation may raise domestic prices, validating and amplifying the depreciation faster and more fully than an appreciation can reduce domestic prices.

I have no firm conclusions to offer on these issues. I do not mean to suggest, for instance, that the worldwide inflation of the last two years can be blamed on the advent of floating exchange rates. If, indeed, I were forced to identify cause and effect unidirectionally, I would regard the shift to more flexible exchange rates as a defensive response to inflation. It should be clear, however, that it has been an imperfect defense, and we need to do more work, theoretical and empirical, before we can make a long-term choice between exchange-rate systems.

My second point pertains much more directly to Fleming's paper, not to the general and sad state of our art. Early in his paper, Fleming suggests that academic economists have attached too much importance to the size of the stock of international money. A shortage of reserves, he says, may perhaps deter a deficit country from the pursuit of full employment, but this influence will not be strong. In consequence, a general increase in reserves is not apt to alter directly or importantly the vigor with which governments pursue their domestic aims. Unlike an increase in private liquidity — the stock of cash balances held by firms and households — an increase in official reserves will not cause a spending spree, adding to global inflationary pressures.

I am inclined to agree with Fleming, and especially to welcome his warning against simple-minded analogies between the motives of governments and households. The money machine run by the International Monetary Fund, which prints SDRs for central banks, is not apt to have the same effects on aggregate demand and prices as the money machine run by the Federal Reserve, which prints high-powered dollars for commercial banks. I would go somewhat further than Fleming — to argue that very few deficit countries have been deterred for long from the pursuit of domestic aims. Sooner or later, but sooner these days, they have sought the freedom they desired by devaluing or floating the exchange rate.

I wonder, however, what Fleming can mean when, a few pages later, he talks about optimal growth in the stock of reserves and extols proposals in the *Outline of Reform* to regulate comprehensively the global stock of reserves. A very slow growth of reserves would not be optimal if, as he suggests, it would lead to the widespread use of trade or capital controls by countries seeking to capture more reserves for themselves. But what criterion is Fleming using when he says that the U.S. deficits of 1970-71 led to an excessive increase in reserves?

The question contains some of its own answer, pointing as it does to the way in which that particular increase took place and to the domestic problems it caused for the countries that gained the reserves. The issue, I submit, is not so much the size of the increase in reserves but the manner in which reserves were created in 1970-71 — the fact that they reflected a massive imbalance in the U.S. balance of payments and led to a large increase in commercial-bank reserves in the principal surplus countries.

Let me put this same point more argumentatively. Those who were most distressed by the increase in reserves during 1970-71 would have been much less upset if, by a stroke of somebody's pen, the price of monetary gold had been raised sufficiently to cause the same increase in total reserves measured in U.S. dollars. There is, indeed, much sentiment for raising that price now, although this would add hugely to reserves already swollen by the events of 1970-71. An increase in this form would not cause an increase in bank reserves and private liquidity like the one that was occasioned by the U.S. deficit. It would not interfere with monetary management. In brief, I suggest that most of the concern about excessive reserve creation derives from the fact that, in the past, reserve creation has affected the domestic liabilities of central banks, not just their external liabilities.

But why, one might ask, do central banks object to the creation of Special Drawing Rights — a mode of reserve creation that would not have this overwhelming disadvantage? There is, I believe, a pervasive desire to limit the foreigner's freedom of action — to curb *ex ante* his ability to interfere with domestic policies. This desire may reflect a general psychological asymmetry in international monetary relations — a belief that the foreigner, whoever he may be, is more prone to make inflationary errors. It may reflect a special and objective asymmetry — the large size of the United States and its unique capacity to affect international capital markets. The latter is the more plausible explanation and serves to illuminate much of the debate on international monetary reform.

There would be little point in limiting the reserve-creating power of the United States — in asking for full asset settlement — if one did not also limit U.S. access to newly created SDRs. The stock of reserves must not be allowed to grow at a rate which would free the United States to pursue whatever monetary policy it desires for its own domestic reasons. Limitations on reserve creation are required if reform is to accomplish an important aim of many major countries — to diminish the financial influence of the United States so as to acquire more domestic autonomy.

Discussions which abstract from this basic issue miss the point of the debate about the optimal stock of reserves and the rate of growth of global liquidity.

The same desire for more autonomy, especially for insulation from the influence of the United States, is an explanation for other recent trends, including the abortive effort at European monetary unification (which would have increased the internal influence of jointly managed monetary policies), the recrudescence of capital controls, and the recent shift to flexible exchange rates (which, whatever their other defects, allow central banks to assert control over their external assets and, therefore, the stock of high-powered money). It is also the cause for my third disagreement with Marcus Fleming.

Apart from my earlier comments on lags and dynamics, I have no quarrel with Fleming's taxonomy of internal policies, exchange-rate systems, and degrees of capital mobility. It is, in fact, superior to earlier taxonomies because it takes complete account of money-stock effects induced by movements in reserves under fixed exchange rates. I am not quite sure that the high-mobility case is the "normal" one for all times and countries, but this is a matter of fact, to be resolved by measurement. My reservations arise in respect of the criteria Fleming uses to rank the outcomes and to appraise exchange-rate arrangements.

Fleming appears to prefer international arrangements that would allow countries to share our instability. Thus, he is inclined to favor fixed exchange rates when capital is immobile, because a boom in one country would be spread to others by the usual Keynesian route, diminishing its local impact, but he has reservations about fixed rates when capital is mobile, because the increase in the interest rate caused by the boom would attract capital from other countries, and, in the high-mobility case, would increase the money stock, fueling the boom. Similarly, Fleming is not happy with flexible exchange rates when capital is immobile, because they would bottle up a domestic boom, but he is content with them when capital is mobile, because the capital inflow would steady the exchange rate, allowing the trade balance to deteriorate and the boom to spread.

These same preferences, however, are the cause of the dilemma with which Fleming struggles for so many pages. When fixed exchange rates send disturbances abroad through the trade balance, they also deprive fiscal policy of its chief domestic impact. And when flexible exchange rates do the same things, they also dissipate the influence of policies. When, conversely, flexible exchange rates give domestic policies the largest local impact, they also bottle up spontaneous disturbances, instead of sharing them with other countries. What is good from the standpoint of efficacious policy is bad from the standpoint of spreading one's misfortunes.

But do we really want to share disturbances? Or, more germanely, will governments agree to do so? Some observers say that they will — or should — because, when foreigners are made to bear some part of domestic instability, the impact on residents is reduced and they are less likely to turn the government out of office. Consider, however, the corollary

to this supposition. Is there no danger that citizens will blame their governments for failing to protect them from foreign disturbances? And if, as I fear, this danger is real, will governments not respond by blocking the channels through which disturbances flow? A system that allows one to export instability may provoke damaging attack when it comes to import instability.

Remember, moreover, what I said before about asymmetrical views and asymmetrical impacts in international financial relations. If governments believe that foreigners are irresponsible, they may not want to share the foreigners' disturbances, believing that they will suffer more than they will. And if economies differ in size and strength, sharing can never be symmetrical, even if the governments of the largest countries are more responsible and better-endowed with the instruments for stabilization.

It should of course be clear from what I said before that no exchange-rate system can provide complete insulation from foreign disturbances, and those which may do so most effectively in respect of output or employment may not always do so most effectively in respect of prices. It should also be clear from Fleming's own paper that some of the difficulties faced by major countries in recent years were not due to the international monetary system, but to institutional and political imperfections in the conduct of domestic policies, especially in monetary policies. At this particular time, however, it may be prudent to base one's choice between exchange-rate systems on the sad fact of mutual distrust and the desire for autonomy, not on an assumption of neighborly willingness to share mistakes and to abide by the rules of the system at any price. We may need a theory of optimum disintegration — a generalization of the theory of optimum currency areas — to tell us how much distance we must put between economies. If integration is too intimate, governments are likely to lash out at the system. Sovereignty at bay is apt to snarl.

Discussion

Richard J. Herring

Because Peter Kenen has ably articulated most of my reservations about Fleming's analysis of the impact of reserves on international stability, I shall confine my remarks to two subjects. First, I would like to round-out the sketch of the low capital mobility case in Fleming's extension of his classic 1962 analysis. Second, I would like to note some of the conflicts between this kind of analysis and the received view of capital flows.

I was particularly interested in Fleming's analysis of the three fundamental policies toward external imbalances — reserve financing, capital controls and flexible exchange rates. He asserted that the ideal policy: (i) would spread domestic demand disturbances widely over many nations; (ii) would offset international shifts in demand; and (iii) would concentrate domestic policy shocks nationally. He followed current theoretical practice in emphasizing the implications of a high degree of capital mobility. I, too, find this assumption plausible, but I think that we should note that it is not consistent with what little empirical evidence we have on the subject. For example, consider the results of recent simulations of the TRACE model of the Canadian economy by Carr, Jump and Sawyer. The simulation experiment involved increasing government spending by C$ 1/2 billion and observing the results under three different exchange rate regimes. After two years the following changes in the interest rate (i) and in the level of income (Y) were observed:

	Δi (%)	ΔY (C$ billions)
a. Floating Rates	.257	.801
b. Fixed rates with sterilization of the monetary base	.074	.464
c. Fixed rates with no sterilization	.326	.366

These results are qualitatively identical to the results one would expect from the Fleming analysis of an economy with low capital mobility. They are surprising because they apply to Canada, an economy which is usually

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assumed to have a very high degree of capital mobility. Thus, since there is some empirical support for the assumption, it may be useful to make explicit Fleming's present analysis for the case of relatively low capital mobility. I shall concentrate on localized disturbances to demand and policy changes, since it is in these areas that the differences are most striking.

With regard to localized shocks in private demand (such as an investment boom), under high capital mobility Fleming found that reserve financing of imbalances (without sterilization) tended to intensify the boom at home, and, in the extreme case of perfect capital mobility, to depress demand abroad. The leakage through the current account was more than offset by the induced capital inflow thus adding an expansionary monetary impact to the increase in demand. Thus financing gets poor marks with regard to dissipating disturbances abroad. However, if capital mobility is low, the conclusions are much different. The induced deterioration in the current account is not offset by a capital inflow. The leakage of demand through imports is reinforced by a monetary leakage through loss of reserves. Much of the boom is spread abroad both through an expansion of export demand and an increase in the monetary base abroad. Indeed, in the extreme case where capital flows are not responsive to interest rates, the boom may be completely cut off through leakage of reserves.

Under floating exchange rates, changing the assumption concerning capital mobility also reverses the conclusion. With high capital mobility, Fleming found that the current account leakage would be intensified through an appreciation of the exchange rate and thus the investment boom would be more widely spread. But with low capital mobility, the investment boom leads to a depreciation of the exchange rate (since the induced current account deficit exceeds the induced capital inflow), stimulating larger exports, discouraging imports and thereby intensifying the boom at home. Thus if capital mobility is low the relative merits of the three policies in dissipating local disturbances change; financing is best, capital controls are second best; and floating rates are least desirable.

With regard to changes in monetary and fiscal policy, under a high degree of capital mobility Fleming found that flexible exchange rates tended to intensify the effects of monetary policy while rendering the effects of fiscal policy less strong than under fixed rates. Indeed, if capital is perfectly sensitive to changes in the interest rate, fiscal policy is totally ineffective in altering the equilibrium level of income in that the expansionary impact is entirely offset by the induced appreciation of the exchange rate. However, if the degree of capital mobility is low, both monetary and fiscal policy are more effective than under a regime of fixed exchange rates. Expansionary monetary policy is reinforced by an induced depreciation of the exchange rate (as in the case of high capital mobility), but in addition, so is fiscal policy. In a country with low capital mobility, an expansionary fiscal policy leads to an incipient deficit and a depreciation of the exchange rate.

Thus if the degree of capital mobility is relatively low, the choice of external policies must involve a trade-off between two of Fleming's objectives. Financing short-run disturbances assures that they are more widely dissipated, while flexible exchange rates enhance the effectiveness of monetary and fiscal policy. Nonetheless, there is some consolation in the fact that the same forces which reduce the effectiveness of fiscal policy under fixed exchange rates also tend to reduce the disruptive impact of domestic disturbances to demand by spreading them more widely abroad. Similarly, the same factors which intensify the disruptive domestic impact of localized shocks to demand under flexible exchange rates, also tend to enhance the effectiveness of fiscal policy. Fortunately, when fiscal policy is relatively weak, demand disturbances will be less disruptive, while when demand disturbances become most intense, fiscal policy will be commensurately more effective.

Finally, I think it is important to note that Fleming's model (and the elaborations I have just outlined) are implicitly based on the flow view of capital movements — that is, the view that the rate of capital flow responds to *levels* of interest rates. It is a useful simplifying assumption and, indeed, it is perfectly compatible with the way investment is treated in the simple IS-LM system inasmuch as the flow of investment is assumed to be a function of the *level* of the interest rate. It is not, however, consistent with the portfolio adjustment view of capital movements which holds that capital flows result from *changes* in interest rates. The most comprehensive treatment of these issues to date is, of course, Bill Branson's contribution to this conference. The usual reconciliation of the flow model with the portfolio approach is to say that the capital flows being analyzed are stock shifts in response to changes in interest rates. Branson's latest results, however, make it necessary to add yet an additional qualification — namely, that the capital flow is independent of the level of income. Otherwise, Branson has shown that with the real sector endogenous, changes in monetary policy have an ambiguous stock shift impact on capital flows.

But with these provisos, does the flow model provide results which are consistent with the short-run, stock-shift implications of portfolio theory? Since most of our empirical evidence indicates that the stock-shift in response to changes in interest rates takes place over several quarters, is the flow model an adequate approximation for short-run, qualitative results?

For short-run analysis under fixed exchange rates the answer is probably yes, chiefly because capital flows impinge on the domestic equilibrium only through their impact on the *stock* of foreign exchange reserves and thus on the level of the domestic monetary base. It is the total stock shift, not the timing of the flow that matters. However, for short-run analysis under floating rates, the timing of the capital flow is of paramount importance. Thus the short-run implications of the flow model and the stock adjustment model may be quite different. For example, in a

regime of floating exchange rate and high capital mobility, an expansionary fiscal policy causes an *appreciation* of the exchange rate since the induced capital inflow exceeds the induced deterioration in the current account. In terms of the flow theory the exchange rate would stay at the new equilibrium level until further disturbed. In contrast, in terms of the portfolio view of capital flows the change in the exchange rate is temporary, inasmuch as pressure on the exchange market will diminish as investors achieve a new portfolio equilibrium. Indeed, if there is negligible growth in portfolio size (and if we ignore exchange rate expectations and the impact of exchange rate changes on wealth), after the stock adjustment is complete the exchange rate will actually *depreciate* below the initial level. This will occur because the increased import demand will remain, while the induced capital inflow will have vanished.

Thus we must be quite judicious, as indeed Fleming has been, in drawing inferences about floating rates from a flow model. What is needed is a convenient way to represent stock-adjustment results in the Fleming model. In the meanwhile we are fortunate to have had a further development of the Fleming model from the master himself.

Discussion

Emil-Maria Claassen

Being the second discussant of J. Marcus Fleming's contribution, I shall concentrate my comment on the second half of his paper. Under the section "Stabilization and Shorter-Term Payments Disequilibria" Fleming discusses three different international payments regimes:

(1) a regime of fixed rates where external imbalances will be financed by reserve movements (or by official borrowing or lending);
(2) a regime of fixed rates where external imbalances will be corrected by "capital-flow-deflecting measures";
(3) a regime of floating rates.

To determine which of the three regimes [which deal with short-term payments imbalances either by financing them — case (1) — or by eliminating them — cases (2) and (3)] is the best one from the point of view of the *internal stabilization of the economy*, two alternative criteria may be chosen:

(I) which international payments regime is the best one for the internal stabilization of the economy of a single country;
(II) which international payments regime is the best one for the internal stabilization of the economy of all countries within the international economy.

There are "dilemma cases" where criterion (II) may lead to an "optimal" payments regime different from that under criterion (I). This problem is discussed by Fleming, but his main criterion is that of type (I).

The traditional analytical technique for selecting the optimal international payments regime according to criterion (I) is that of comparative statics by asking what is happening to the internal equilibrium situation of a country, under alternative payments systems:

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(A) when there is an internal disturbance;
(B) when there is an external disturbance;
(C) when internal policy actions ("demand management measures" as Fleming calls them) are undertaken.

The optimal payments regime will be that which guarantees simultaneously:

(a) an "export" of the internal disturbance to the rest of the world such that the domestic economy is hardly affected by its internal shocks;
(b) a protection against external shocks such that the domestic economy is functioning as if it is a closed economy;
(c) a full impact of the stabilization policies on the attainment of the desired internal objectives.

Fleming comes to the conclusion that in all three cases the system of floating exchange rates will be relatively better than the two other payments regimes: it will be *better* in particular under the assumptions of high capital mobility, low speculative capital flows with respect to the future current account, and under the assumption of a rather immediate effect of a change in the exchange rate on the trade balance; it will be better only *relatively* because floating rates have negative side effects as for instance in terms of a certain instability with respect to the activity of particular foreign trade industries.

Fleming's results are derived from the Keynesian literature of the 1960s (respectively, from the Mundellian literature of the early 1960s). Our comment is concerned with the question whether the same results hold if one chooses another analytical framework for the *world economy* which is that of the "monetary approach" (or "monetarist" approach) to internal and external stabilization of an economy and which has been developed in the later 1960s and early 1970s by Harry Johnson, Robert Mundell and their disciples.

In the present context the two main differences between the Keynesian and the monetary view of the *international economy* are that:

- from an empirical point of view, in the last 10 to 15 years the world economy (being largely at full employment) has become integrated to such a degree that the only closed economy is the world economy, the member countries being like regions among which differences in prices of tradable goods and in interest rates cannot last and will be eliminated by goods-arbitrage and by interest-arbitrage, respectively.
- from a theoretical point of view, a surplus or deficit in the balance of payments is a monetary phenomenon to the extent that it is reflected (not necessarily caused) by an excess stock demand for money or by an excess stock supply of money, respectively; the rate of exchange is equally a monetary phenomenon to the extent that it corresponds to the ratio between the internal and foreign price level (of tradable goods).

The question now is to what extent Fleming's arguments have to be modified under this "old" view (i.e., Wicksellian-Casselian view) on the "new" world.

I begin with Fleming's example of an internal disturbance in terms of an autonomous increase in the domestic demand for goods. Fleming's reasoning is along Keynesian lines according to which the following changes will take place: (i) Increase in national income, either in domestic output or/and in internal prices; trade balance deficit as an increasing function of the degree of "commercial openness" of the economy dampening the impact effect on national income. (ii) Increase in the domestic interest rate; capital balance surplus as an increasing function of the degree of "capital openness" (interest sensitivity of capital flows) of the economy. (iii) If there is an overall balance-of-payments surplus (deficit):

in regime (1):	inflow (outflow) of reserves; rise (decline) in the money supply reinforcing (dampening) the impact effect on national income.
in regime (2):	balance-of-payments equilibrium because the trade balance deficit is compensated by a surplus on the capital account.
in regime (3):	upvaluation (devaluation) deteriorating (improving) the trade balance and, by this, dampening (reinforcing) the impact effect on national income.

Thus, in case of high capital mobility involving a balance-of-payments surplus, a floating exchange rate permits the highest absorption of internal income fluctuations by the rest of the world.

The picture looks different if one accepts the monetary (or monetarist) scenario. Because the monetary view postulates a total equilibrium/disequilibrium approach (in contrast to the Keynesian "partial" equilibrium approach), an excess demand for goods must be accompanied by an excess supply of other "goods."

If the excess demand for goods equals a (flow) excess supply of money — because the stock demand for money has fallen or the stock supply of money has risen and where the stock excess supply of money will be normally higher than the flow excess supply of money due to usual stock adjustment behavior (à la Archibald and Lipsey) — there will be a trade balance deficit for the following reasons. In a world of full employment the excess demand for goods is satisfied partly by internal output increases and mainly by imports. Since the prices of tradable goods are determined on the world market, they will increase in proportion of the domestic excess demand to the world demand for tradables, for a given degree of full employment in the world economy. In the extreme case of

no output changes, either at home or abroad, the real transfer of goods to the domestic economy is made possible because the demand for money in the rest of the world increases as a consequence of the rise in prices — and consequently foreign hoarding decreases foreign absorption. One could take into account an additional aspect which concerns the non-tradable goods. Their prices will rise equally because one part of the excess demand for goods may be directed towards the non-tradable sector on the one hand and because an increase in the price level of tradable goods induces a substitution effect in favor of the non-tradable goods pushing their prices upwards until the relative prices between tradable and non-tradable goods have been restored.[1]

There will be a temporary balance-of-payments *deficit* in the amount of the trade deficit:

in regime (1): outflow of reserves and decline in the money stock until the moment where the stock demand for money equals the stock supply of money.

in regime (2): capital-flow-deflecting measures are only conceivable to the extent that direct capital controls are imposed in order to get an overall balance-of-payments equilibrium; however, this measure would push up world prices to an even higher level because the only equilibrating trade-balance mechanism works through the demand for money which has to be higher, abroad and at home, in the absence of any change in the foreign and domestic supply of money.

in regime (3): devaluation eliminating the trade balance deficit; it involves an increase in the internal price level of tradable goods by the amount of the devaluation rate (and an increase in the price level of non-tradable goods according to the above reasoning in terms of the substitution effect).

A floating exchange rate system would "internalize" the internal shock — a radically opposite view to Fleming's results. Remember that he arrives at the conclusion that under the hypothesis of an extremely high degree of capital mobility, there will be an upvaluation which could neutralize via the trade balance the internal shock for the domestic economy. Even though we have operated with the same "small-country hypothesis" with respect to the current account and the capital account, one of the main

[1]Another (extreme) case is where the domestic excess demand for goods is equal to a domestic (flow) excess supply of securities. The arguments run now in terms of the world interest rate. An increase in this latter rate leads to a stock adjustment in asset holdings by foreigners such that they decrease their absorption which permits an increase of securities holdings by foreigners such that the trade balance deficit is approximately equal to the capital balance surplus (by neglecting any side effects of the change in the interest rate on other macroeconomic variables) so that the balance of payments will not be affected.

contentions of the monetary approach is that the nature of the exchange rate does not represent a relative price between domestic and foreign output, but is a *nominal* price of foreign currency. To the extent that the expansionary shock affects mainly the price level — which is a reasonable assumption of a world of full employment — changes in the exchange rate are caused by, or lead to, a relative change in the domestic price level with respect to the foreign price level. In order to "externalize" the internal shock, the best international payments system will be regime (1) provided that the country disposes of sufficient reserves.

This may seem a rather trivial statement, but is most important, at least in the context of the "small-country hypothesis." It is equally applicable for the two other analytical experiments discussed by Fleming: external shocks and internal policy actions. With respect to external disturbances take the case of an increased foreign price level which is transmitted to the internal price level of tradable goods because of the monetary assumption of integrated markets. In a fixed exhange rate system there may be a temporary trade balance surplus via the real-balance effect (higher domestic price level — real balances are lower than the desired real balances — reduction in absorption — inflow of reserves — increase of money supply) and via the substitution effect (switching the demand from tradables to non-tradables. If, however, policy actions are undertaken in the sense of a lower monetary expansion rate than that of the rest of the world, these internal policy actions will be effective in terms of a lower domestic price level than the foreign one provided that the country adopts a floating exchange rate system.

With the *new* tools of the monetary approach (total equilibrium approach and the exchange as a nominal variable for a highly integrated world economy in a situation of full employment) one comes to the *old* conclusion that a fixed rate regime is better for "externalizing" internal disturbances and that a floating rate regime is better for protecting the domestic economy from external disturbances and for achieving a higher autonomy of domestic stabilization policies. Taking into account an additional fact of our (western) world economy which consists of small (dependent) economies, medium-size (interdependent) economies and one super-size (independent) economy, the issue of fixed versus floating exchange rates — in terms of an optimum international payments regime — could be best solved by the theorem of optimum currency areas, at least from the point of view of the internal stabilization of the concerned economies.

Coordination and Harmonization of Stabilization Policies Among Countries, with Special Reference to Britain and the EEC[1]

Douglas Dosser

I. *Introduction: Stabilization Policy Today*

Short-run stabilization analysis and policy by fiscal means[2] may fairly be said to be in a state of considerable flux at the moment. There are several groups of reasons: loss of confidence in short-run forecasting; serious conflict over target priorities; increasing political constraints on instruments; the substitution by governments of direct legislative control for fiscal and monetary policy; etc.

These factors apply with some force to many of the 24 OECD countries with their rather similar trends of price inflation, relative growth of public sector, etc. But they apply with even more force to the nine member-states of the EEC, where integrative movements, both in the private sector and in hesitant steps towards public policy coordination, are adding supplementary problems to autonomous national stabilization policies.

Britain presents the most interesting case of reconciling the continued possibility of fiscal flexibility for stabilization purposes with the limitation of fiscal autonomy implied by a Community tax harmonization programme. The use of fiscal instruments to balance aggregate supply and demand has, since Keynes, been more conspicuous in the United Kingdom

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[1] This paper represents the background to two research programmes (a) by an EEC group of academic economists, each from a different member-state, on the past and future use of fiscal policy for stabilization within the Community, see Cosciani (1974); (b) in the S.S.R.C. Public Sector Studies programme of I.S.E.R., University of York, on the stabilization policy of the United Kingdom as a member-state.

[2] The chapter deals with some aspects of fiscal policy for stabilization in the context of Community tax harmonization. Exchange rate policy in the context of Community monetary unification is fully dealt with in Corden (1972, 1973), Dosser (1973) and Magnifico (1973).

than in the other member states of the Community.[3] This fact, together with the general sensitivity which exists in the United Kingdom over the transfer of areas of sovereignty to the Community makes the question of whether autonomous U.K. fiscal policy for stabilization is any longer desirable or possible a particularly significant one.

Two groups of issues are raised in reviewing stabilization policy in Britain today: those that exist irrespective of EEC membership, and those that arise through that membership. Both are much affected by "open economy" aspects, e.g., the growing integration of the European economy might render autonomous British policy ineffective, even if Britain were not a member. However, the fact of membership can affect both targets and instruments for the stabilization policy of a member-state.

2. *Coordination of Targets of Stabilization Policy*

The general problem of defining targets in today's conditions of excess demand in product markets and excess supply in factor markets needs little elaboration. There is still (presumably) a Phillips curve trade-off with normally "acceptable" levels of unemployment (below one million unemployed) now corresponding to inflation rates of over 25 percent per annum in the United Kingdom. Whether the post-war degree of very limited tolerance of unemployment should now be greatly modified to bring down this anticipated rate of inflation is a matter of the most acute political controversy in Britain today. In addition, coordination of policy by members of the EEC raises the problem of the differing position of the Phillips curve in each member-state, and the differing choice on the trade-off that each government wishes to make.

There is likely to be little scope for "abnormal" behavior by a member-state on its own, because of the financial consequences imposed (especially as monetary union proceeds) on one's partners. A member-state's predilections about the choice of trade-off may eventually have to be realized by its being a party to a general agreement within the whole community, on the community action vis-à-vis the rest of the world, and acceptable divergencies from community norms by one member-state.

This implies the distinction in a member-state's stabilization policy between imbalance with respect to one's partners, and being a party to a joint stabilization program of the community. The United Kingdom might engage in a policy to counter inflation in the whole community *and* to get itself to the norm already existing in other member-states.

This *relative* stabilization policy — getting in line with one's partners — will lead to "external" deficit vis-à-vis one's colleagues and require their financing, so above-agreed inflation rates are "intolerable" unless justified by superior productivity trends. The member-state is expected or mandated to act in this situation.

[3] "There is probably no country in the world that has made a fuller use than the U.K. of budgetary policy as a means of stabilizing the economy," Dow (1965).

The conclusion is that following off-norm targets will become more and more difficult for a member-state. The control of instruments will have to fall more and more into the hands of a central authority. At the same time, member-states will express themselves more forcibly in the determination of community policy both for community stabilization as a whole and member-state relative stabilization policy.

For the external account, the Nine as a whole can expect to benefit from the recycling of OPEC surpluses. But both the deficit and the recycled inflow are on a community basis. The relative target then is determined by the "sharing-out" of the tenable community deficit. Attempts at apportioning it are difficult since the "share" of any member-state depends mainly on the attractiveness of its currency at the time. But, as soon as separate currencies lose their identities, the *relative* problem becomes a debated agreement as to the composition of the (deficit) community current account with the rest of the world.

It may reasonably be argued that there is as yet little sight of coordinated positions on an unemployment-inflation trade-off for the community as a whole, on an "acceptable" level of inflation, on permitted member-state deficits, etc. But conformity to average norms or those acceptable to one's partners will increasingly be *forced* by the financing implications of a monetary union. Whilst the institutions do not as yet exist to mandate such conformity, the conditions attached to credits supplied by one's partners, as implicit in the new Community Reserve Fund, will gradually have that effect, not so much while exchange rates can be varied, but if this becomes more difficult as monetary union proceeds.

Insofar as this implies manipulation of member-state economies from the center by fiscal and para-fiscal instruments, it is of interest to note which instruments are beginning to be transferred to the community in the process of tax harmonization, and whether these are the appropriate ones for the tasks.

3. *Coordination of Instruments of Stabilization Policy*

Since we are mainly referring to the United Kingdom, it is desirable to review the traditional, i.e.,pre-membership, use of fiscal and para-fiscal instruments in U.K. stabilization policy. This is desirable as a background as to which are being coordinated, or constrained, by the process of economic and monetary union and tax harmonization. Are traditionally key instruments being removed from U.K. autonomy?

The number of occasions on which the main instruments have been used in the 10 years before accession, 1963-74, is given in Table 1.[4]

The "imbalance" between the "restriction" and "reflation" sides of the account reflects the growth in the relative size of the public sector. The more frequent use of indirect taxes does not necessarily reflect a swing to indirect taxation when the greater fiscal drag of the direct tax system is remembered.

[4] From Dosser in Cosciani (1974).

Table 1

	Restriction of Aggregate Demand	Reflation of Aggregate Demand
Purchase Tax	4	2
Excises: tobacco	5	—
alcoholic drinks	6	—
petrol	5	—
motor licenses	2	—
Personal Income Tax: standard rate	1	2
other rates	2	4
allowances	2	5
Hire Purchase Regulation	5	1
Corporation Tax	4	3
Selective Employment Tax	3	2
National Insurance	7	

Of course, sometimes the occasions had something of a structural and not just a stabilization aspect. This applies usually for the Corporation Tax, and sometimes in the case of the Personal Income Tax. Also the introduction and ending of taxes — Purchase Tax, SET, Corporation Tax — have been counted in.

The figures tend to conceal changes in the frequency of use in different parts of the whole period. There has been a slight preference for direct tax measures on the part of a Conservative Government, compared with indirect tax changes by a Labor Government.

An interesting point lies in the fact that (other than reforms in a tax) swinging changes have been avoided — the changes in a tax have usually been relatively small, the norm being one involving a revenue change of £ 100 mn. When a substantial deflation or reflation has been required, a package of tax changes has been put together rather than a very large change in, for example, the standard rate of income tax, or in purchase tax rates and categories.

This "piecemeal" approach has also extended to stabilization by fiscal means through time. That is, if "normal" changes have been made in one or two taxes in one part of the year, further action later in the year has used some other instruments.

The procedures for making tax changes for stabilization purposes in the United Kingdom are much more flexible than is commonly supposed. Indirect taxes and hire purchase regulations can be and have been, altered at any time. (Indirect taxes can be varied between certain limits by administrative order — called the regulator.) Changes in direct taxes and large changes in indirect taxes can be announced in supplementary budgets as well as the regular annual budget — and supplementary budgets have occurred in a majority of years in 1963-74. The usual assumptions about the difficulty in the United Kingdom of changing income taxes for stabilization purposes arise from the complex administrative tasks involved (especially in view of the PAYE system) rather than from the constitutional need for a budget and an enabling Act. Tax changes can always be arranged at any time of the year, if the gravity of the situation justifies undertaking the big administrative rearrangement.

These modes of stabilization policy of 1963-74 are now subject to severe modification. Any extrapolation of the use of instruments in the United Kingdom has to take account of (a) a loss of confidence in fiscal instruments irrespective of EEC membership and (b) constraints on the use of fiscal weapons imposed by community tax harmonization.

The first reason is due to the loss of efficiency of fiscal instruments in attaining targets, an issue taken up under comparative advantages of instruments later.

The second requires some account of the position to date of coordination of taxes in EEC countries.

The main tax subject to harmonization is the VAT, which has now replaced (and would be used instead of) the Purchase Tax and SET.

The three-part recommendation of the Neumark Committee of 1963 on the harmonization of general sales taxes remains the target of European Commission policy: a common structure in the form of a VAT, equalized rates, and the origin principle for intra-Community trade.

The first part, structural harmonization, has been partially achieved in five Directives of 1967-69. However, while using the same general form, the Six, and the acceding Three member-states show significant differences in coverage and administration. These are tackled by the Proposed Sixth Directive. This has been circulating for some time among national administrations in attempting to reach common ground on numerous practical details, large and small, such as the point of liability to tax, turnover limits for exemption, timing of payments of tax, etc. Of course, it is implied that the big divergencies in coverage in some member-states, such as the food sector in the United Kingdom and retail sector in Italy, have to be eliminated.

Structural harmonization is supported by the trade-distortion principle and by the Eurobudget principle. Differences in VAT rates applied in the same sector in different member-states have some quasi-tariff or trade-distorting effects. Under the Eurobudget principle, the 1 percent VAT yield that would finance the Community budget in 1975 (1978 for the acceding Three) must equitably be raised on an identical base in each

member-state (assuming a proportional principle of taxation between member-states). There seems little argument about many of the details of structural harmonization, except the inclusion of food, and educational and cultural items (principally books) which some member-states want to exclude (or rather zero-rate) for "social" purposes.

When we come to rate harmonization, the situation is vastly different. It is still official policy to equalize VAT rates, explicitly stated in a Communication of the Commission to Council in April 1973,[5] and implicit in the Proposed Sixth Directive. Indeed, the ideal is a single, uniform rate, with "universal" exemptions, and (hopefully) an equally effective administration everywhere.

The single uniform rate can be supported by the trade-distortion principle, and it is required by the Eurobudget principle, if and when the VAT steadily becomes the federal tax of the European Community (assuming the proportional principle again). On the other hand, it is opposed by the economic management principle (the subject of this paper) and by the "social" autonomy some states wish to reserve for special sectors.

These points for and against rate equalization as an aim bear on the third part, harmonization of jurisdiction principle. If rates were equalized, it would be a near formality to switch from the destination to the origin principle, and thus add to the "abolition of customs frontiers" the equally emotive Community achievement, the "abolition of fiscal frontiers." It would be near-formal because there would be a change in member-state revenue receipts from VAT on traded goods. But if rates are not equalized, the destination principle has to remain along with border checks, since trade distortions from rate differences are much more serious under the origin principle.

Thus the question of rate flexibility for member-state stabilization policy is wide-ranging, knocking a dent in several Community aims, and it is certainly of crucial interest whether the VAT is (a) necessary and (b) effective, as an instrument for such policy, a point again taken up later under the "comparative advantage" of different instruments.

Excises, the specific form of sales tax, are also subject to harmonization procedures, though not so far advanced as VAT. We can see that any rigidity built into these by Community centralization would compromise another fiscal instrument much used in recent British history. Further, harmonization is to be limited to the classic five (tobacco, beer, wine, spirits, petrol) of most prominence in the United Kingdom. However, devices are to be sought to equalize only on excisable products entering into cross-frontier Community trade. The qualifications to the use of excises in policy for internal and external balance are complex ones. The Community will not want to rely on them as instruments; they have traditionally been important as such in the United Kingdom, but later they are likely to be at least partially constrained for such use, although in ways too early to define at present.

[5]In EEC (1973).

The last major tax field in the path of harmonization is corporate taxation. A common *form* has now been agreed upon, the credit or imputation method. Much work on the alignment of company law is necessary over a long period, but the aim of a common Community corporation tax, taxing enterprises equally wherever they operate in the Community, certainly lies in the background. Considerable discussion has taken place as to whether a Community corporation tax might not be a more suitable tax to develop as a Community budget source of revenue rather than the planned VAT. This would put a different sort of tax into Community hands also for stabilization policy, a tax which is usually reckoned to have limited efficiency, but which has certain advantages in the new potential situation of comparative efficiencies of instruments briefly explored in the next section.

4. *Domestic and International Factors Affecting Efficiency of Stabilization Policy Instruments*

Any assessment of the use of a given instrument must at the present time take account of increased repercussions across borders in the Community and of the changing response of economic groups within one's own state.

We must first recognize a certain asymmetry among closely linked countries such as the Nine member states of EEC. The Nine partners are, by the usual trade (tradeables)/GNP measures, highly open to each other. This openness, while common to all, might apply much more strongly to some partners than others, so as to separate a class of inflation-exporters from inflation-importers ("transmitter" *vs.* "transmittee" economies). If so, this implies (a) from the Community's point of view, a stabilization policy for the Community is a stabilization policy in transmitter member-states and (b) from a member-state point of view, an autonomous stabilization policy is ineffective in transmittee states, while in transmitter states autonomous policy carries the responsibility of controlling one's partners' demand management.

In order to distinguish empirically transmitter states from transmittee states, one might work along the lines of competitive *vs.* non-competitive imports (and perhaps exports). Recent work by OECD on transmission of inflation has used this approach, and it forms the basis of the so-called Nordic model of a transmittee economy.[6] The distinction between competitive and non-competitive imports/exports is an awkward one. It may be defined in terms of elasticities (elasticities of substitution or price elasticities of demand) which in turn depend on the stiffness of competition a sector faces from a home/foreign sector making a similar product. These elasticities are in part determined by the relative size of the sector under consideration. If it is small, it may be relatively powerless to compete against price changes imposed by a big foreign exporter, or to impose

[6]See OECD(1973).

price changes through its exports in the presence of large foreign domestic sector.

Although there may be some difficulties measuring these elasticities, we shall rely on concepts of competitive *vs.* non-competitive imports (exports), and define two polar cases: the transmitter state has competitive imports and non-competitive exports, i.e., is a price-maker on both sides of the trade accounts; the transmittee state is precisely the opposite, a price-taker on both sides of its trade account.

We now turn to the consideration of changing responses of domestic economic groups to stabilization policy measures. "Traditional" stabilization analysis evaluated the immediate effects of tax-induced price changes through substitution and income effects.[7] But, more and more, some powerful economic groups are, in response to some policy measures, insisting on money income and price adjustment which tend to neutralize the intended real income effects. These adjustments were in the past considered too small and delayed so that they could be neglected in the short time span over which stabilization policy was designed to operate. But they are getting to be much larger and less delayed, so that they can no longer be ignored in our analysis of policy instruments.

Disposable income retaliation, or real income maintenance, consists of the reactions of labor unions (but also other income and wealth holding groups) to the impact on their real incomes of the stabilization instruments. Principally this involves adjustment of the pre-tax money wage to compensate for (a) increases in product prices from devaluation, or increases in VAT, or other sales taxes, and (b) increases in the tax-take from the money wage by increased PIT.

Other neutralizing forces may be present, working through prices, in pricing policies of European companies and in public programs, which neutralize the member-state's autonomous stabilization policy.

In each case, adjustment of money incomes or prices can come about through automatic or non-automatic means. A leading example of partial automatic money wage adjustment exists in fact in the United Kingdom under Phase Three of the legislated Prices and Incomes Policy. This states that once the cost-of-living index shows a certain rise on the base month of October 1973, a wage rise for each additional 1 percent increase in the index is automatic for workers who have received pay awards under Phase Three: at the time of writing, some eight to ten million.

Discretionary upward adjustment may be connected to the above, for there may be a degree of substitutability between the two types of adjustment. As further employees are drawn into Phase Three and entitled to automatic increases, they may be satisfied and not make further claims — on the other hand, they may soon press further claims over and above those adjustments occurring automatically. The automatic provision may form the model for discretionary awards, but again it may not.

[7]For a standard example, see Kraus (1967).

In the context of EEC, instances of the Community policy to adjust prices automatically appear to be increasing. The Common Agricultural Policy applying to agricultural prices in all member-states is a much documented example. It is well-known that its provisions, which establish uniform real income levels for farmers through a maintained price system, protected the farmers from the effects of parity changes. That is, the "excess real wage" in that (mainly French) sector has not been affected by French devaluation and German revaluation. This was full automatic adjustment upwards of incomes (through the price of the product) undertaken by the public authority.

The more interesting and speculative area lies in whether this might not become a more general practice in Community expenditure policy. The indications are that the combined effect of the Social Fund and the new Regional and Employment Funds may well be an industrial welfare policy matching the agricultural welfare policy.[8] That is to say, the Community budget will support real income in depressed areas of the Community. It will not be acceptable for these real incomes to be suddenly slashed by a member-state devaluation or general tax-increases: they will have to be defined in an external unit, such as the unit of account, or compensating increases made in the stricken currency. Thus the very areas or sectors which "need" a real wage cut — both industrial and agricultural — may be insulated from member-state stabilization acts by Community policy.

Other prospective Community programs could lead to price homogenization. For example, the development of European public corporations in energy and transportation could lead to pricing policies which automatically offset member-state actions to vary *national* prices or after-tax real incomes. Such possibilities are a long way off, but discretionary corporate pricing by European firms may already be having some such effect.

One important difference between discretionary and automatic adjustment remains to be noted. In the case of automatic adjustment it is irrelevant from what source the increase in the cost-of-living index is derived — the size and timing of the wage adjustment is the same. But in the case of discretionary retaliation, it might be highly significant. Some actions of government against inflation and an external deficit may be considered consistent with the now popular "social contact," e.g., a devaluation "forced by foreign interests." Other actions may not be considered tolerable, e.g., an increase in domestic taxes. Then, instruments with equivalent primary impacts on the targets may *not* have equal consequences in setting-in train money wage demands.

When we come to review the main fiscal instruments for stabilization policy today, any comparison of efficiency has to take account of the generation of money, wage and price maintenance.

[8]See Dosser and Prest (1974).

It remains to emphasize what is already implicit: that the two sets of repercussions, cross-frontier and within-frontier, are increasingly interrelated. We have seen this in the case of Community pricing policies; in money wage adjustment, the future could see indexation of money-wages in some sectors of the Community as an automatic adjustment device, or bargained adjustment in one member-state because of what was happening in similar circumstances in other member-states, as labor unions spread over member-state boundaries.

5. *Indirect Taxes as Stabilization Instruments in the Community*

We have seen that member-state autonomy over the VAT is in the process of being qualified. The question is whether the implicit transfer of control is in line with the needs of stabilization policy of the Community economy as a whole and in its parts.

VAT is a major factor in influencing both the internal and external balance, speaking only of the primary phase at present. There are, of course, two forms of VAT, origin and destination principles to keep in mind in reviewing their role in stabilization policy. We shall also retain our earlier distinction between transmitter and transmittee states.

Under the VAT origin principle,[9] the base of the tax is domestic production including exports, and excluding imports and exempt sectors. An increase in rates (or decrease in exempt sectors) reduces aggregate demand by post-tax price increases and subject to neutralization of the proceeds in the national budget. The internal effect will, initially, be similar in transmitter and transmittee states. The external effect differs since a rate increase will tend to increase competitive imports, while competitive exports decrease in quantity but non-competitive do not. Thus from price effects alone, a transmitter country's external account may suffer on the import side from an increase in import quantities at prices which have not risen at all (extra-Community sources) or from a combination of equal quantities and higher (Community) supply prices, if VAT is increased simultaneously in other parts of the Community. On the export side, it increases its export takings from extra and intra-Community countries.

A transmittee country has fixed import quantities now at fixed, or higher prices from Community sources, while its export take with a combination of higher prices and lower quantities may change in either direction.

Income effects stem from the fall in domestic demand and reduce imports overall in both economies. In a transmitter country the income effect depressing imports may outweigh the price effect and lead to an improvement (bearing in mind the export gain) in the external account. This is less likely for a transmittee country.

[9]As recommended for trade within the Community in the Neumark Report.

Subject to all the parameters involved, the likelihood is that while a VAT (origin) rate increase will improve the internal balance in both types of economy, it only has much chance of improving the external balance in a transmitter country.

The effects of VAT increase under the existing destination principle are quite different. The base is now composed of imports plus domestic production, excluding exports. As before, only consumption goods are involved. But in contrast to the previous case, and as is well-known, there are now no price substitution effects on imports and exports. Income effects are still to be taken account of, but since these are not connected with the different structures of transmitter and transmittee countries, this distinction has no bearing on the use and effects of this policy instrument. The VAT increase will therefore improve the internal balance (subject to budget neutralization) as well as the external balance through depressing import demand.

Our analysis of the VAT has so far been concerned with conventional or what we have called primary effects. The secondary effects take account of money, wage and price adjustments, both automatic and bargained, which may substantially qualify these primary effects, even in the short term.

The most obvious neutralizing factors are automatic and bargained internal money wage increases. The VAT increases the official cost-of-living index[10] which triggers off indexation agreements, and forms a leading argument in wage-bargaining.

Now there is some difference between VAT origin and destination principles as regards the effect on the index. In the origin case, as we have seen, there is an increase in import prices for a transmitter country and for a transmittee country, although of differing complexion. The index is affected upward both immediately and after a lag through the import content of domestically produced consumer items. For the destination principle, index increases through imports are not involved. Thus automatic increases in money wages are likely to be more significant in the origin case than the destination. However, bargained increases may or may not be; as part of the "social contract," employers (and, prominently, the government in the case of nationalized industries) might be able to ward off some retaliation when the increases are externally generated.

If the money wage increase does occur, perhaps automatically, and, with an accommodating money supply, shows up in increases in product prices, the effects can be compared with the product price rise wrought by the increase in VAT. The deflationary internal effect of the VAT increase, with budget neutralization of the proceeds, is spoiled to the extent that prices and money wages increase again. The external effect repeats that of the VAT (origin principle) increase, but excludes income effects; viz., a probable deterioration of the external account through price effects. This is more likely for a transmittee country than for a transmitter country.

[10]Estimates of the effect on VAT changes on the British official index of retail prices are available in Georgakopoulos (1973).

Excise duties could be discussed in a similar way to VAT. They are subject to harmonization in the Community; they are much used as a stabilization device in the U.K. economy. An increase in their rate of duty has the usual deflationary effect, which is nullified as money wages respond to the resulting rise in the cost-of-living index (in which they figure significantly). The initial external effect is akin to that for the VAT destination principle, and will remain so under harmonization. However, the second-stage external effect, arising from the money-wage increase, has external effects like those of VAT origin principle.

6. *Direct Taxes as Stabilization Instruments in the Community*

The corporation tax is similar to the indirect taxes previously dealt with in being subject to Community harmonization plans, but it has not been so commonly used as a stabilization instrument for obvious reasons of time-lags and relatively low marginal propensities of dividend receivers to spend. The only potential to affect aggregate expenditure lies in advancing the payment of the corporation tax,[11] and also in circumstances where investment plans depend significantly on profit levels. Since investment would carry the burden of aggregate expenditure reduction, the corporation tax is unlikely to become a stabilization instrument. However, its relative freedom from secondary income maintenance effects is worth noting. Indeed, profit reduction may be part of the "social contract" as labor unions see it, and hence corporation tax increases lead to money wage claim restraint.

The other principal direct tax, the personal income tax, is of course a major stabilization instrument, but is not subject to Community harmonization plans. It will, however, share with indirect taxes the secondary effects of income maintenance or retaliation, although with differences.[12]

The first difference is that money wage adjustment will not fall into the automatic category, since the retail price index is not immediately affected by an increase in PIT rates. This instrument thus has some advantages at the secondary stage. At the primary stage, it can be responsible for a deflation of internal demand, and it can reduce imports through income effects.

It should be remembered that, given the progressive rate structure of PIT, as money wage rate increases, wage earners are pushed up to higher tax categories, thus increasing the average rate of taxes. When prices are also rising, money income maintenance responses may occur in response to this automatic increase in the average tax rate, and the progressive structure of the PIT has been cited as a cause of accelerating inflation. If this is so, a discretionary rate increase in the PIT may also be met by

[11] As was in fact done in the British Budget of February 1974.

[12] The model developed by Dernburg (1974) stresses these effects.

money wage retaliation, though perhaps with some longer time lag compared with those in response to an increase in indirect taxes working on the retail price index.

7. *Some Conclusions*

As EMU proceeds, more control over fiscal stabilization instruments must pass to Brussels. The first reason for this is the partial locking, and then extinction, of exchange rates between member-states. The second, arising from growing trade and capital market integration, lies in the increased "burden" on one's partners of a typical (particularly above average inflation) behavior in a member-state.

Control can be exercised either through Community fiscal instruments directly, or through regulatory powers over those remaining entirely under member-state jurisdiction. If it be the former, these are likely to consist of the VAT, Excises, and Corporation Tax; if the latter, the Personal Income Tax is the principal instrument, but also Consumer Credit control.

In the case of the former category of harmonizable instruments, there is a further distinction: the Community may "own" the tax (for "resources propres"), or only have control over the (harmonized) structure and rate applied by the member-states.

The question of VAT harmonization is raised most acutely here. Already, the Community will receive a first tranche of the VAT, a 1 percent rate for itself, in 1976-78.

Should this VAT transfer be progressive? The issue is likely to be bitterly fought between Community supporters and opponents.

A steady convergence of the VAT rate to a single Community figure, and its gradual take-over by the Community, will be opposed on grounds of the transfer of sovereignty *and* the need to retain flexibility in the rate for member-state stabilization policy. Compromises in this most crucial case of Community fiscal harmonization and member-state fiscal flexibility may be found along these lines.

The simplest solution would be (i) to equalize VAT rates into a band of, say 3-4 percentage points, which allows some variability and where trade distortions would hardly be significant, and (ii) to endorse the U.K. "regulator" technique, already applicable to the U.K. rates in its VAT system, allowing variation in the standard rate between 7 1/2 percent and 12 1/2 percent, to be applied by any member-states to the equalized rate. These leave open the question of the Community/member-state division of control/revenues.

More complex, and a further move to member-state autonomy, are shadow systems. The Community budget receives its revenues of a 1 percent (or later 5 percent or more) VAT from each member-state, but the member states are allowed varying degrees of autonomy in how they actually raise the revenue. The Community tax system may shadow reality

fairly closely; for example, member-states may charge a slightly higher rate on the majority of sectors in order to charge nothing on one. Or the Community "tax system" may be only an accounting device to determine member-state contributions, where member-states can raise the revenues by *any* means.

Decisions in these areas determine what tranche of the VAT around the Community is uniform in structure and rate and is *not* available for variation for member-state stabilization policy. What is available is any degree of freedom in this Community tranche, and any permitted autonomous member-state VAT system alongside the developing Community VAT system.

The transfer of instruments to the Community level is mainly politically or administratively determined, with only little reference to economic criteria. The economic criterion behind concentration on VAT harmonization and transfer lies in the supposed analogy between tariff distortion to trade and indirect tax distortions — VAT differences seen as quasi-tariffs. A more respectable reason for concentration on the VAT is the political one of obtaining for the Community a tax of excellent revenue potential.

But when it comes to stabilization policy, there is no necessary match between a proper division of instruments between Community and member-states for the tasks each ought to perform in short-term demand management, and the ongoing transfer of instruments.

Certainly it is difficult to make such an assignment to levels of government because of the changing comparative efficiency of instruments, bearing in mind the strength and rapidity of retaliatory action to maintain real income. In the last resort, the new responses may so compromise an instrument's efficiency to affect the internal or external balance as to make it a trivial question from the stabilization point of view as to who gets that instrument.

It is difficult to re-evaluate the comparative efficiency of traditional instruments, as used in Britain in the last 10 years, at the present moment in time.[13] It does seem as though the force of some of those listed in Section 3 is considerably weakened. This leaves others intact, but means that budget packages will in the future have to contain bigger action through fewer instruments.

As responsibility for stabilization policy has to be transferred to a central authority as part of EMU, the accompanying instruments, notably VAT, may well not be those with much efficiency left for short-term management. The Community may have to use such instruments as income tax and consumer credit control that were to be left in member-state discretion in the earlier discussion.

[13]At the very moment of writing, a substantial body of British economists are advising the Chancellor of the Exchequer to reflate and an equally distinguished body is recommending deflation.

Our conclusion has to be that while there appears to be a growing need to recognize both the limits of autonomous stabilization policy in Britain as a member-state, and also its externalities on Benelux-type partners, little help can be offered in the proper assignment of stabilization instruments between Community and member-state because of the changing efficiency of given instruments *per se*. Naturally this can be used as an argument against centralization; but equally it can be used to reassert historical Community tax harmonization (i.e., uniformization) for some taxes over fiscal flexibility. Elucidation awaits analysis of the secondary effects of retaliation and group emulation pertaining to traditional fiscal instruments.

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Discussion

Richard N. Cooper

In reading Professor Dosser's paper, I found it useful to put his line of thought into my own terms, and I do so here in the thought that it may also help others interpret his paper and at the same time permit me to make some general comments on the broader question of assignment of policy instruments to policy targets that runs through Dosser's paper.

Professor Dosser has identified three particular targets of economic policy: the balance of payments, the rate of change of prices, and the rate of unemployment. And he directs at these targets three instruments of policy: the rate of exchange, the value-added tax rate (VAT) and the personal income tax rate (PIT). These instruments and targets in principle exist for *each* country within the Community. Moreover, he draws attention to three different stages, distinguishable mainly by their time dimension but partly also by the degree of economic integration within the Community. The first stage represents the impact effect (in the first year) of a change in any instrument on the target variables. The second stage allows for "income retaliation," that is, the response by various factors of production to preserve or restore their income levels to what they were before the change in policy. For example, organized labor may try to recoup any increase in the VAT or PIT through higher money wages. The third stage is less clear than the first two, but seems to envisage a regime in which factors of production (mainly labor) attempt to attain and maintain comparable wages in all member countries, even without actual movement of labor between countries. That is, factor prices are kept in harmony by imitative behavior rather than by factor movements linking the factor markets in the various countries.

A simplified formulation of the economic structure that Dosser seems to have in mind can be written in compact matrix form as

$$y = A_i x, \quad i = I, II, III.$$

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Here y represents a vector of the target variables, as enumerated above, x represents a vector of the three policy instruments, and A_i represents the reduced form linear structural relationship between the instruments and the targets in each of the three stages enumerated above, call them, I, II, and III. Dosser's paper is clearly a working paper, and he makes only a rough stab at identifying some of the elements of A_I and of A_{II} for the United Kingdom and for Belgium. Dosser would like to discover the *comparative advantage* of each policy instrument in pursuit of each of the three target variables, so that each instrument can be assigned to a particular target. To do this he needs numerical values for the elements of the structural matrices.

I would like to make some general comments on this framework for analysis, which runs through the paper, and in particular on the question of assigning instruments to targets. Robert Mundell started us down this road in two celebrated articles on the division of labor between monetary and fiscal policy in the early sixties. The basic idea is that policy instruments should be manipulated so as to track discrepancies between the actual and desired values of particular target variables, one instrument to each target. In the notation above, the values of the instrument variables, x, should be altered so that: $\dot{x} = k(y^* - y)$, where the dot over x indicates its rate of change, y^* represents the desired values for y, and k is a matrix which by appropriate arrangement can be made diagonal and which makes the assignment of each instrument to each target and also specifies the speeds of adjustment. Combining the two equations (for a given set of structural coefficients) yields the system of simultaneous differential equations $\dot{x} = -kAx$, where $y^* = 0$ by choice of units.

The rationale for this type of policy adjustment is that we cannot always know just what the disturbance was, but we can observe the variables in which we are directly interested. Therefore a system of "tracking" these variables back to their desired values is a useful one, if we can be sure that the process of tracking will in fact lead to the desired values. Identification of each instrument with a target according to the comparative advantage of the former is alleged to achieve this.

Mundell's original contributions were couched in terms of two instruments and two targets. They are very nice for exposition in the classroom, but they have perhaps received too much serious attention from those concerned with the actual formulation of economic policy. In particular, four important qualifications have to be introduced into this framework.

First, the simplicity of assignment disappears when the number of instruments and targets exceeds two. The notion of "comparative advantage" of each instrument ceases to be well-defined, just as the notion of factor-intensity of each commodity ceases to be well-defined, where three or more are involved. As a result, while a stable assignment in a tracking model can always be made when there are only two instruments and targets, it is still an open question whether stability of the tracking

model (that is, convergence to target) can always be assured if there are three or more instruments and targets. There is a presumption that stability cannot be assured. (For the above system of simultaneous differential equations to be stable, i.e., to converge to target, the matrix -kA must satisfy the Routhian conditions noted in Samuelson's *Foundations of Economic Analysis*. While this can be for an arbitrary matrix A for *some* values of k, it probably cannot be done for just any value of k, the adjustment speeds, even with complete freedom to assign instrument to target.)

As a footnote, S.C. Tsiang has shown in a recent article in the *Quarterly Journal of Economics* (forthcoming) that Mundell's assignment in the 2x2 case of monetary policy to the balance of payments and of fiscal policy to aggregate demand will be unstable in the long run, once allowance is made for the higher interest costs of servicing external debt created by directing monetary policy to the preservation of external balance. By moving the problem into a longer time frame, the appropriate assignment of instrument to target may thus be altered.

Second, in practice there is clearly a great deal of uncertainty about the values of the structural coefficients, that is, the elements of the A matrices. This fact has two important implications. In the first place, we cannot be sure about our reckoning of comparative advantage even in those cases in which we are confident about the theoretical structure, for sharp differences in numerical values might alter the appropriate assignment. In the second place, to the extent that uncertainty does surround our knowledge of economic structure, we should take that uncertainty into account in framing economic policy. This requires being explicit about the costs of being wrong, and it means therefore that we must confront directly our preferences and priorities among the different targets in case a choice must be made among them. The quadratic framework of analysis developed by Theil, while artificial, is nonetheless a more satisfactory one for dealing with policy choice than the simple Tinbergen-Mundell framework because it can accomodate both of these factors.[1]

Third, lags in the response of target variables to changes in policy instruments may be such that 1) an otherwise stable system is rendered unstable (except in the 2x2 case) and that 2) some target variables may be far from their targets much of the time, leading to loss of utility. A more

[1]See H. Theil, *Optimum Decision Rules for Government and Industry* (Chicago: Rand McNally, 1964).

On the bearing of uncertainty in the coefficients on the formulation of policy, see William C. Brainard, "Uncertainty and the Effectiveness of Policy," *American Economic Review*, LVII (May 1967), pp. 419-21, and Richard N. Cooper, "Comment on Limited Information and the Assignment Problem," in E. Claassen and P. Salin (eds.). *Stabilization Policies in Interdependent Economies* (Amsterdam: North-Holland Publishing Co., 1972) pp. 117-122.

sensible strategy may then be to direct several instruments at the same target for awhile. Here, as in the case of uncertainty, some choice among targets may have to be made for temporal reasons and the assignment of one instrument to each target will be inappropriate.

Fourth, there is no compelling need for decentralization of policy instruments *within* countries, the case typically discussed and the case considered by Dosser. Various government agencies can and do consult one another, and economic policy can be coordinated at the top. Choices can be made among targets, and several instruments can be (and usually are) devoted to the pursuit of a single target, and then to another, in sequence. With enough information, the whole economic "system" can be solved simultaneously for the appropriate values of all targets, and they can be set accordingly, although that rarely in fact occurs.

The real need for a stable decentralized system arises among different but economically interdependent national economies, an issue addressed by Max Corden in his remarks.

Thus the economic structure of the whole Community (ignoring relations with the rest of the world) can be depicted as

$$\begin{pmatrix} y_1 \\ \vdots \\ y_n \end{pmatrix} = \begin{pmatrix} A_1 & \cdots & I_{1n} \\ \vdots & \ddots & \vdots \\ I_{n1} & \cdots & A_n \end{pmatrix} \begin{pmatrix} N_1 \\ \vdots \\ N_n \end{pmatrix}$$

where y_i represents a vector of target variables and N_i a vector of instruments in country i, A_i represents the internal structure of the i^{th} economy, and I_{ij} represents the interaction effects (marginal propensities to import, interest sensitivity of capital movements, etc.) of the instruments of country j on the target variables of country i. High values of the I_{ij} suggest a high degree of economic interdependence, and hence a strong influence of actions in one national economy on the economic variables of another.

Corden suggests that decentralization among nations will work, but he rightly retreats from the suggestion that full decentralization should therefore be allowed to reign and offers some reasons for attempting to coordinate policies among countries. Close coordination (which is quite different from harmonization, which means doing the same thing), by minimizing the extent to which countries work at cross purposes or unknowingly reinforce one another's actions and thus lead to overshooting of targets, permits all countries to remain closer to their targets more of the time — provided the targets are consistent — than would a regime without coordination.

But does the European Community need a single stabilization authority? The answer is clearly yes, if the instruments of policy are tied together, as Dosser suggests they should be. Therefore we must ask, should the various national instruments of policy be tied together in their use, i.e., "harmonized"? In the space remaining I will give my own answer to this question, which is an evolutionary one and divides the process into three stages. It assumes that the various national targets are consistent with one another.

If the objective of monetary unification is a serious one, it implies fixity of exchange rates and hence harmonization of national monetary policies, that is, formulation of monetary policy for the Community as a whole. If this step is taken before the national economies are fully integrated in the sense of free and easy movement of labor, it is important that fiscal policy *not* be harmonized among the member countries. On the contrary, each should be left free to use national fiscal policy to cope with periodic national booms and slumps that are out of phase with those elsewhere in the Community. Of course, governments would not have access to the national central bank to finance any resulting budget deficits; rather, they would have to sell government debt into the Community-wide capital market, as has been suggested by James Ingram.

Over the course of time, the localized impact of fiscal policy will be eroded, as the marginal propensity to import from the rest of the Community increases and each national economy becomes more closely linked to others through the markets for goods and services. As this happens, the effectiveness of conventional fiscal policy, whether operated through changes in taxes or expenditures, will diminish. In order to retain their grip on the national level of employment, governments will be drawn increasingly into "regional" policies to attract internationally mobile real capital (not just financial capital) into their areas in order to stimulate economic activity, raise incomes, etc. Various tax subsidies and other forms of support are used to accomplish this, and these devices in effect represent a way to alter relative factor prices through the fiscal system with the relatively immobile (and therefore potentially unemployed) factors paying the tax bill for the relatively mobile factors, mostly footloose business firms. These actions of course take a longer time to be effective than does conventional fiscal action, and therefore at this stage it will be necessary to introduce Community-wide fiscal action, that is, to harmonize national fiscal policies or to use the Community budget for stabilization purposes for the Community as a whole.

After a further period, vigorous competition will develop among the various regions of the Community for the same mobile activities, and gradually it will become necessary to limit this regional competition through harmonization of the instruments of policy used in the competition, e.g., property and profits taxes, subsidies to long-term borrowing, provision of construction sites, and so on. This harmonization will have to take place not in the name of economic stabilization, which

can be handled adequately by a combination of Community-wide fiscal and monetary action and by competition among regions for mobile firms, but rather in the name of distribution of income, which may become strongly skewed in favor of the mobile factors of production for which the various regions are competing. With harmonization of the regional instruments of policy, regional policies will have to be financed on a Community-wide basis.

All of the forces described here can be observed to some degree at the present time. But some of them are still sufficiently weak that they can be ignored for awhile. The Community should not proceed too rapidly toward fiscal harmonization or it will deprive the member nations of still badly needed tools of stabilization. By raising the costs of membership, such deprivation might well undermine politically the move to eventual economic union.

The Coordination of Stabilization Policies Among Countries

W. Max Corden

What is Coordination?

Is it really necessary for countries to "coordinate" or "harmonize" their stabilization policies? This rather fundamental question is of interest since there is not too much evidence that countries *actually* coordinate their policies.

What do we mean by "coordination"? Country A may simply adapt or adjust to the policies of Country B, doing whatever it wishes to do from its own point of view. But this is *adaptation* or *adjustment*, not coordination. Alternatively, in choosing its policies Country A may take into account the effects *on* Country B of its (A's) policies. And similarly, Country B may take into account the effects of its policies on A. They bear in mind the effects on each other of their policies *not* because of indirect repercussions through multipliers, and so on, but because they have struck a bargain that each take into account the other's interests This could more reasonably be described as *coordination.*

A Simple Argument: Coordination not Necessary

It can be argued that if countries make adequate use of the policy instruments available to them, there is no need for coordination of stabilization policies among countries. This argument hinges on a number of assumptions which will be removed below. But it seems useful first to state it quite baldly. For this argument one must define stabilization as being concerned with demand management: a government's stabilization policy aims to keep the country on the optimal point (however defined) of some sort of Phillips curve, or at least to avoid substantial departures from this point.

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The simple argument is as follows. No country need have more unemployment or more underutilized capacity than it wants to, bearing in mind its Phillips curve constraints and trade-off. If Country B deflates and in the first instance, this reduces demand for Country A's products, Country A can use its own fiscal or monetary policy to compensate for the fall in foreign demand. If Country A's import prices rise, and if its elasticity of demand for imports is less than unity, so that demand for its own goods would fall in the first instance (with a constant level of money expenditures), again fiscal or monetary expansion can compensate. The point is obvious. Exchange rate alterations would deal with the balance-of-payments consequences of Country A's stabilization policies.

Similarly, no country need have more price inflation than it wants to, bearing in mind its Phillips curve trade-off. A country can insulate its traded-good price-level from world price inflation by appreciating its currency appropriately. The prices of non-traded goods can be regulated by the level of demand (bearing in mind the Phillips curve again). If incomes expand owing to an improvement in export prices or capital inflow, hence increasing demand for non-traded goods, this can be offset by appropriate deflationary policy.

One can thus imagine countries reacting continually, and atomistically, to events from outside them, including the consequences of other countries' stabilization policies. And if their policies are intelligent and speedy, they will achieve whatever stabilization they wish to achieve given their various *internal* constraints (such as the Phillips curve).

Let us now qualify this approach, to see what case there is for deliberate coordination. Some of the qualifications, especially the first, are no doubt very obvious.

First Qualification: Information and Policy Lags

It takes time to make policy adjustments. Country A needs warning of what B is going to do, and vice versa.

Two things follow. Firstly, there has to be exchange of information about economic trends and policy intentions. This is what OECD is all about, and is what is often meant by "coordination." Each country still considers only its own interests in making its policies, but at least it gives the others warning of policy changes. Secondly, sudden policy changes need to be avoided. Country B's own interests may require it to deflate suddenly, but its obligations to A, as part of a coordination understanding, may cause it to deflate more gradually. In this type of case advance information could not be provided since the policy decision was, presumably, sudden and called (in B's interests) for immediate implementation. Country B thus has to modify its actual policies in the interests of A.

Second Qualification: Policy Rigidities

The exchange rate may be rigid. Let us first look at the effects on prices, and distinguish prices of traded goods from prices of non-traded goods.

With a rigid exchange rate, a country cannot insulate its domestic prices of *traded goods* from world price movements. Each country's price-level depends on the price-level in other countries: inflation can be "imported." The domestic prices of *non-traded goods* depend on the demand for non-traded goods, and hence on the level of aggregate expenditure. With the exchange rate fixed in a world of capital mobility monetary policy may also be ineffective in regulating this level of demand. But fiscal policy could still do the job. A rise in the demand for non-traded goods resulting from increased export incomes or capital inflows could be offset by a deflationary fiscal policy. But if there is, in addition, a rigidity in fiscal policy not even the prices of non-traded goods could be insulated from external shocks.

The same issues arise if we are concerned with stabilizing output and employment. If the exchange rate were flexible, a fall in export demand could be offset by depreciation. But when the exchange rate is fixed, demand can be maintained neither through the stimulating effect of a depreciation nor (with capital mobility) through monetary policy. Only fiscal policy can maintain demand.

It seems then that the need for coordination arises when *both* the exchange rate and fiscal policy are rigid. Suppose the exchange rate were rigid but not fiscal policy.

With a flexible fiscal policy it is always possible to stabilize demand for, and hence prices of, non-traded goods. Hence employment and output can be stabilized (apart from short-term effects). But is is not possible to stabilize the general price-level, since the domestic prices of traded goods are at the mercy of world prices. This assumes realistically that a rise in the domestic prices of traded goods cannot actually be offset by a compensating *fall* in the prices of non-traded goods so as to keep the general price-level constant. Furthermore, fiscal policy can maintain internal balance but it cannot, at the same time maintain external balance, since we have only one instrument for two targets. When world prices rise, it may then be necessary to allow the prices of non-traded goods to rise.

Third Qualification: Stabilization Redefined as Real Income Stabilization

Sometimes people do not interpret the concept of stabilization in terms of demand management — in terms of maintaining, for example, a constant rate of unemployment — but rather in terms of maintaining real incomes or expenditures constant. Let us now redefine the concept in this way.

It is true that fluctuations in the rate of unemployment and capacity utilization must certainly lead to fluctuations in real incomes, but the reverse is not true. The rate of unemployment may stay constant and yet real incomes may fluctuate. This can happen if, for example, there are fluctuations in the terms of trade. So the redefinition is significant. We shall suppose now that there are no rigidities in the policy instruments, notably the exchange rate, hence assuming away the complications discussed above.

Country A's terms of trade may deteriorate owing to stabilization policies in Country B. Unless Country A runs a balance-of-payments deficit, it cannot maintain its real expenditures constant. It cannot insulate itself from *real* effects. For example, even with a flexible exchange rate and a flexible fiscal policy, a raw material exporter still finds his real income destabilized by fluctuations in consuming countries. Similarly a raw material importer's real income may be destabilized by fluctuations in demand from competing importers. Here, of course, is the role for exchange reserves: to stabilize expenditures even when incomes are not stable. But I put this aside now. The main point is that countries may wish to coordinate their policies in order to stabilize real expenditures or, at least, take *real* effects on each other into account. For example, a group of raw material importers may seek to avoid simultaneous demand expansion policies.

One can go further. There may be rigidities in real factor prices. Consider the simple case where the average real factor price after tax is rigid downward. One can think here of a rigid real wage and suppose the profit margin to be fixed.

Imagine a country's terms of trade to deteriorate. The *equilibrium* real factor price — that is, the price compatible with continued full employment and external balance — will then fall. But the actual real price may refuse to fall. A devaluation may simply be offset by an appropriate rise in the money wage. Fiscal policy can maintain full employment with a balance-of-payments deficit or it can restore external balance at the cost of unemployment. It cannot do both. In the latter case the destabilization of the real factor price brought about by the terms of trade change in the case where the real price is flexible, is transmuted when the real factor price is rigid into a familiar *employment* destabilization.

Fourth Qualification: Stabilization Redefined as Sectional Income Stabilization

Sometimes the concept of stabilization is thought to refer to stabilization of *sectional* incomes, for example, incomes in the exporting sector, or incomes of consumers of imported goods. The problem now is that a country's sectional incomes may be destabilized by external events which affect the domestic prices of its traded goods.

Let us then suppose that the relative traded goods prices that are externally given to Country A change because of other countries' stabilization policies or lack of them. This relative price change will have

effects on income distribution in Country A. Incomes of particular exporting or import-competing interests may fall. On the lines of the earlier argument this sectional income destabilization may become transmuted into employment destabilization if real factor prices are rigid.

If there were no institutional obstacles and no resource costs to income redistribution, it would always be possible to avoid a fall in anyone's real income or expenditure provided the terms of trade overall have not deteriorated. (If they have then, to some extent, we have discussed the problem in the previous section.) But because of institutional obstacles or resource costs, offsetting income redistribution may not take place. One might regard this failure of income redistribution policy as another kind of policy rigidity.

It has to be stressed that we are here concerned with *relative* price changes in the traded goods sector, since a *general* change in the price-level of traded goods can always be offset by exchange rate adjustment. It might also be noted that tariffs, and especially variable levies, can insulate particular domestic-traded goods prices from changes in world prices. Tariffs are, as is well-known, the second-best (or worse) means of redistributing domestic incomes.

It follows that when there is a desire to stabilize sectional incomes and when adequate domestic redistribution policies are costly or not available, countries may wish to coordinate their economic policies to reduce such redistributive effects.

Summary So Far

The simple argument that there is no need for so-called coordination of economic policies must thus be qualified for a number of reasons:

(a) It takes time to make policy adjustments; hence information has to be exchanged and sudden changes must be avoided.

(b) There may be policy rigidities, notably in the exchange rate.

(c) Stabilization policy may require stabilization of real incomes, whether in total or sectionally; or real factor prices may be rigid.

Thus some policy coordination may be needed or desirable. It becomes essential if countries wish to lock their exchange rates. Since 1971 we have seen a grand un-locking of rates, so that the need for coordination has been reduced. But if there are renewed moves towards a pseudo exchange rate union in the EEC, the need for coordination in the EEC will certainly arise.

Note on Incompatible Exchange Rate or Balance-of-Payments Objectives

Countries may have price-level targets, they may have exchange rate targets, or they may have quantitative balance-of-payments targets. In a world of flexible rates price-level targets can be made compatible by exchange rate variation. This has been a main theme so far. Let us now

look at the question of incompatible exchange rate or balance-of-payments targets.

(a) *Exchange Rate Targets*

Exchange rate targets are thoroughly irrational when they are independent of relative price levels. Nevertheless, countries do have them, at least in the short run. The rigid exchange rate situation discussed above is a special case of an exchange rate target.

A problem certainly arises when exchange rate targets are not compatible. This can arise whenever exchange rates are seen in relative terms — as one currency expressed in terms of another — rather than in terms of gold or SDRs. If countries have flexible rates and focus on stabilization of prices, employment and output, avoiding payments imbalances, there is no need for "coordination" other than for the reasons already discussed. But if Country A devalues in terms of SDRs and this is followed by B devaluing to restore the original exchange rate relationship, then the exchange rate is not really an instrument of policy available unilaterally to Country A. A need for coordination between countries arises. But this is coordination of exchange rate policy rather than stabilization policy.

(b) *Balance-of-Payments Targets*

Finally, countries may have incompatible balance-of-payments targets. This is a matter of great current interest. If countries behave atomistically, such incompatibility will again create a disequilibrium situation.

Suppose that Country A — which we can think of as the United States — starts off by expanding aggregate demand and, at a given exchange rate, runs a deficit. Country B (Europe) thus runs a surplus. Now consider four possible responses. Only Response IV gives rise to the need for coordination among countries.

Response I. Country B is happy to run a surplus. It reduces absorption so that the excess of income over absorption is equal to the surplus. The balance-of-payments targets of the two countries are thus compatible. This may be said to describe broadly the world situation for a period up to 1971.

Response II. Country B does not want the surplus, so it appreciates its currency. The crucial issue now is whether Country A accepts this. Let us suppose that Country A did not have a balance-of-payments target at all, but just had a rigid exchange rate combined with a full employment target. In that case it will accept the elimination of the payments imbalance.

Some people would argue that if Europe (B) had really not wanted its surplus in, say, 1969, the United States (A) would have responded in this way, having only exchange rate (gold price) and full employment targets, but not a balance-of-payments target. Failure of Europe to appreciate its exchange rates sufficiently suggests that really Europe was happy to run

the surplus. But some Europeans might have argued (unconvincingly to me) that *if* they had appreciated sufficiently the following response would have ensued instead.

Response III. Again, Country B does not want the surplus, and again it appreciates. But this time Country A does not accept this. It wants to "live beyond its means" and thus wants its deficit. The balance-of-payments targets are incompatible.

One can then envisage the following destabilizing process. Country B appreciates to eliminate the surplus. This raises prices and reduces real spending in Country A. So Country A increases the money supply and hence money expenditures further, restoring its real spending level and its deficit. So B appreciates further, and so on. There will be an inflationary spiral in Country A. But provided Country B is willing to use the exchange rate instrument, it can insulate itself from the inflationary consequences. It need not "import inflation."

Response IV. Finally, we come to the "coordination case." Again Country B does not want a surplus. But this time it chooses not to use the exchange rate, but rather allows its domestic prices to rise. Again, A does not wish to accept the elimination of its deficit, it expands the money supply further, restores its deficits, provokes a further price rise in Country B, and so on. This time there is an inflationary spiral in both countries, created by the money supply expansion in A. Country B will then have an incentive to seek some coordination of monetary policies and balance-of-payments targets to eliminate the inflation at source. This need only arises because Country B is unwilling to use the exchange rate instrument.

Stability in The International Economy: The LINK Experience

Keith Johnson
and
Lawrence Klein

National Economic Stability — The Single Country Case

The response mechanism of an economic model under imposed disturbance is an insightful way of looking at the stability properties of the system being modeled. It should show the quantitative magnitude of fluctuations or movements that are generated by the shock and might also indicate policies that would serve to reduce the severity of the fluctuations. In the case of national models, there has been an extensive application of simulation under shock and some analytical techniques for studying the associated problems of stability.

Given a model of an economy, stability is examined through calculation of multipliers, simulation under general changes in exogenous inputs, or parametric change, dynamic simulation over long periods of time from given initial conditions, and dynamic stochastic simulation. Most of these studies could be in parallel: (1) by numerical simulation calculation, (2) by analytic formula evaluation. The second method is generally applicable only in the linear case.

An abstract model of an economy can be written as

$$F(y'_t, y'_{t-1}, \ldots y'_{t-p}, x'_t, \theta') = u_t$$

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where

F is a vector of functions $(f_1, f_2, \ldots, f_n)'$

y'_t is a vector of dependent variables $(y_{1t}, y_{2t}, \ldots, y_{nt})$

x'_t is a vector of independent variables $(x_{1t}, x_{2t}, \ldots, x_{mt})$

θ' is a vector of parameters $(\theta_1, \theta_2, \ldots, \theta_r)$

u_t is a vector of random disturbances $(u_{1t}, u_{2t}, \ldots, u_{nt})'$

For given initial values of $y_{t-1}, \ldots, y_{t-p}$; given simulation period values of x_t; given parameter values (estimates) $\hat{\theta}$; and assumed random errors (usually at mean values = 0); the system can be solved dynamically at successive values of t. This is called a simulation, and if u_t is set at its zero mean, it is called a "deterministic" simulation.

The response characteristics of the system are studied by examining behavior of the simulation for changes in input values of x_t, θ, and u_t. If a component of x_t is changed to $x_{it} + \delta_{it}$, we get the multiplier effect of x_{it} by comparing a standard simulation with that obtained by using $x_{it} + \delta_{it}$ as input. A sustained change in x_{it} would be obtained by making δ_{it} a constant, an impulse change by assigning a non-zero value to δ_{it} for one period and changing it back to zero for subsequent periods. In this case, we should cumulate the differences between the shocked and the standard simulation.

Both x_t and $\hat{\theta}$ are input values for simulation. Some economic policy simulations are associated with changes in exogenous variables (e.g., changes in government spending), but others are associated with changes in parameter values (e.g., changes in tax rates). Simulation studies of the response mechanism consider both types of change. The changes can also be generalized in the sense that several x_t and $\hat{\theta}$ components can be changed simultaneously and that the changes need not be uniform over time; they can be turned "off" or "on" for different time periods. Finally, random numbers can be drawn for u_t in the study of stochastic simulations.

All these ways of simulating dynamic systems lead to understanding of their stability properties. In dynamic stochastic simulations we can look at the oscillatory properties of systems and ascertain whether they tend to be damped, explosive, or maintained in limit cycles. The periodicity of oscillation tells about duration of recession and recovery. The multiplier values of a system show how different policy instruments change performance towards more or less stable values. By changing parameter estimates we can see the effectiveness of built-in stabilizers for modern economies. A simulation without such built-in features ought to be less stable in some sense than an economy with such features.

In extensive simulation calculations with models of the American economy, the following facts are emerging:

(i) The postwar economy is strongly damped. If models are temporarily disturbed from standard growth simulations, they return quickly to the standard path after the disturbance is removed.

(ii) The automatic stabilizers appear to be doing their job in dampening fluctuations in the U.S. economy.

(iii) The postwar cycle has been moderate in amplitude and duration.

(iv) Longer-run implications of energy shortage are strongly unsettling to the U.S. trade balance.

(i) In their pioneering study of stochastic simulation, Adelman and Adelman found that a single-period exogenous change in defense spending deflected a U.S. model from its simulated growth path for a very short period.[1] The system showed great resilience in returning to the standard path. Similar results have been found in simulated post-Vietnam disarmament solutions and in general shocked simulations.[2]

(ii) In the aftermath of 1929, the American economy together with most of the rest of the world fell to pieces in a most unstable way, leading to the introduction of numerous automatic stabilizers, such as a progressive tax system, cyclically sensitive transfer systems, deposit insurance schemes, and price support levels. In simulations of U.S. models under modern conditions, with the full range of automatic stabilizers, it has been found virtually impossible to duplicate the 1929 kind of cumulative decline.[3]

(iii) Adelman and Adelman found evidence of a moderate postwar cycle of approximately four years' duration. The actual cycle has peaked in 1948, 1953, 1957, 1960, 1969, and 1973. None of the fluctuations has been cumulative. On prewar standards, they were mild cycles, and the classical Juglar oscillation of 8-10 years does not seem to be characteristic of the present system.

(iv) Long before the energy problem became an acute crisis, Preston had been simulating one of the Wharton models of the U.S. economy under conditions of large scale oil imports at rising prices.[4] The price rises

[1] I. and F. Adelman, "The Dynamic Properties of the Klein-Goldberger Model," *Econometrica* 27 (Oct., 1959): 596-625.

[2] L.R. Klein and Kei Mori, "The Impact of Disarmament on Aggregate Economic Activity: An Econometric Analysis," in *The Economic Consequences of Reduced Military Spending*, edited by B. Udis (Lexington, Mass.: D.C. Heath, 1973).

E.P. Howrey and L.R. Klein, "Dynamic Properties of Nonlinear Econometric Models," *International Economic Review, 13 (Oct., 1972):599-618.*

[3] L.R. Klein, "On the Possibility of Another '29", *The Economic Outlook for 1967*, (Ann Arbor: Department of Economics, University of Michigan, 1967).

[4] R.S. Preston. *The Wharton Annual and Industry Model* (Philadelphia: Economics Research Unit, Universtiy of Pennsylvania, 1972).

were probably too mild, at least in the special conditions of 1973-74, but the large volume of imports foreseen were fully expected to be unsettling for the U.S. balance of trade. All the gains of devaluation in 1971-73 were expected to be overcome by oil imports some time after mid-decade, according to his simulations. This suggests a shift in mix of imports towards low elasticity items, weakness of exchange depreciation policy, and tendencies towards external instability.

The very simple mathematics of multiplier theory for the individual economy can be derived as follows,

$$Y = d(1 - t)Y + G + E - mY$$

$$\frac{dY}{dG} = \frac{dY}{dE} = \frac{1}{1 - d(1 - t) + m}$$

Y = real output

d = marginal propensity to spend $\quad 0 < d < 1$

t = tax rate $\quad 0 < t < 1$

m = marginal propensity to import $\quad 0 < m < 1$

G = real public spending

E = real exports

The response of real output to exogenous changes in G or E varies directly with d, inversely with t, and inversely with m. It is assumed, for stability, that

$$0 < d(1 - t) - m < 1$$

In relation to simulation of large dynamic systems, as outlined in general terms above, changes in G or E correspond to changes in x_{it}, x_{jt}; while changes in d, t, or m correspond to changes in $\hat{\theta}_k$, $\hat{\theta}_1$,$\hat{\theta}_m$. The simple mathematics are worked out for expository purposes, for the linear, static case. The parameter t is a stabilizer because it reduces, by the fraction (1 — t), the influence of d on the multiplier. Similarly, imports for the open economy are another source of "leakage" in that addition of m to the denominator offsets in part the effect of -d(1 — t).

This application of simple multiplier analysis is best for the small country case because it can more safely be assumed that exports are exogenous and largely independent of the response dY in the world economy. Even in the largest of economies, however, the feedback influence of Y on world trade or world production and own exports is usually neglected in calculations to a first approximation.

If taxes are progressive so that t varies directly with income, we find even more built-in stability and reduced multiplier responses. Similarly, if m is large and positively associated with Y, as is often the case in small countries, we find even stronger leakages and smaller multiplier responses. If 2.0 is a rough figure for a large, relatively closed economy, the corresponding figure would be 0.5 to 1.0 for a small open economy.[5]

This simplified model has no supply side, i.e., no mechanism of domestic price determination. The multiplier mathematics lose their simplicity in this case, but numerical simulation shows that a given shift in the *endogenous* export equation may have a larger multiplier than a corresponding *exogenous shift* in the volume of public expenditures. This difference comes about because exports depend on relative prices; they are positively related to the ratio of world to home prices and because there is usually a time build-up in the adjustment of exports to shifting demand. If the increase in productivity usually associated with output expansion leads to relatively lower or stable home prices, there may be an induced expansion in exports, which becomes progressively larger as time lags work out their effects. If the expansion comes at a point of full capacity utilization, however, it may lead to relatively higher domestic prices which would restrain the export expansion.

These cases would have to be worked out in numerical simulations by changing the component of x_t representing G_t, in one case, and by adding a shift parameter to the component of F representing the export function, in the other case. In early multiplier simulations of the Wharton Model (1966-68 version) export multipliers appear to be quite strong in comparison with government expenditure multipliers. The real multiplier arising from a change in G quickly rose, in that model, to approximately 2.0 and oscillated in a narrow range about the average.[6] This is different from the present version of the Wharton Model because the standard expenditure multiplier falls in subsequent quarters after peaking at about 2.9 in three to four years. The export multiplier exceeded the real government expenditure multiplier in the older version of the Wharton Model. It settled down at about 3.5 after growing for three to four years. In that system exports were in a distributed lag relation; therefore, the initial impact was compounded in the dynamic solution. If this effect is eliminated, the long-run multiplier would be only about 2.1. It should be slightly larger than a domestic expenditure multiplier because it has a *direct* and immediate impact on private output and because it may cause less of an increase in domestic prices than other changes in exogenous spending.

[5]An extreme case with high values for m is shown in the models of the Dutch economy. For small multiplier values associated with large values of m see, J. J. Post and P. J. Verdoorn, "Capacity and Short-term Multipliers," in *Economic Analysis for National Economic Planning*, edited by Hart, Mills and Whitaker. (London: Butterworths, 1964.)

[6]L. R. Klein and M. K. Evans, *The Wharton Econometric Forecasting Model*, 2nd enl. ed. (Philadelphia: Economics Research Unit, University of Pennsylvania, 1968)

Perhaps more is known about the stability and dynamic response properties of various U.S. models because there have been more coordinated simulation studies;[7] nevertheless, other individual participant models in the LINK system have been put through a number of simulation calculations or stability analyses. In this respect, Canadian results with TRACE are important in showing the stabilizing effects of alternative exchange rate policies.[8] The Canadian model is unique in having a significant statistical sample of both floating (1951-60) and fixed (1961-69) exchange rates. Also, the model includes a comprehensive balance-of-payments sector. The exchange rate is a variable in the trading, pricing, and capital flow equations of the model.

At the level of partial equilibrium analysis, the TRACE model satisfies the Marshall-Lerner condition. Nominal exports fall and nominal imports rise when the exchange rate (Can. $ per U.S. $) falls, *cet. par.* The balance-of-payments surplus falls at the same time the exchange rate falls; thus it is possible to program a rule in TRACE to vary the exchange rates for solutions that show balance-of-payments disequilibrium and solve for an equilibrating exchange rate.

This is not a full stability condition, however, because exchange rate changes induce changes in income levels, price levels, and interest rates. The total effect on the system for changing exchange rates shows that, on average, a change in the rate by 1 cent, induces a change (in the same direction) of the payments balance by $300 million in the short run. The long-run effect is lower.

In simulations of TRACE under floating and fixed rates, it is found that expansionary policies (public expenditure increases, tax cuts, easier money) work better under floating than under fixed rates as far as increasing output, and lowering unemployment are concerned. There tends to be somewhat more inflation under the floating system when an expansionary policy is followed, and, of course, the balance of payments is closer to an equilibrium value than under fixed rates.

These are suggestive and promising results in favor of stabilization for the single country case; there is no similar experience for other countries, either individually or linked.

Prior to the 1971 revaluations, simulation of the German (Bonn) and Japanese (Japan Economic Research Center) LINK models were individually and separately made for different levels of DM or ¥ exchange rates in order to see if there would be movements toward equilibrium as a

[7]B. Hickman, ed., *Econometric Models of Cyclical Behavior*, (N.Y.: Columbia University Press for NBER, 1972); O. Eckstein, ed., *Econometrics of Price Determination*, (Washington D.C.: Federal Reserve Board, 1972); G. Fromm and L.R. Klein, "A Comparison of Eleven Econometric Models of the United States," *American Economic Review*, (May, 1973).

[8]J.L. Carr and J.A. Sawyer, "The Balance of International Payments and the Foreign Exchange Rate in TRACE Mark IIIR," University of Toronto, August 1973, memo. See also the paper by John Helliwell in this volume.

result of devaluation. The German results produced the pessimistic conclusions that unilateral up-valuations would reduce their trade surplus in the very short run, but in a few years time the surplus would re-appear unless some compensatory fiscal or other stimulative policy were pursued to maintain domestic activity at a level that would be conducive to strong import demand. Revaluation, therefore, would be stabilizing for the world economy provided it was accompanied by complementary domestic policy.

In the case of Japan, 10 percent ¥ up-valuation with ¥ 90 billion additional public expenditure almost doubles the simulated drop in the current account balance, adds 300 basis points to the real growth rate and 100 basis points to the rate of rise in real wage rates. In a sense, what appears to be good for the nation is also good for the world. These Japanese simulations of 1970 and early 1971 did not foresee the enormous inflation that is associated with the present decline in the Japanese real growth rate, but this is because extremely high import prices for oil and other basic materials were not introduced at that time into the Japanese model solution.

International Economic Stability — The Multi-Country Case

The analysis takes on a new dimension if we consider the inter-relatedness of national economies in the world system. The two-country analysis formulated many years ago by Lloyd Metzler provides an indicative starting point.[9] This again proceeds by the simple mathematics of multiplier analysis. Let there be two (look-alike) economies (one country and the rest-of-the-world, e.g.):

$$Y_1 = d_1(1 - t_1)Y_1 + G_1 + e_1Y_2 - e_2Y_1$$

$$Y_2 = d_2(1 - t_2)Y_2 + G_2 + e_2Y_1 - e_1Y_2$$

Following the Metzler model, we assume that one's exports depend on two's output level and that one's imports depend on its own output level. Corresponding switches are introduced in the relations for two's exports and imports.

The world economy reduced forms are

$$Y_1 = \frac{1}{1 - d_1(1 - t_1) + e_2 - \dfrac{e_1e_2}{1 - d_2(1 - t_2) + e_1}} \left[G_1 + \frac{e_1}{1 - d_2(1 - t_2) + e_1} G_2 \right]$$

[9]Lloyd Metzler, "Underemployment Equilibrium in International Trade," *Econometrica* X (1942):97-112. Graphical results for the two-country case are worked out in a highly informative way by Romney Robinson, "A Graphical Analysis of the Foreign Trade Multiplier," *Economic Journal*, LXII (Sept., 1952): 546-64.

$$Y_2 = \frac{1}{1 - d_2(1 - t_2) + e_1 - \dfrac{e_1 e_2}{1 - d_1(1 - t_1) + e_2}} \left[G_2 + \frac{e_2}{1 - d_1(1 - t_1) + e_2} G_1 \right]$$

Looking at country one by itself with a change in G_1 alone, we see that the multiplier has been increased over the single country analysis by the subtraction of

$$\frac{e_1 e_2}{1 - d_2(1 - t_2) + e_1}$$

in the denominator, again assuming that all values satisfy standard stability conditions. The increment to the multiplier depends positively on one's marginal propensity to export (two's marginal propensity to import), and on two's ordinary multiplier. Essentially, the added term offsets the dampening effect of one's marginal propensity to import by having

$$e_2\left(1 - \frac{e_1}{1 - d_2(1 - t_2) + e_1}\right)$$

in place of

$$e_2$$

alone, that would be used in the single country analysis.

In addition, the *multiplicand* as well as the *multiplier* can be a reinforcing factor in the multi-country case. If two's public expenditure changes in the same direction as one's, the *multiplicand* changes from

$$dG_1$$

to

$$dG_1 + \frac{e_1}{1 - d_2(1 - t_2) + e_1} dG_2$$

Of course it would be possible for countries to offset one another in the sense that negative values for dG_2 could reduce the positive multiplicand contribution of dG_1.

In the simple single country case, we analyze a domestic multiplier for dG by assuming that exports are fixed ($dE = 0$). This cannot be assumed to be the case in the multi-country case because exports are undergoing

induced change and thus affect the multiplier; in addition policy changes in other countries can affect the size of the multiplicand. There is no basis for assuming that one country acts alone.

It is evident that the two country models can be extended, without price effects, readily to a general n-country analysis, but few qualitative results would be affected. The introduction of prices turns the simple problem into a more complicated one; therefore, we shall rely on LINK simulations in the next section to study these effects.

In the business cycle history of the period since World War II, we may make the following rough chronicle:

1950-60 In the early part of the decade, there was reconstruction and recovery on a general upward trend in most countries except North America. There was a post-Korean recession in the United States. In 1957-58, there was a synchronized recession throughout the world — the United States, Canada Europe, Japan.

1960-70 There were nonsynchronized recessions,

United States	1960-61,1969-70
Italy	1963-64,1969
France	1963,1968
Germany	1963,1967
United Kingdom	1962
Japan	1962,1964-65

1970- After the U.S. recession of 1969-70, there was a delayed recession in Europe and Japan 1971-72. In 1973-74 there was a synchronized recession in the United States and Europe, aggravated by the energy crisis.

As any traffic manager knows, staggered office hours for opening and closing times are conducive to a smoother flow than is the case with completely uniform hours. The latter tends to cause jams. This is like the effect of business cycle crises brought about by common reinforcing fiscal policies. Offsetting policies ought to be properly coordinated to help to smooth the flow of traffic.

Associated with the usual assumption that export volume or factors determining export volume, such as world trade and production, is exogenous to the single economy, is the assumption that world prices are also external. Import prices or competing export prices are assumed to be given to the national economy. The effect of these prices on domestic inflation is well recognized, but the feed-back effect of countries' own inflation on world prices is usually not taken into account. If two-country or multi-country models are constructed with real trade flows and prices as separate variables, they become so complicated that simple analytical study does not appear to be feasible. We shall study the effects in the next

section of world inflationary pressures in numerical simulation exercise. At this time, we simply note, in a general way, some aspects of inflation for the single country and the world.

A typical equation for a country model expresses price in a mark-up relation with unit costs — unit wage costs. In some industries unit capital cost is equally important, and in others unit material costs should be entered. For countries importing capital goods, import costs will be expressed through unit capital costs. For countries importing materials, inflation transmittal will occur through a mark-up on unit material costs. The only special note to make in this instance is that the dependent price variable should not be a value-added price, such as the price of GNP (GDP); it should be a gross output price such as a wholesale price index or a deflator of total domestic spending, measured as GNP plus imports.[10] But just as domestic activity can affect trade and thereby world trade with an induced feedback effect, so can domestic inflation affect world price level and an induced feedback on the domestic inflation rate.

World inflation has been a fact of life since World War II, sometimes stronger than at other times and rarely moving in reverse, except during the simultaneous business cycle downturn of 1957-58 when basic material prices fell. The latest round of world inflation received something of a step upwards in the mid-60s when heavy U.S. purchases for Vietnam stimulated many commodity booms. General world expansion contributed to strong overall demand, but large Soviet-Sino grain purchases intensified increases in food prices in 1972. This inflated import costs in a large part of the world, including the major exporting country, the United States. An unusual jolt was added by the October (1973) War in the Middle East and the related increases in oil prices. Prices of food, fuel, and other basic commodities in the import bills of several nations have risen on an inflationary path in the latest world round. It will be an objective of the LINK analysis that follows to analyze the world inflation problem as well as world fluctuations in real output.

Some LINK Results

By analytical methods, we have seen how and why a single country's response is different from a system's response, where many countries are linked multilaterally in the system. These points can be illustrated on a larger scale by comparing national solutions for models in Project LINK with the fully linked system solution for these same countries. These are known as pre- and post-linkage simulations.[11] In pre-linkage calculations,

[10]The price index of gross domestic spending is often used in the Dutch Model, where imports comprise a large fraction of total spending. For the relevant model calculus on this point, see the paper by B.G. Hickman in this volume.

[11]See R. J. Ball, ed., *International Linkage of National Economic Models*, (Amsterdam: North-Holland, 1973). A compact statement of the present form of the model is given by K. Johnson and L. Klein, "LINK Model Simulations of International Trade: An Evaluation of the Effects of Currency Realignment," *Journal of Finance, Papers and Proceedings*, XXIX (May, 1974):617-30.

Table 1

Effects of Linkage 1973

	Real Exports			Import Price Index			Real GDP (GNP)		
	Pre-linkage	Post-Jan. rates	Post-73 rates	Pre-linkage	Post-Jan. rates	Post-73 rates	Pre-linkage	Post-Jan. rates	Post-73 rates
Australia	$59x10^8$ $A	63	61	105	112	109	311	316	313
Austria	$128x10^9$ AS	134	124	132	136	129	357	364	353
Belgium	$548x10^9$ BF	568	561	133	140	134	1074	1087	1079
Canada	$238x10^8$ $C	209	214	124	132	134	749	742	753
France	$116x10^9$ F	118	115	130	140	134	631	627	628
Germany	$190x10^9$ DM	208	184	88	95	88	621	623	618
Italy	$132x10^{11}$ L	134	135	128	131	135	486	490	493
Japan	$110x10^{11}$ ¥	101	98	136	120	114	741	728	722
The Netherlands	$52x10^{12}$ DFL	52	52	120	122	117	92	91	92
Sweden	$334x10^{11}$ SK	341	331	—	—	—	1076	1081	1072
United Kingdom	$103x10^{11}$ £	101	101	88	90	89	366	364	364
United States	$63x10^{12}$ $US	63	66	143	148	152	834	834	839

Pre-linkage results determined by national model builders at various times during 1973.
Post-linkage results — January rates, computed using $ exchange rates effective January, 1973.
Post-linkage results — 73 rates, computed using average of monthly $ exchange rates prevailing during 1973.

each specialist model builder solves his own system in advance on the basis of his expert judgment about domestic input values and his personal appraisal of the world economy. These national solutions are assembled with all input values set by the national model builders except those relating to world trade and prices; these are endogenously generated by the algorithm solving the LINK system. In particular, exports (or world trade), import prices, and competing export prices are assumed given at particular values as inputs for solution of each national model. Assumed values for these variables are used only in a starting iteration of the LINK solution, and generated values are developed on successive iterations. A general result of such calculations in today's environment is that the linkage process induces higher inflation rates and lower export values for most countries than are assumed for separate national calculations. In the process of scaling down trade or scaling up inflation rates, the multiplier effects of simultaneous movement in the same direction among countries gets amplified. Before we look at amplification, let us look at the effects of the linkage.

In Table 1, there are summary results for selected countries before and after the linkage algorithm is used for simulating 1973. Pre-linkage results are individual country projections provided by each model builder without having been put through the LINK system calculation. These results came to the central LINK files at different times during 1973; they do not, therefore, represent a given set of exchange rates. This reduces the overall meaning of the intended comparison, but the results are, nevertheless, strongly indicative of the effects being discussed. Results are shown only for those countries submitting independently considered projections. We have to make our own initial assumptions for all other models in LINK in order to start the iterative solution algorithm, but our assumed values would not show anything interesting about the effects of linkage.

In order to study exchange rate changes, we made a "control" solution, assuming that January, 1973, exchange rates (U.S. cents per unit of foreign currency) would be in effect for the whole year. This solution provides the entries for the second set of columns: Post-linkage — January rates. Finally, actual rates were averaged by months over the year. This gives rise to the solution, Post-linkage — 1973 rates. For the present analysis, this is an ex-post calculation. Solutions like this were being made on different occasions during 1973, and estimated rates had to be used ex-ante. Similar calculations for 1974 and 1975 used estimated rates. It was assumed that exchange rate changes of 1973 would be "passed through" to foreign trade prices by two-thirds of the amount of the rate change.

The strongest result in Table 1 is that import prices are higher for most countries listed in one or both of the linked solutions than in the individual country, unlinked solution. The principal exception to this general rule is Japan, where yen prices of imports fall markedly. In this inflationary environment linkage induced some inflation. In a strongly

Table 2

Effects of Linkage 1975

	Real Exports		Import Price Index		Real GDP (GNP)	
	Pre-linkage	Post-end 73 rates	Pre-linkage	Post-end 73 rates	Pre-linkage	Post-end 73 rates
Australia	66	71	111	119	316	324
Austria	153	134	144	140	418	388
Belgium	647	649	142	143	1174	1170
Canada	293	252	130	146	867	856
France	140	123	135	143	694	675
Germany	243	181	69	83	695	650
Italy	152	147	136	153	525	531
Japan	129	115	174	120	851	889
The Netherlands	55	58	128	121	94	98
Sweden	388	387	—	—	1159	1159
United Kingdom	118	111	116	124	385	374
United States	74	85	155	169	864	885

Post-linkage results — end 73 rates are computed using November 1973 rates for 1974-75.

deflationary environment, it may well work the other way. It indicates that when prices are going up all round, individual model builders may fail to take account of the full impact of inflation, though this need not be the case, and the LINK method of world simulation will catch the added inflationary impact. It is not that linkage is, in itself, an inflationary process. It is just a way of taking account of fuller international effects of inflation and making sure that a world market environment will be represented in each model even if the initial single country simulations fail to reflect it properly.

LINK solution exports will generally be different from individual country export assumptions based on separate appraisals of world economic prospects. Less striking than the underestimate of inflation is the tendency to overestimate exports. More often than not the post-linkage exports with 1973 exchange rates are smaller than those used in the pre-LINK solution. When linked exports are lower than assumed exports GDP tends to be lower and vice versa if the linkage process raises export volume above the assumed values used in individual model solution.

One impression to be obtained from Table 1 is that the LINK system calculation modifies values for each country within a year's time, but not very much. GDP change, as a result of linkage alone, is usually not as large as 1.0 percent in Table 1.

By 1975, in a three-year simulation, the approximate effects of linkage are much larger. In Table 2, we compare the pre-linkage solution with post-linkage using 1973 rates. In this tabulation we omit the Control solution with January 1973 rates because these rates are strongly outdated, as of 1975. The rates used for the post-linkage simulations in 1975 are the rates in effect during November 1973 but with an assumed full (3/3) pass-through of exchange rate changes to export prices.

In comparison with Table 1, we see that differences between pre-linkage and fully linked solutions build up to much larger amounts over a three-year period. Not all the differences are larger but many are. Instead of saying that usual difference in GNP is less than 1.0 percent as in Table 1, it becomes as large as 3 percent or more, frequently in Table 2. The import price differences are much larger in Table 2 than in Table 1, but the full effects of oil shortages, high oil prices, and high prices for other basic materials are not strongly built into these linked solutions. There is an allowance for the oil price rise that occurred in 1973, but the 1975 price implicit in the linked solution does not reflect the effective tripling of this price expected in a year-over-year comparison of 1974 or 1975 and 1973. A solution that contains higher (more realistic) oil and basic material prices will be presented in a later table that tries to interpret the "oil crisis."

At this date, the entire LINK system has not been simulated for periods as long as 5-10 years. In principle, it can be extrapolated for an indefinite period as long as input values are provided, but such a large amount of input information is required that it is no easy task to make longer-run

simulations. At this stage we can only conclude that there is a tendency for buildup of discrepancy between unlinked and linked simulations.

Given that linkage has some effect, although moderate, on the functioning of the world economy, what can we learn about international stability from linked results of estimated effects of major disturbances? The first disturbance that we shall study is the series of currency rate changes that took place in early 1973 as a sequel to the Smithsonian rates of December 1971. On many occasions, the LINK system was used to try to interpret the U.S. New Economic Policy of August 15, 1971, and the Smithsonian exchange rate realignment. The statistical equation system has changed so much, by a process of evolution, since that period, that we shall not concern ourselves here with 1971-72 simulations, but will start with 1973 and the present version of LINK.[12]

Lacking a complete set of balance-of-payments equations for each LINK model, this system is now only an international trade system that can be solved for given exchange rates. The solutions for different exchange rate configurations 1973-75 will be studied in two parts. The first will be a static comparison for 1973 under two separate assumptions for exchange rates:

(i) The rates of January 1973 are assumed to prevail for the whole year.

(ii) The rates are average for the different months of 1973 and assumed to be passed through by a factor of two-thirds.

The only difference between these two solutions will be an assumed change in exchange rates. All other input values for 1973 are left unchanged.

The second analysis will be dynamic, tracing the effects of the exchange rate changes through time, 1973-75, under the assumption that the pass-through is two-thirds in 1973-74 and three-thirds in 1975.

In Table 1, we can already see some of the static (one-year) effects on GDP, exports, and import prices by looking at the second and third columns tabulated for each variable. The usual pattern is for exports to be reduced for upvaluing countries and to be increased for devaluing countries. Generally speaking, higher exports stimulate higher growth. These comparisons do not indicate whether growth will be present or absent or whether it will be absolutely strong or weak for any country; it shows simply whether the exchange rate change will induce a *different* growth rate for exports or production. According to Table 1, the exchange rate changes would restrain Japanese and German real GDP by somewhat less than 1 percent and add a slightly smaller percentage amount to the U.S.

[12]For some retrospective interpretations of former LINK solutions for 1971-72 see L.R. Klein, "Five-Year Experience of Linking National Econometric Models and of Forecasting International Trade," International Colloquium, Namur, January 31 — February 1, 1974.

Table 3

Inflation and Exchange Rates

	January Rates		Average Rates 1973	
	Exchange	Price Index	Exchange	Price Index
Australia	1.27160	144.3	1.35740	145.0
Austria	.04320	154.7	.04992	153.0
Belgium	.02266	163.1	.02524	161.3
Canada	1.00710	150.6	.99990	151.1
France	.19671	160.9	.21864	157.6
Germany	.31288	150.9	.36145	148.1
Italy	.00171	162.4	.00172	162.4
Japan	.00331	151.1	.00359	151.3
The Netherlands	.31084	180.4	.34454	174.3
Sweden	.21092	—	.22671	—
United Kingdom	2.35620	168.3	2.44487	168.3
United States	1.00000	153.9	1.00000	154.0

level. Canada, which is strongly tied to the U.S. economy would be expected to put on more GDP (in percentage terms) than the United States. Similarly, Austria, which is closely associated with Germany, would lose more in percentage terms than the latter. Most of the GDP changes are small. Australia does not show a strong sympathetic movement with Japan. Import price changes between the two solutions are estimated to be positive for the United States, Canada, and Italy. They are put at negative values for the other countries in Table 1. The changes in import prices as a result of the revaluation, with the assumed rates of pass-through, work their way through to final prices. Estimates of the GDP deflators for the two solutions, together with exchange rate values for each case are shown in Table 3. Mostly, the upvaluing countries show a lower domestic price level, and the devaluing countries a higher domestic price level, but the U.S. change, for a devaluing country, is almost negligible.

Oddly enough, inflation was more serious in many of the upvaluing countries than in the United States, but the LINK calculations in Table 3 suggest that the inflation rates in Western Europe would have been even worse if it had not been for the devaluation.

A calculation for the whole world economy covering the developing countries, the CMEA countries, and the rest of the developed world has been made for the change in trade balances associated with revaluation. To do this wider calculation, we valued each country's trade flows in U.S. dollars and constructed models (structural and reduced form) for each of these areas in U.S. dollar units.

The largest single anticipated gainer from the 1973 revaluation turns out to be the United States in this calculation and this is actually an understatement. The U.S. improvement is at the simulated expense of France, Germany and a variety of other compensatory changes. The widespread distribution of adjustment is favourable for the preservation of stability in the face of exchange rate changes, for the 1973 changes were of significant magnitude.

Ever since the imposition of the Smithsonian rate structure, LINK model simulations have been showing that dollar devaluation, to reduce imbalances like those with Germany and Japan, tended to reduce the estimated volume of world trade and this result holds for the 1973 calculations of the effect of the second wave of revaluations. The value of non-socialist world exports in 1963 prices is estimated to be reduced by $1-2 billion as a result of the revaluations. The reason for the drop is that the effect of the change is to shift world activity away from some of the faster growing (in output and trade) areas to somewhat slower areas. This brings about an overall reduction in real world demand. It does not mean that world demand is expected to fall on a year-to-year basis; it means that the growth path is lowered at the point of revaluation. This, however, is only a short-run effect because after three years (see below) the simulated LINK growth path under revaluation shows a full recovery to the path that was estimated to have prevailed under old exchange rates.

Table 4

Estimated Change in Trade Balances, 1973 Exchange Rate Changes

(trade balance with 1973 rates less that estimated with January, 1973 rates)

Australia	0.19
Austria	-0.17
Belgium	-0.23
Canada	0.17
France	-0.64
Germany	-0.89
Italy	0.17
Japan	0.29
The Netherlands	0.46
Sweden	-0.03
United Kingdom	0.52
United States	1.66
Africa	-0.12
Asia	0.05
Middle East	-0.27
Latin America	-0.40
Denmark	-0.08
Finland	-0.01
Greece	-0.08
Iceland	0.00
Ireland	-0.01
New Zealand	0.02
Norway	0.00
Portugal	-0.10
South Africa	-0.07
Spain	-0.09
Switzerland	-0.16
Turkey	-0.04
Yugoslavia	-0.04
CMEA[1]	0.08
ROW[2]	-0.19

[1]CMEA is the Council for Mutual Economic Assistance which includes

Bulgaria
Cuba
Czechoslavakia
German Democratic Republic
Hungary
Mongolian Peoples Republic
Poland
Romania
USSR

[2]ROW is the rest of the world.

The exchange rate changes introduced in 1973 were in effect for only part of the year, and there were changes within the year. When we look at 1974 and 1973 together, we see that there is further adjustment in a year-over-year comparison if the rates prevailing at the end of 1973 are continued throughout 1974 at a two-thirds pass-through level. We have assumed a further change by virtue of a full three-thirds pass-through by 1975. Another way of studying stability is to look at the change in the simulation over a three-year span. This particular time interval was never thought to be an ordinary one even before the serious disturbances associated with the oil crisis and longer-run energy problems became apparent. There was an expected slowdown in growth during 1974 to fight the strong inflationary pressures that set in during 1973. An interesting aspect of this expected growth slowdown was that several countries lined up together for a simultaneous slowdown. In 1969-70 the United States experienced a recession first; then a year or more later there was a transmission in the form of reduced growth rates. The point of interest in 1974 has been a convergence of slow growth rates among many leading industrial countries.

As a projection, the three-year movement under the impetus of exchange revaluation looks quite stable. There is a projected slowdown for 1974, not categorized as a recession but possibly as a "growth recession" and a mild recovery in 1975. There is comparatively little evidence of expected cooling of inflation, except in the United States and Japan.

Trade balance effects of the revaluation simulation over three years are shown for all countries including those for which we have area models or simple reduced form models.

Without a sudden rise in the price of oil, it already appeared that the Middle East producers were on the path towards accumulation of an unusually large trade surplus. This amount is so large that it appears to be unsustainable in a stable trading world. There is some indicated progress in the adjustment of the German surplus, but not much in the Japanese surplus. In fact, the Japanese surplus fell drastically in 1973 but shows indication of recovering some in 1974. The seriousness of the U.K. deficit and its failure to improve is another omen of instability in this exchange rate configuration. To a lesser extent this is also the case for Italy. The chronic persistent deficits for Latin America and Asia are not as destabilizing because these countries have traditionally had to cover negative merchandise balances with services and capital flows. We are much less confident about the results for individual countries obtained from reduced-form trade models, but the estimated deterioration of the Spanish balance is possibly a sign of economic weakness.

The serious deterioration in the external position of the United Kingdom after a good performance in 1972 was attributed to high import costs for materials in 1973. An expected decline in world commodity prices has not yet occurred in 1974. In addition domestic economic difficulties further impeded growth in production and exports. The precarious position

of the United Kingdom with compounded world energy difficulties in early 1974, did not spread to its trading partners in large degree. Domestic instability did not become a major source of international instability.

The energy problem was already foreshadowed in what turns out retrospectively to have been moderate price increases for crude petroleum and very large trade surpluses in primary producing areas. But the oil crisis came as a major disturbance to the world economy, with price tripling and supply reduction. These events are additive to the general policy-induced-slowdowns that we could observe in 1974 simulations. The modest recoveries projected for 1975 rounded out the picture. Although the oil crisis never held in its most extreme form, it was enough of a disturbance, especially with the higher prices that do seem to show signs of holding at levels well above early 1973 crude oil prices, that its analysis should tell us something informative about world economic stability. Does the slowdown brought about by simultaneous coordination of anti-inflation policies become a genuine world recession under the impact of this large disturbance? This is a question of some interest to investigate with the LINK system in a hypothetical simulation of the oil crisis, assuming that embargoes and price increases would be strictly adhered to.

During the height of the oil crisis (November-December, 1973), the main troublesome point of interpretation was how to incorporate supply restrictions in demand-oriented models? That is an interesting question in itself and will not be taken up in detail at this time, but a specific technique for approximating an answer to this question was worked out and led to some interesting LINK simulations that have a bearing on world stability.[13]

The initial reactions of most LINK model proprietors were that the restrictions and shortfalls being discussed in October and November, 1973, would reduce real growth rates, in some cases by direct limitation and in others by indirect effect on close partner countries. The level of information was unusually sparse and sometimes mysterious; nevertheless a similar reaction came from most countries in Western Europe, United Kingdom, Japan, Canada and United States. A significant common difficulty was the question of treating a supply problem in a demand-oriented system. Decreases of imports of oil coupled with domestic restraints on final consumption were, in many cases, offsetting adjustments in the identity of most demand models.

$$GDP = C + I + G + E - M$$

The offsetting changes were to reductions in both C and M. The key to obtaining a net impact as a result of supply limitation is through negative changes in inventory investment, a component of I. This makes sense because inventory change is the difference between supply and demand. If

[13]See L. R. Klein, "Supply Constraints in Demand Oriented Systems: An Interpretation of the Oil Crisis," *Zeitschrift fur Nationalökonomie* 34 (1974): 45-46.

Table 5

Estimated Dynamic Effects of Exchange Rate Changes, 1973-75

(% changes)

	GDP			Inflation			Real Exports			Real Imports			Effective Exchange Rates ($/foreign currency)		
	1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975
Australia	7.3	3.5	-0.1	10.9	7.2	7.2	5.8	9.0	7.3	20.3	7.0	0.0	1.35740	1.37053	1.42000
Austria	4.9	6.7	2.9	9.1	9.1	7.8	8.6	4.3	3.3	16.0	10.7	2.2	0.04992	0.05353	0.05870
Belgium	5.1	3.6	4.7	5.8	5.9	5.6	9.8	7.3	7.7	7.6	8.5	7.0	0.02524	0.02630	0.02812
Canada	6.6	6.2	7.0	5.1	5.2	5.3	11.5	8.1	9.1	12.9	6.2	8.0	0.99990	0.99950	0.99890
France	4.6	3.9	3.5	6.1	6.6	6.4	9.8	4.0	3.5	10.1	6.8	6.2	0.21864	0.22784	0.24340
Germany	6.3	2.4	2.6	5.4	6.9	5.8	8.2	0.1	-2.0	15.0	8.6	9.0	0.36145	0.38865	0.42640
Italy	6.0	3.3	4.2	10.0	6.6	7.7	9.1	3.8	4.5	8.6	5.5	5.7	0.00172	0.00173	0.00174
Japan	10.5	8.3	13.6	9.5	7.4	4.3	3.4	10.8	5.9	27.0	6.4	11.3	0.00359	0.00363	0.00379
The Netherlands	4.1	4.7	1.9	8.1	5.0	6.9	9.5	6.5	4.2	8.0	6.5	7.7	0.34454	0.36186	0.38710
Sweden	4.9	4.3	3.7	—	—	—	8.8	8.6	7.6	4.6	6.0	5.4	0.22671	0.23544	0.24770
United Kingdom	6.9	1.7	1.1	7.3	9.2	7.2	9.8	4.3	5.0	10.0	3.7	4.2	2.44487	2.45987	2.51170
United States	6.5	1.3	4.1	5.5	4.9	3.3	9.9	11.2	15.5	7.3	5.7	6.8	1.00000	1.00000	1.00000

Table 6

Merchandise Trade Balances for Exchange Rate Changes, 1973-75
(billions of U. S. dollars)

	1973	1974	1975
Australia	0.69	0.68	1.42
Austria	-2.13	-2.99	-3.21
Belgium	1.07	0.61	0.30
Canada	1.53	2.14	3.28
France	1.03	0.41	-0.18
Germany	12.17	11.36	9.51
Italy	-1.21	-1.09	-0.75
Japan	5.52	6.41	6.11
The Netherlands	-0.97	-1.26	-2.00
Sweden	1.13	1.37	1.78
United Kingdom	-4.79	-4.96	-4.41
United States	-2.36	0.38	3.03
Africa	0.70	-0.22	0.25
Asia	-7.43	-7.47	-7.53
Middle East	12.81	14.79	16.77
Latin America	-7.03	-6.14	-6.00
Denmark	-0.82	-1.33	-1.81
Finland	-0.08	-0.12	-0.17
Greece	-1.67	-2.13	-2.66
Iceland	-0.02	-0.04	-0.06
Ireland	-0.49	-0.73	-0.96
New Zealand	0.53	0.40	0.32
Norway	-0.94	-1.33	-1.67
Portugal	-0.73	-0.96	-1.24
South Africa	-1.24	-1.71	-2.20
Spain	-2.98	-3.87	-4.81
Switzerland	-0.98	-0.92	-0.76
Turkey	-0.62	-0.81	-1.01
Yugoslavia	-1.02	-1.58	-2.20
CMEA	0.38	0.52	0.69
ROW	-0.06	0.59	0.19

The major target of the 1973 revaluation was the U.S. $, and the American trade balance does respond strongly to this second wave of devaluation, added to the Smithsonian changes of 1971-1972. The balance figure for 1973 is a distinct improvement over 1972, the disastrous year that stimulated a second wave of $ devaluation, but not as large in simulation as actually occurred. The whole set of calculations in Table 6 should be considered more for the year-to-year movement than for the realism of any one year. This is particularly so because the simulation values of Table 6 do not use contemporary values for oil prices. It is interesting to note that Canada improves right along with the United States in the three-year simulation.

supply is to be restricted, it should show up as an inventory decrease — not an actual decrease, but decrease below the levels that would be implied by the normal working of an inventory equation. In any event, an inventory decrease will bring the required net effect after taking account of offsetting movements between C and M.

A full interpretation of the oil crisis would require other changes. Import prices must be raised; specific types of consumption must be reduced; consumer purchases of complementary items should undergo temporary structural shifts (cars, travel); compensatory monetary and fiscal policies must be introduced; etc.

We noticed that almost all LINK model proprietors were estimating that their growth rates in GDP would be reduced by 100-200 basis points as a result of the crisis. The base rates were the 1974 values in the GDP group of columns in Table 5. Some unusual cases outside this general range were Japan and the Netherlands, the former because of an unusual dependence on Persian Gulf crude and the latter because of being an outstanding target for the embargo.

We posed the following hypothetical question: What would happen to world trade and activity levels in individual countries if there were a synchronized decline in real GDP in each of the major industrial countries? Accordingly, we lowered the inventory equation or made similar adjustment in each LINK model by an amount that would lower its 1974 growth rate by 100 basis points. These calculations were all done as separate unlinked simulations, country-by-country. Trial and error methods were used until each country model came down in its *unlinked* simulated growth rate for 1974 by the given amount. It was essentially a process of finding the appropriate multiplier for each model.

The interesting result for the world economy is that most growth rates fell in a fully linked solution by a larger amount than in the unlinked simulation. An interesting way to look at the results in Table 7 is to compare the two pre-linkage solutions first. By design the shocked solutions are approximately 100 basis points lower than the original solution before the shocks are applied. In some cases the drop is only 80 basis points, and some times it reaches 110, but the differences are always close to 100 points except for the Netherlands where the model was not responding to the impulse and Australia, where we introduced no changes. Similarly, we can compare the two linked solutions and notice that they fell by (absolute) amounts that are approximately 1 1/2 times as large as the fall in the pre-linkage solutions. We tentatively conclude that international linkage introduces an amplification factor of 50 percent if there is complete synchronization. To many people, this kind of calculation indicated great stability in the world economy. A moderate synchronized movement, assuming that 100 basis points was reasonably indicative of the realistic situation in the world economy, did not develop in the short run into a world recession. The linked simulation reduced growth rates but did not make any of them negative.

Table 7

Effects of Synchronized Declines in Real Growth Rate
(% change)

	Pre-Linkage		Post-Linkage	
	Before Shock	After Shock	Before Shock	After Shock
Australia	3.7	3.7	3.5	3.2
Austria	9.0	8.2	6.7	5.5
Belgium	4.1	3.3	3.6	2.2
Canada	8.1	7.1	6.2	4.8
France	5.1	4.0	3.9	2.5
Germany	6.7	5.9	2.4	1.3
Italy	3.8	2.9	3.3	1.8
Japan	5.6	4.7	8.3	7.1
The Netherlands	3.8	4.2	4.7	4.4
Sweden	4.7	3.7	4.3	2.6
United Kingdom	3.4	2.4	1.7	0.3
United States	0.7	-0.1	1.3	0.1

Table 8

Effects of Synchronized Declines in Trade
(% change)

	Pre-Linkage				Post-Linkage			
	Before Shock		After Shock		Before Shock		After Shock	
	Real Exports	Real Imports	Real Exports	Real Imports	Real Exports	Real Imports	Real Exports	Real Imports
Australia	11.6	8.6	11.6	8.6	9.0	7.0	7.8	6.9
Austria	9.5	14.3	9.5	12.4	4.3	10.7	3.1	8.3
Belgium	9.1	10.0	9.1	8.9	7.3	8.5	4.9	5.7
Canada	14.0	12.0	14.2	10.3	8.1	6.2	7.0	3.8
France	9.4	9.7	9.4	7.6	4.0	6.8	2.5	4.0
Germany	13.1	20.9	13.0	18.8	0.1	8.6	-1.4	6.0
Italy	7.2	6.1	7.2	5.1	3.8	5.5	1.9	3.8
Japan	6.2	4.4	6.2	3.6	10.8	6.4	9.7	5.4
The Netherlands	5.9	6.4	6.1	4.2	6.5	6.5	4.8	2.8
Sweden	10.6	6.5	10.6	6.5	8.6	6.0	6.5	3.4
United Kingdom	8.3	6.1	8.3	5.0	4.3	3.7	2.9	2.1
United States	7.8	6.4	7.7	5.7	11.2	5.7	8.9	4.9

This is a *real* calculation. There were induced effects on prices but no disturbed price changes for direct increases in oil prices. There were no direct monetary or fiscal changes. It is a calculation that shows something about international stability but was not intended to be a realistic interpretation of the actual crisis.

Every part of the world economy is not shocked in the simulations for Table 7. No changes were made for Australia, developing countries, CMEA countries, or the rest of the developed world (except for import changes in simple reduced form models for Portugal and South Africa). These varied and selected changes, though hypothetical, reflected the overall pattern of the oil cutbacks imposed by the Arab nations.

Although no changes are introduced in the Australian model, it shows the consequence of secondary effects. The Middle East model for developing countries shows a lower growth rate between the two linked solutions because it has sharply lower real exports as a result of the oil cutbacks. This is not indicative of export earnings, only export volume.

The slowing down of the main economies of the world, apart from effects of oil cutbacks, is apparent in the projected growth rate for real world trade (non-socialist) of only 6.0 percent. A notable result of the multiplier calculation demonstrated here is to reduce this estimated growth rate to 4.4 percent; herein lies the main source of the amplification factor because exports depend on world trade. In Table 8 the growth rates of real exports and imports for each country show that without linkage a decline in growth can be brought about by simulation with almost every major country remaining nearly steady in its export trade position. Imports are generally lower because of the induced decline in real growth. The discrepancies between the movements of exports and imports are naturally not taken into account in the pre-linked national model solutions. The linkage of these solutions induced a set of downward trade adjustments that intensify the decline in real output, country-by-country, but not to the point of world recession in this particular simulation.

The primary (imposed) and secondary (induced) effects of this international multiplier-type calculation are large enough to show up as changes in real output and trade growth rates, as indicated in Tables 7-8; moreover, the changes are realistic in magnitude, yet there are not clearly discernible changes in other variables (interest rates, prices, unemployment rates) as a result of the small changes involved. This is, in a sense, an indication of international stability inherent in the LINK system.

The principal thing that is missing from these calculations, as far as the transmission effects of the oil crisis are concerned, is the price effect, manifesting itself as a world inflationary movement caused by sharply higher fuel prices.

We have undertaken a more realistic analysis of the oil crisis with LINK, incorporating these higher fuel prices. This analysis, is mainly a complicated and technical forecast exercise. More suitable for the comparative simulation and stability analysis stressed in this paper is the

Table 9

Effects of Price Increase of Developing Nations' Exports

		%ΔGNP	%ΔPGNP	%ΔPC	%ΔX	%ΔPX	%ΔM	%ΔPM	ΔBAL
Australia	1974	+2.0%	-1.1%	-0.3%	+5.7%	0.0%	+0.1%	+4.5%	+0.24
	1975	+3.6	-2.0	-0.8	+6.6	0.0	+1.5	+5.1	+0.08
Austria	1974	+1.2	+0.4	NA	+2.2	+0.2	+1.4	+1.9	-0.06
	1975	+1.7	+0.3	NA	+2.5	+0.2	+3.0	+2.1	-0.28
Belgium	1974	+0.1	+0.9	NA	-0.9	+4.9	-0.2	+4.4	+0.24
	1975	-0.4	+1.4	NA	-1.6	+5.2	-0.9	+4.4	+0.41
Canada	1974	+1.2	+1.3	+1.6	+3.9	+0.9	+1.3	+1.3	+0.87
	1975	+0.7	+2.7	+2.8	+3.8	+0.9	+1.5	+1.5	+1.29
Finland	1974	+2.2	+0.2	NA	+4.6	+0.2	+2.3	+2.8	+0.01
	1975	+4.2	+1.2	NA	+4.8	+0.2	+4.5	+3.6	-0.12
France	1974	-1.0	+2.6	+3.3	-0.3	+3.8	-1.7	+5.8	-0.18
	1975	-1.5	+3.7	+3.5	-0.5	+3.8	-2.8	+6.0	+0.16
Germany	1974	-0.4	+0.3	NA	+3.9	+0.1	-1.3	+6.0	-0.19
	1975	+0.4	+0.7	NA	+4.0	+0.2	-3.3	+6.2	+0.86
Italy	1974	-0.7	0.0	-0.2	-1.6	+5.7	+0.1	+9.0	-1.91
	1975	-0.8	-0.3	-0.3	-3.4	+6.8	-0.8	+9.1	-2.05
Japan	1974	-0.1	+0.1	+1.0	+0.5	+2.2	-1.7	+9.5	-1.67
	1975	-1.2	+2.0	+1.9	-1.2	+4.1	-2.3	+9.6	-1.36
The Netherlands	1974	-1.7	+4.6	NA	-0.1	+4.2	+3.7	+2.0	-0.48
	1975	-1.3	+4.9	NA	+1.0	+2.5	+3.2	+2.3	-0.68
Sweden	1974	+1.3	NA	+0.5	+4.1	+0.2	+1.1	+5.0	-0.01
	1975	+2.0	NA	+0.9	+4.1	+0.2	+2.0	+5.4	-0.19

Table 9 (cont.)

United Kingdom*	1974	0.0	0.0	+1.5	+1.7	+2.5	-0.4	+7.7	-1.27
	1975	0.0	0.0	+1.6	+1.8	+2.7	0.0	+7.9	-1.55
United States	1974	+0.5	0.0	+0.2	+5.1	+0.8	-0.2	+4.8	-0.49
	1975	+0.5	0.0	+0.3	+4.8	+0.9	+0.1	+5.7	-2.36
Developing**	1974	-1.5	+0.8	NA	-15.9	+26.0	-2.4	+5.2	+5.90
	1975	-2.0	+1.2	NA	-17.7	+28.2	-3.3	+5.8	+6.96
ROW**	1974	—	—	—	-0.1	+2.9	+0.1	+3.4	-0.73
	1975	—	—	—	-1.7	+4.9	-0.8	+4.1	-0.67
CMEA	1974	—	—	—	—	—	—	—	-0.26
	1975	—	—	—	—	—	—	—	-0.19

World Trade Statistics:

		Volume Growth	Price Inflation
SITC 0 — 4	1974	-2.0%	+11.2 %
	1975	-2.7	+11.6
SITC 5 — 9	1974	+1.2	+ 2.7
	1975	+0.8	+ 3.1
All Goods	1974	+0.1	+ 5.6
	1975	-0.4	+ 6.0

For specification of shocks and further description of entries, see text.

*Note that the U. K. output is supply constrained in 1974 and 1975 under these circumstances.

**Averages

GNP = real GNP (GDP)
PGNP = implicit deflator of GNP (GDP)
PC = consumer price index
X = real exports
PX = export price index
M = real imports
PM = import price index
BAL = FOB trade balance, US$

consideration of higher world raw materials prices, in isolation, as a companion to the preceding multiplier-type analysis. Moreover, this is just one form of world inflation. A second interesting companion to the preceding study of synchronized real shocks is a study of synchronized wage-rate shocks, an analysis which also enables us to focus on world inflation originating in domestic labor markets.

Unfortunately, it is a well recognized fact that the component models which make up LINK are better specified in terms of real demands than in terms of prices. More than half of the models fail, as yet, to incorporate endogenous monetary sectors to explain money supply and interest rates; also the monetary influences on the price level are sometimes weak or absent. As a consequence, there are not yet any linkages on the monetary or balance-of-payments accounts. Also, export price disaggregation by commodities is not yet complete, but imminent. We have, for example, three new sets of disaggregated export price equations which are not yet programmed into the model. Current research is underway in LINK on the monetary and balance-of-payments modelling/linkages as well as commodity market modelling/linkages. At this point, however, the predictive performance regarding prices, which has been poor relative to the real side, as well as the incomplete specifications on the price side, make the following calculations more tentative than the preceding.

In Table 9 may be found a comparison of two alternative LINK simulations where the distinction between the two is that one assumes substantially higher food, raw material, and fuel prices than the other. The control solution for this comparison is calculated in terms of Spring, 1974 LINK forecasts, and so already exhibits a somewhat different picture than was anticipated in November and December, 1973. Since this control is not exactly the same as the results already discussed, we hope to avoid confusion by reporting in Table 9 the differences between the "shocked" path less the control path, as a percentage of the control solution (except for the goods trade balance). It is understood, however, that response characteristics must be treated with some care in a non-linear system as they will depend on the values of the control solution.

In the control solution, the price of Middle Eastern exports — virtually all oil products — is assumed to increase 1974 over 1973 by 100 percent and further 1975 over 1974 by about 15 percent. The price of exports of other developing nations is forecast to increase 1974 over 1973 by about 30 percent and further 1975 over 1974 by slightly less than 10 percent. These other exports include some fuels (Venezuela, Nigeria, etc.) representing about 10 percent of the total in value, foodstuffs and raw materials representing about 25 percent each, and the balance manufactures. In the shocked simulation, we assume that Middle East fuel prices are increased by an incremental 100 percent in 1974 (so that the 1974 total change is 200 percent and the 1975 change 9 percent), and also we shock export prices of the other area models by an incremental 20 percent in 1974 with no further change or offset in 1975. This is, as already noted, a

hypothetical calculation; for example, no changes are introduced to the prices of non-manufactured products exported by developed economies. Nevertheless, the changes are broadly plausible and perhaps indicative of what may obtain if cartels such as the OPEC were to become widespread.

The first interesting aspect of these calculations may be seen in the effect on growth of real world trade and its price deflator. While export prices of developing countries increase by an average 26 percent, total world primary goods prices increase by 11.2 percent in 1974. Also the price of world manufactures trade increases by almost 3 percent in 1974. A small fraction (perhaps as much as 80-90 basis points) may be attributable to imposed shocks to prices of manufactured goods exported from developing areas, but the bulk of this effect arises from raw material prices feeding through to manufactured goods prices. Corresponding to this change in relative prices, we see a change in the volume of trade when distinguished by commodity. Real trade increases in manufactures and falls in primary goods. Part of this substitution may be attributable to substitution in production, but it is likely that a more important reason is a demand shift away from goods with high raw material or fuel content into products which are more labor and/or capital intensive. It may also be seen that the substitution elasticity implicit in these comparisons increases from 1974 to 1975. Disappointingly, there appears to be little lagged price impact, however. The differences between the control and shocked path of world trade prices is only slightly higher in 1975 than 1974. While this conclusion is indicative of a dynamically stable system following this type of price impulse, one might view this result as being perhaps too strong.

Turning now to the country-by-country impacts, it is easy to verify that the channels of price transmission which do exist today in the LINK system are clearly operative. First, import prices increase in every country. The impact is as much as 8 — 10 percent in such primary products importers as Japan, Italy, and the United Kingdom. The impact is much smaller in Canada which imports few primary products (on a percentage basis). Second, export prices of the various countries increase rather noticeably and often by much more than may be accounted for by import content of exports.[14] In open economies like Belgium and the Netherlands, the impact on export prices actually exceeds that on import prices. Clearly, the changes in export prices not accounted for by import content represent either competitive adjustments by exporters or indirect

[14]Exceptions are Australia, Austria, Finland, and Sweden where export prices are exogenous. This fact accounts for the rather different results for these countries in real growth also, but is not necessarily representative of actual real-world responses. The Australia results are, in one sense, more counter-intuitive in that the GNP deflator actually declines. Mechanically, this result follows from the definition of PGNP as a value-added deflator with import prices subtracted out. Hence, an increase in import prices may have a negative impact on the GNP deflator; however, such a feature also indicates an inadequate specification of price transmission. For example as just noted, export prices are implicitly assumed to be constant, and this fact contributed to the unexpected fall in GNP prices.

Table 10

Effects of Price Increases of Developing Nations' Exports on Domestic Labor Market

	1974				1975			
	%ΔGNP	ΔUR	%ΔPC	%ΔWR	%ΔGNP	ΔUR	%ΔPC	%ΔWR
Australia	+2.0	-0.1	-0.3	+0.2	+3.6	-0.2	-0.8	+0.3
Austria	+1.2	-0.1	+0.4*	+0.5	+1.7	-0.1	+0.3*	+1.0
Belgium	+0.1	NA	+0.9*	0.0	-0.4	NA	+1.4*	0.0
Canada	+1.2	-0.5	+1.6	+1.9	+0.7	-0.5	+2.8	+3.3
Finland	+2.2	-0.3	+0.2*	NA	+4.2	-1.0	+1.2*	NA
France	-1.0	NA	+3.3	+1.8	-1.5	NA	+3.5	+2.0
Germany	-0.4	+0.1	+0.3*	-0.2	+0.4	-0.2	+0.7*	+0.3
Italy	-0.7	+0.0**	-0.2	-0.2	-0.8	+0.3	-0.3	-0.5
Japan	-0.1	+0.0**	+1.0	+0.5	-1.2	+0.0**	+1.9	+1.2
The Netherlands	-1.7	-0.4	+4.6*	+1.2	-1.3	-0.6	+4.9*	+2.3
Sweden	+1.3	NA	+0.5	NA	+2.0	NA	+0.9	NA
United Kingdom	0.0	0.0	+1.5	0.0	0.0	0.0	+1.6	0.0
United States	+0.5	-0.1	+0.2	+0.1	+0.5	-0.2	+0.3	+0.3

*GNP deflator instead of consumption deflator

**Positive but less than 0.1%

UR = unemployment rate
WR = wage rate
Other variables are defined in Table 9.

effects through domestic prices or wages. Wage rates may vary in two ways: in response to increased costs of living, particularly where wage rates are indexed, and where output prices change, in response to changing marginal value products or different profit margins. Also, wages, and therefore prices, may move along a Phillips curve if the unemployment rate varies as a result of different real output demands. It cannot be seen in Table 9, but each of these mechanisms is operative in this exercise; we transfer some columns from Table 9 and append the impacts on unemployment and wage rates in Table 10 to describe the details. Very simplified theory (i.e., ignoring substitution of capital for labor and assuming a stable Phillips curve) suggests that the impact on GNP and unemployment should be of opposite sign and also that the impact on wage rates should be in the same direction as consumption and prices and opposite to the movement in the unemployment rate. With the sole exception of the Netherlands' real output and employment movements, Table 10 is in accord with these results. Moreover, the size of the whole of these various impacts may hardly be judged negligible.

Referring back again to Table 9, a final observation may be made about trade balances. The final change will, of course, follow from a large number of partially or wholly offsetting effects. Import prices will be larger, but so, too, will export prices and possibly even more so. Real exports may increase or decline, as relative competitiveness is quite different in some cases and also because of different changes in various import markets. For example, the relative competitiveness factor is clearly important for Australia, Austria, Finland, and Sweden where (unrealistically) export prices are exogenous, but also for Canada, Germany, and the United States as opposed to Belgium, France, Italy, the Netherlands, and the United Kingdom. Also France, Japan, the United Kingdom and the United States are affected by the high proportion of their exports which are traditionally sold to developing regions which, in this exercise, sharply curtail imports. The real import effect is less varied, but still real imports are sharply down in Germany, for example, contributing to an improvement in the trade balance. The stability of the trade balances generally is somewhat surprising; it is evidence of the stability of a fixed-exchange rate world where the Keynesian adjustment mechanism along with rather important relative price shifts are responsible for external balance. The large improvements in Canada and Germany as well as the declines in Italy, Japan, the United Kingdom and the United States (while perhaps underestimated) suggest that such an adjustment mechanism may act to eliminate extreme disequilibria, but weaken in effectiveness for small shocks or when nearing balance again.

An interesting counterpart is provided by the case where the stimulus to world inflation arises from domestic origins, in particular from increased wage demands. In order to examine this possibility, we use a control solution essentially the same as above, and let the wage rate equation be disturbed in each country model. Now we are interested primarily in

Table 11

Pre-Linkage Effects of Sustained Synchronized Wage Shocks

		%ΔWR	%ΔPGNP	%ΔGNP	%ΔX	%ΔPX	%ΔM	%ΔPM	ΔBAL
Australia	1973	+5.1	+2.3	+0.3	0.0	0.0	+1.0	0.0	-0.05
	1974	+4.9	+3.1	0.0	0.0	0.0	+0.9	0.0	-0.06
	1975	+4.6	+3.3	-0.6	0.0	0.0	+0.1	0.0	0.00
Belgium	1973	+7.8	+1.9	+0.4	-5.7	+1.0	-2.0	-0.1	-0.55
	1974	+8.1	+3.3	+0.3	-7.5	+0.9	-2.3	0.0	-0.98
	1975	+8.2	+3.7	-0.2	-7.6	+0.9	-3.3	0.0	-0.98
Canada	1973	+4.3	+2.1	-1.1	-1.7	+0.3	-0.1	+0.1	+0.08
	1974	+4.5	+2.7	-1.1	-2.2	+0.3	+0.4	+0.1	-0.12
	1975	+5.1	+2.5	-1.4	-2.0	+0.2	-0.3	+0.1	+0.08
Finland	1973	+4.0	+2.0	+0.4	0.0	0.0	+0.8	0.0	-0.03
	1974	+4.2	+2.1	+0.9	0.0	0.0	+1.4	0.0	-0.06
	1975	+4.8	+2.5	+1.2	0.0	0.0	+1.9	0.0	-0.10
France	1973	+5.5	+2.1	0.0	-0.6	+1.6	+0.1	0.0	+0.26
	1974	+5.5	+2.1	-0.2	-0.6	+1.7	-0.4	0.0	+0.43
	1975	+5.5	+2.2	-0.2	-0.6	+1.9	-0.4	0.0	+0.49
Germany	1973	+2.6	+1.8	-1.1	-0.2	+0.2	-2.6	-0.1	+1.14
	1974	+4.6	+3.1	-2.2	-0.3	+0.3	-3.8	-0.2	+2.24
	1975	+5.4	+4.0	-2.9	-0.4	+0.4	-4.3	-0.2	+3.04

Table 11 (cont.)

Italy	1973	+13.4	+2.1	-0.9	-0.5	+0.6	-1.1	0.0	+0.31
	1974	+13.5	+3.3	-2.7	-1.2	+1.7	-4.1	+0.1	+1.73
	1975	+9.9	+5.0	-4.5	-1.5	+2.1	-6.9	+0.1	+2.35
Japan	1973	+10.8	+2.2	+0.4	-1.3	+0.9	+1.4	+0.1	-0.51
	1974	+11.0	+2.9	+1.1	-3.1	+1.5	+3.5	0.0	-2.21
	1975	+9.9	+3.3	-0.4	-3.4	+1.6	+2.2	0.0	-1.84
The Netherlands	1973	+2.7	+2.1	-0.5	-1.3	+1.0	+1.1	+0.1	-0.31
	1974	+3.0	+2.2	-0.7	-2.6	+0.9	-0.2	-0.2	-0.28
	1975	+3.1	+2.3	-0.8	-2.9	+0.8	-0.3	-0.3	-0.23
Sweden	1973	+5.0	+3.0	+0.8	0.0	0.0	+1.4	0.0	-0.15
	1974	+5.6	+5.2	+0.9	0.0	0.0	+2.1	-0.1	-0.22
	1975	+5.0	+5.5	+0.5	0.0	0.0	+1.5	-0.1	-0.19
United Kingdom	1973	+3.8	+2.3	+0.1	-0.3	+1.3	+0.4	0.0	+0.20
	1974	+3.7	+3.3	-0.1	-1.0	+1.8	+0.3	0.0	+0.22
	1975	+3.4	+3.6	-0.7	-1.6	+1.8	-0.4	0.0	+0.26
United States	1973	+6.9	+2.4	+0.2	-0.7	+2.4	+1.7	+0.2	-0.61
	1974	+7.2	+3.7	-1.3	-1.3	+3.7	+1.3	0.0	+0.47
	1975	+8.0	+5.0	-2.5	-1.8	+4.9	+0.3	-0.1	+2.16

For specification of shocks and further description of entries, see text.

Table 12

Post-Linkage: Effects of Sustained Synchronized Wage Shocks

		%ΔWR	%ΔPGNP	%ΔGNP	%ΔX	%ΔPX	%ΔM	%ΔPM	ΔBAL
Australia	1973	+5.1	+1.8	+0.8	+1.3	0.0	+0.9	+1.4	-0.01
	1974	+4.9	+2.4	+1.2	+2.2	0.0	+1.2	+2.4	-0.03
	1975	+4.6	+2.3	+0.8	+1.7	0.0	+0.6	+2.8	-0.11
Austria	1973	+0.1	+0.1	+0.2	+0.3	0.0	+0.2	-0.5	-0.03
	1974	+0.2	+0.1	+0.2	0.0	-0.1	+0.3	+1.0	-0.12
	1975	+0.3	+0.1	+0.1	-0.5	-0.1	+0.2	+1.1	-0.23
Belgium	1973	+7.9	+2.2	+1.4	-1.7	+2.6	+1.0	+1.2	-0.25
	1974	+8.3	+3.5	+1.4	-2.7	+3.3	+1.3	+2.5	-0.68
	1975	+8.5	+3.8	+0.5	-4.4	+3.5	-0.8	+2.8	-0.56
Canada	1973	+6.2	+3.3	-0.8	-0.3	+0.9	-0.6	+1.1	+0.46
	1974	+7.9	+5.0	-0.8	-1.9	+0.8	-0.3	+1.7	+0.17
	1975	+8.3	+5.6	-1.7	-3.4	+0.6	-1.8	+2.1	+0.15
Finland	1973	(+4.0)	+2.1	+0.9	+1.0	+0.1	+1.3	+0.9	-0.02
	1974	(+4.2)	+2.2	+2.0	+1.2	+0.2	+2.5	+1.4	-0.10
	1975	(+4.8)	+2.6	+1.7	+1.3	+0.2	+1.5	+0.7	-0.08
France	1973	+4.8	+2.5	-0.2	-1.3	+2.0	-0.6	+1.0	+0.06
	1974	+5.2	+3.0	-0.7	-2.2	+2.5	-1.7	+1.7	+0.06
	1975	+5.4	+3.3	-1.0	-3.5	+2.5	-2.3	+1.8	-0.30
Germany	1973	+2.8	+2.0	-1.1	+1.3	+0.2	-2.5	+1.1	+1.47
	1974	+4.8	+3.2	-2.2	+1.2	+0.4	-4.8	+2.1	+2.35
	1975	+5.5	+4.0	-2.7	-0.2	+0.5	-6.4	+2.4	+2.50
Italy	1973	+13.5	+2.0	-0.8	-0.5	+1.4	-1.3	+0.7	+0.29
	1974	+13.7	+3.2	-3.8	-2.8	+3.2	-6.7	+1.7	+2.17
	1975	+9.5	+4.0	-6.3	-5.1	+3.7	-12.0	+2.0	+4.39

Table 12 (cont.)

Japan	1973	+10.9	+2.2	+0.8	+0.4	+1.4	+1.6	+1.4	-0.05
	1974	+11.4	+3.1	+1.8	-0.8	+2.4	+4.1	+2.4	-1.40
	1975	+10.7	+3.9	0.0	-1.3	+2.8	+2.8	+2.6	-1.29
The Netherlands	1973	+2.9	+2.4	-0.5	-1.3	+1.9	+1.6	+1.2	-0.46
	1974	+4.6	+6.9	-3.3	-5.6	+5.8	+1.3	+1.8	-0.70
	1975	+6.3	+8.6	-4.7	-7.5	+6.4	-0.6	+1.9	-0.64
Sweden	1973	(5.0)	3.2	+1.1	+1.0	0.0	+1.7	+0.6	-0.14
	1974	(5.6)	5.3	+1.3	+1.2	0.0	+2.3	+1.3	-0.39
	1975	(5.0)	5.9	+0.7	+0.5	0.0	+1.6	+1.5	-0.48
United Kingdom	1973	+3.8	+2.2	+0.1	-0.2	+2.0	+0.4	+1.3	-0.09
	1974	+3.8	+3.2	0.0	-0.7	+2.8	+0.3	+1.9	-0.03
	1975	+3.8	+3.3	0.0	-2.0	+2.8	-0.9	+2.0	-0.46
United States	1973	+6.9	+2.3	+0.2	-1.2	+2.4	+1.4	+1.0	-1.26
	1974	+7.1	+3.7	-1.3	-1.7	+3.7	+0.6	+1.2	-0.48
	1975	+7.8	+5.0	-2.6	-3.2	+5.0	-0.7	+1.3	-0.61
Developing	1973	—	+0.2	+0.4	+1.3	+0.4	-0.1	+1.2	-0.29
	1974	—	+0.4	+0.5	+1.3	+0.4	-0.4	+2.0	-0.27
	1975	—	+0.4	+0.4	+0.4	+0.2	-0.7	+2.3	-2.02
ROW	1973	—	—	—	+0.1	+0.6	-0.3	+1.3	+0.19
	1974	—	—	—	-0.7	+2.2	-0.7	+1.7	+0.33
	1975	—	—	—	-1.4	+3.1	-1.7	+3.0	+0.09
CMEA	1973	—	—	—	—	—	—	—	-0.04
	1974	—	—	—	—	—	—	—	-0.23
	1975	—	—	—	—	—	—	—	-0.49
World Trade	1973				+0.3	+1.0			
	1974				-1.1	+1.8			
	1975				-1.4	+2.1			

For further specification of shocks and further description of entries, see text.

two aspects of the system: (a) How and to what extent is price inflation stemming from wage pressures in developed countries transmitted in comparison with inflation resulting from increases in prices of non-manufactures supplied by the developing areas? (b) How does the "amplification" phenomenon caused by synchronized impulses behave on the price side in comparison with the same feature discussed previously on the real side?

To cope with the second issue, we require some uniformity (across models) of the shock as measured in prices, and the price we employ is the GNP (or GDP) deflator. Therefore we initially alter the wage-rate equation or equations in each model sufficiently to increase the GNP deflator by approximately 200 basis points.[15] While this is a rather arbitrary magnitude, it is not far from what many countries have been experiencing as a consequence of disturbances in 1973-1974.

The differences produced by these impulses are collected in Table 11, which contains pre-linkage changes, with the component models standing alone, and in Table 12, which contains post-linkage changes, with the entire system solved as a whole.

The wage shocks produce an interesting set of responses in the models even without linkage; however, in this paper we only briefly and broadly discuss the detailed changes. First, it is apparent from Table 11 that a given (percentage) shock to the wage rate will result in varying impacts on the GNP deflator in different models. This finding follows from prices generally being more or less responsive to wage changes (because labor is of different importance relative to capital or materials in production) and with longer or shorter lag structures. Second, a given shock to wage rates clearly has varying effects on real growth. A superficial presupposition would be that real output would drop since an increase in domestic prices relative to the price of internationally traded goods (both import prices and competing export prices) would depress exports and stimulate imports. To be sure, real imports may not increase if the income effect overwhelms the relative price effect, but in any case the net result must be to retard real output. In some models, however, real growth fails to drop: Belgium, France, Japan, the United Kingdom and the United States.[16] The reason is that wages may increase relative to other factor prices, in particular, to capital costs, stimulating substitution effects which, in Japan for example, strongly accelerate fixed investment. Another reason is that wage increases tend to squeeze profits and, because of different marginal propensities to consume from wage compared to capital income, real demands may increase for a short time. In the United States, for example, profits fall in 1974 between the two simulations by almost 15 percent. The longer-run impact on real growth is more uniform. By 1975, real output is below the control path except where exports are exogenous.

[15]No changes were made for Austria, the developing models, ROW, or CMEA.

[16]Also in Australia, Finland, and Sweden, but here real exports are exogenous pre-linkage. Still since real imports increase in these models, the above analysis applies, but the effects noted need not be nearly as powerful.

By comparing Tables 11 and 12 we may again examine the strength of international transmission of prices. Qualitatively, the transmission effects are obviously similar to those resulting from an external shock to prices of primary commodities. Import prices, constant in Table 11, are up by about 1 percent in Table 12 in 1973 increasing to about a 2 percent difference by 1975. That this occurs is hardly surprising, since an identity determines import from export prices, post-linkage. Also, export prices increase more rapidly when international linkage channels are opened; as before the differences are smaller for insulated economies like Germany and the United States (and of course where export prices are exogenous) but substantial for Belgium and the Netherlands, possibly also for Canada, Italy, and Japan.

The changes to GNP deflators in the post-linkage computation as compared to the changes to GNP deflators in the pre-linkage computation may be viewed as a price-side "amplifier" to be compared to the real amplifiers discussed before. By comparing Tables 11 and 12, it may be verified that the shocks to PGNP are only slightly higher with internationally synchronized wage-rate impulses as opposed to results from the models standing alone for most countries. In Japan, for example, the difference between the shocked and control paths of PGNP before linkage is +2.2 percent in 1973, +2.9 percent in 1974, and +3.3 percent in 1975. The same differences with full linkage are +2.2 percent, +3.1 percent, and +3.9 percent. However, a further result is that there is much less uniformity of impacts of synchronized wage shocks than impacts of real expenditure shocks. In the latter case, the amplifier ratio was very nearly 1 1/2 for all economies; whereas here in the case of synchronized inflation Canada, France, and especially the Netherlands show a much larger impact with full linkage as compared to pre-linkage.

The impact of increased primary commodity prices on domestic GNP deflators (Table 9) are uniformly greater than the impact of wage inflation in the rest of the world on domestic GNP deflators (i.e., comparing Table 12 with Table 11). This finding arises not so much from system response multipliers — which remain an open question — but rather from different sizes of multiplicands. In other words, the shock represented by the increase of primary commodity prices by 25 percent can surely be regarded as a more severe shock than that represented by the increased wage demands considered here. However, and this is the point, both of these impulses may be viewed as reasonable possibilities in the context of current economic conditions and so are comparable in that sense.

Each of these two analyses of transmission of price inflation across national boundaries suggest that, while the appropriate channels are clearly open, and pass-through as well as feedback properties are significant, there is no strong evidence of instability or runaway inflation dynamically. The time horizon on which this conclusion is based is only two or three years. Also, if countries adopted fiscal policy to combat these inflationary tendencies, then we would return to the previously considered case of

synchronized real recessionary changes. Moreover, we emphasize again that the LINK system is less complete regarding interdependencies among prices (both domestically and internationally). Even so the results are informative and suggest numerous possible directions of further analysis.

Some Policy Considerations

Many more LINK simulations are being planned to investigate hypothetical policy changes that may lead to a more stable world economy. At present, we have mainly a large collection of simulations that were done for other purposes and are trying to distill some information from them. To a large extent, these simulations are passive; they examine the effect on the world economy of particular input assumptions and are not specifically designed to search for policy solutions to world problems.

Policies for international stabilization may be classified as follows:

1. Exchange rate policies
2. Other trade policies
3. Domestic fiscal policies
4. Domestic monetary policies.

In simulating the series of exchange rate changes that have taken place since December 1971 (Smithsonian rates) LINK estimates have consistently been that the effects would be in the direction of stabilization by increasing the balance of deficit nations and decreasing the balance of surplus nations. We have generally found that the policy changes were too small to wipe out the main imbalances fully. This is because of lagged response, world business cycle conditions, and world energy needs. All LINK models combine income and price effects, probably less satisfactorily for the latter, but world business cycle developments in 1972 clearly worked against the success of the Smithsonian rates and in 1973 worked for the rates established in the second wave of devaluation. U.S. oil imports on a large and increasing scale have been used in LINK simulations for some years, and were cited as a factor working against stability of Smithsonian or 1973 rates. Now this problem is transformed into a new scale of effects of the world energy shortage with high prices. This is a strongly destabilizing result. There are no LINK simulations to show how to deal with this form of instability, short of a longer-run solution to energy problems, enabling industrial countries to have abundant fuel sources at nonescalating prices.

Other external effects such as armament deliveries, and large bilateral trade agreements have been programmed into the various simulations with different exchange rates, and they generally show expected and stabilizing effects in that they have helped to restore balance where large surpluses or deficits existed.

The changed world currency rates in LINK simulations have not, together with other input changes, shown improvement for the U.K. deficit

position. This is a persistent aspect of world instability found in our calculations.

A problem that has not been systematically investigated yet with the LINK system but that could probably be treated in its framework is the search for a set of exchange rates that would define international equilibrium.

As far as other trade policy is concerned, the LINK calculations, as noted above, have taken account of bilateral agreements and the particular ones studied have been favourable for closing trade gaps. The U.S.-Soviet wheat agreement may have had the destabilizing effect of stimulating domestic inflation in the United States, but it contributed significantly towards reduction of the U.S. deficit. Liberalization policy would generally improve price sensitivities of the flows of trade. Low price elasticities have worked against establishment of international equilibrium under changed exchange rates; therefore liberalization of trade ought to lead to more quickly and sharply stabilizing results from exchange revaluations.

Individual LINK models have strong income effects on imports. These have played important roles in estimating effects of currency realignments. If an upvaluing country does not adopt compensatory stimulative policies, the slowing down of activity levels can work against reductions of surpluses. Individual simulations of Japanese and German LINK models showed the need for compensatory fiscal policies to accompany revaluations in order that imports were maintained. On a broader scale fiscal policies should be coordinated with international policies so that the two are not operating in opposite directions.

A more important consideration for policy coordination, however, is that countries should try to avoid strongly synchronized movements in which all are inflating or deflating together. LINK calculations of world amplifier effects suggest that they are not disastrous in particular episodes, but they are nevertheless present. It is in the interests of international stability to stagger timing of policies among countries. This is easier said than done, but it is a way of reducing amplitude in international fluctuations. Developing nations would benefit from a strongly growing volume of world trade. The simulated world slowdowns that we examined with LINK held back world trade growth by large amounts. A stable economic environment in the developed nations would undoubtedly work to the advantage of growth for the developing nations.

Monetary policies, like fiscal policies, have significant impacts on domestic economic performance. In the "Oil Crisis" simulations, there were unusually high interest rates for Japan, the United States, Canada, Italy, Belgium, and especially the United Kingdom (more than 11.0 percent). These were parts of domestic anti-inflationary policies adopted on a world-wide scale and formed a base pattern of slowdown upon which the shortages of fuel were superimposed. Monetary policies, like fiscal policies, if they all come together at the same time tend to accentuate international fluctuations. Many individual LINK models have estimates of

capital movements in response to interest-rate differentials. While these partial estimates all generate capital flows in response to differentials in a way that appears to be stabilizing, the LINK system is not yet able to provide complete world solutions for capital flows in the same way that it has functioned for estimates of trade flows.

Monetary policies have been used domestically to fight inflation, although evidence does not suggest that they have been successful. An interesting issue arises in this connection, whether individual countries should intensify monetary stringency to fight inflation that is brought about by rising oil and other basic commodity prices. If these could be accepted as one-shot price rounds in the developed countries, then they would be well advised to pursue stimulative fiscal and monetary policies together in order to arrest recessionary tendencies that have developed as a result of shortages. But there is little evidence to suggest that these rounds of inflation — grain/beef in 1972-73; oil in 1973-74 — are one-shot affairs. They have spread significantly to other related sectors of the economies concerned and they are reinforced by rising prices in nonferrous metals and other commodities. The LINK evidence is stronger that movements in the real world economy are stable than that world inflation rates are stable. Given a high degree of uncertainty about the mechanism of the world inflationary process, it may be preferable for the countries concerned to ease fiscal burdens to arrest recessionary tendencies but to keep tight monetary policies to try to hold inflation in check.

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Discussion

Anton Barten

The LINK experience is unique in the area of macro-economic model construction. Attempts have been made before to engage a large number of specialists to design parts of a greater model, but the LINK effort is the first to result in an operational global model. The intellectual and organizational talents required for coordination deserve the deepest respect of the profession.

The LINK project links together country or area models of different kinds (and of differing quality). In a number of cases these models were not specifically designed for use in the LINK project. The advantages of using existing models are several. It has saved considerable time for the whole project. Several of the models have been used for some time in the past and their advantages and weaknesses are known. As far as the models are more or less "official" models, one avoids discussions with the "officials" about the validity of results.

There are also some disadvantages associated with the use of dissimilar country or area models. It is very difficult for a relative outsider to form an idea about the mechanism by which external effects are transformed into internal effects to be again exported. Since the eventual magnifying or reducing takes place within the country models, it is difficult to understand the nature of the (de)stabilizing effect of international trade and to suggest policy measures to cope with undesirable consequences.

Before beginning with the comments on the paper itself I would like to underline the significance of the LINK project. It provides an operational instrument to analyze and predict consequences of policy measures. It also enables the operators of the national models to obtain a sharper picture of the international context of their own economy. This could lead to more rational economic policies. Some parts of the model may not be quite adequate. Experimentation reveals such shortcomings, which can then be overcome. Modelbuilding has no natural end, but the fastest death for a model comes from not being used. Let us now turn to the use made of the LINK project in connection with the topic of this conference: International stability.

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In the Johnson-Klein paper two different concepts of (in)stability are used. One of them is well known from dynamics: A system is stable if the effects of an initial disturbance are a non-increasing function of the distance in time from the moment of the disturbance. The other concept is related to the scope of the model. Multipliers change in value when variables, initially taken as exogenous, are made dependent on endogenous variables of the system. If the multipliers of the new system are smaller than those of the original one, the extension of the system is said to have a stabilizing effect. For example, if the introduction of a system of progressive income taxes reduces the value of certain multipliers, progressive income taxes are considered to be stabilizing. It is clear that the two concepts can be combined by comparing time paths of multiplier values. However, since the Johnson-Klein paper deals both with the process of linking national models, i.e., a process of making initially exogenous variables (international trade variables) endogenous and with the analysis of lagged effects of "disturbances," it is good to keep the distinction between the two concepts of stability in mind.

The evaluation by Johnson and Klein of the LINK experience discusses two different issues, as already mentioned: a) the effect of integrating a set of national models into a global one and b) the effects of changes in the "conditions" of international trade, like changes in exchange rates, restrictions on the supply of oil, changes in raw material prices and changes in domestic wage rates. In the paper the discussion of the two issues is somewhat interwoven. This is perhaps due to the procedures used in the LINK project, where one starts with a set of unlinked control solutions for the national models and then searches for a solution of the integrated system. In theory, of course, one could have proceeded directly to the solution of the integrated system.

As far as the "*linking*" itself is concerned, the authors present a theoretical argument and illustrate it empirically. The theory is straightforward. The authors are well aware of modifications due to capacity constraints and price effects. I would like to make two comments on the theoretical argumentation. First, the question may be asked how the multipliers are affected by an increase in exports and imports, relative to real output of a country. If they increase with international trade, more of the latter adds to possibly destabilizing effects. Some algebra can be used to verify that under the condition of maintaining equilibrium on the trade balance $\partial Y_1/\partial G_1$ decreases and $\partial Y_1/\partial G_2$ increases as the exchange of commodities goes up. In other words, one becomes more sensitive to what happens elsewhere and the effectiveness of domestic policy measures decreases. To benefit from an increased international division of labor, one has to pay the price of reduced control, hence increased instability. Somewhere, there exists an optimal relative size of international trade.

A second comment concerns the comparison of large versus small economies. Among the 10 major traders in the world there are three small ones, both small in population and in the ratio of output to exports,

namely Canada, the Netherlands, and Belgium. Such small economies have a strong initial response to an increase in exports, but rather soon reach capacity limits and then the expansion becomes more one of prices than of volume, which eventually might even decrease again. For the larger countries the initial effect is weak but can be sustained for a long time before running into capacity problems, and hence price increases. It would be of interest to verify this by way of an experiment with LINK.

Turning now to the empirical evidence on the effect of linking as presented by the authors, it seems to me that comparing the pre-link solutions with the post-link solutions does not reveal much about the increase in feedback because of the linking process. It does show the ability of the country operators to assess world trade developments. Assume that these operators would have done their job perfectly, then the linking would not have resulted in modifications. In fact, participation in the LINK project might educate the country operators to improve their appraisals of world trade as relevant for their country so that the actual linkage will be less and less important for unconditional predictions. The results of Table 7 are much more adequate to illustrate the consequences of linkage. In my opinion these results contradict the authors' statement of "the world economy as being quite stable in terms of its transmission effect." Also a comparison of Tables 11 and 12 reveals that for countries like Canada and the Netherlands a substantial lagged increase in wage rates results from linking. These economies are both relatively open economies. If other countries tend to become more internationally oriented, could one not expect a more universal explosive effect?

Part of the experiments with the integrated model concerns *exchange rate* adjustments. Before commenting on the presented results it may be conjectured that changes in the exchange rates are not very effective in correcting trade balance problems in the long run. First, a considerable part of, say, a revaluation is absorbed by a decrease in the export price in domestic currency, while importers do not hand on the full decrease of the prices of imported goods to their customers. The reduced profits of the exporters are compensated by the increased profits of the importers. Hence the income effect of a revaluation is small. The absorption is caused by competitive price-setting behavior. What is left of an increase in the export price in dollar terms causes import prices of the trading partners to go up, causing domestic inflation, while a direct competitive effect will increase their export prices in dollar terms. Relative export prices have not changed very much and the net reduction in the surplus on the trade balance will be minor. Domestic price inflation in the revaluing country is reduced somewhat but the continued pressure of external demand prevents it from being spectacular. This script is, for example, more or less confirmed by experiments with the COMET model, the model for the European Economic Community.

It would be of interest to analyze the long-run responses to exchange rate modifications by means of the LINK project, since this project takes

into account the additional effect of changes in total world trade. Unfortunately, Tables 5 and 6 of the paper do not represent the pure effect of exchange-rate changes but give simply the expected time path. Only short-run effects can be extracted from the paper. From Table 3 it appears that the German mark was revalued on average by about 16 percent with respect to the U.S. dollar in the course of 1973. Other major traders had a smaller revaluation. The results for 1973 only are summarized in the table below for Germany and the United States.

Effects of 1973 Exchange Rate Changes

	Germany	U.S.	Source
Real Exports	-11%	+5%	Table 1
GDP	- 1%	+6%	Table 1
Import Prices	- 7%	+5%	Table 1
Price Index	- 2%	+1%	Table 3
Trade balance	-0.89×10^9\$	$+1.66 \times 10^9$\$	Table 4

The effect of the German trade balance is very small, if at all significant. According to Table 6 this balance is \$12.17 billion. The actual figure is close to \$15 billion. Also according to Table 6 further effective revaluations of the D mark do not result in drastically lower surpluses. The stronger effect for the United States is small compared to its volume of international trade but, of course, large compared to its small balance in absolute value. It is puzzling that a decline of 11 percent in exports produces less than a 1 percent decrease in German GDP while exports represent about 30 percent of GDP or roughly 20 percent of total final demand. It would indicate a rather low instantaneous export multiplier. Import prices have declined by less than the exchange rate because exporting countries in part also revalued and in part increased prices in their own currency. The decrease in the German domestic price index seems to be too strong to be realistic. The results for the United States appear in general acceptable.

It seems difficult to believe that following through the consequences over a longer period than one year will indicate a greater sensitivity to exchange rate changes. On the contrary, one might expect a smaller lasting effect. Apparently, exchange rate modifications are not very effective in restoring balances except when they are applied in isolation, which could only be the case for small traders.

To comment more adequately on the presented results one would have liked additional information, like export prices. However, one cannot blame the authors for being miserly in producing arrays of results! In

presenting results of simulation there is always a problem of what to select among the flood of numbers flowing from the computer.

The part of the paper dealing with the "oil crisis" is reassuring. The authors do not predict a major recession, they only suggest smaller real growth rates. In their discussion, they point towards the "international stability inherent in the LINK system." Does it mean that the LINK system is more stable than reality, or that reality, as well as possible described by LINK, is more stable than some pessimists have assumed, or that an internationally open system is hardly less stable than a world economy consisting of more or less autarchic national economies? Only the last meaning has significance, but is difficult to accept.

The last two major experiments are related to the problem of worldwide inflation. Rather than trying out the effects of an impulse originating in a single country, the authors have selected as impulses an increase in the prices of raw materials and a synchronized wage increase in the industrialized countries. Are these types of impulses really the most probable causes of world inflation?

As appears from Table 9 an average of a 26 percent increase in the prices of raw materials has a noticeable effect on import and export prices, but usually a weak effect on the consumption price, which is the most relevant indicator of inflation. The number of NAs reveals that some models are not really adequate in describing the relation between international and domestic prices. To study problems of inflation these defects should be remedied. Still, for some countries one might expect a type of independent development of international and domestic prices. In the 15 years before 1969 import and export prices moved up and down in a rather narrow interval, while domestic prices moved up almost monotonously. The reverse could then also be true. Consider as an example of an extreme nature the Curacao economy. The main economic activity of this tiny island off the coast of Venezuela consists in refining crude oil. An increase in the price of crude oil will have its effect on the prices of refinery products, hence increases in Curacao import and export prices, but why should domestic prices be affected? Only in the longer run, when prices of consumable imports go up, the Curacao consumption prices will start moving. Not all economies are like the Curacao one, but many of the smaller open ones resemble it to a certain degree. Anyway, the experiments of Johnson and Klein appear to confirm the impression that an increase in the prices of several products cannot be a major factor of the present rate of inflation.

Turning now to the other candidate: Synchronized wage increases. It is unfortunate that the effects on consumption prices are not reported. Again it appears that in the LINK project the direct relation between domestic prices and export prices is weak. Only after linkage, i.e., by introducing indirect effects, does the effect on international prices become noticeable.[1] Still the amplifying effect of linkage as far as wage increases

[1] Are the results for Italy to be believed? The solution for its balance-of-payments problem would be a substantial wage increase!

are concerned is negligible if at all positive. Apparently, synchronized wage increases can explain synchronized inflation, but the synchronization would be accidental and not essential.

In this connection it may be useful to quote a result from an as yet unpublished paper by one of my Louvain colleagues, Guy Carrin. He applied spectral analysis to quarterly data on price and wage increases for eight E.E.C. countries. It turned out that in the short run there is hardly any coherence, which becomes only significant for small frequencies, corresponding with a period of four years and more. This result points towards a rather slow process of mutual adjustment.

These experiments first of all show that the LINK project is operational. This is in itself an important achievement for which the participants, and more in particular the coordinators, deserve warm congratulations. The experiments also show rather moderate transfers of domestic shocks to other economies, certainly when these shocks are applied to prices. They do not point to an obvious cure for the present problem of inflation.

Today's world economy is characterized by strongly increasing international trade, wildly fluctuating exchange rates, and widespread inflation. The situation cannot be called steady or stable. Exchange-rate changes can have reduced the amplitude somewhat, but have not basically solved our problems. National governments, many of them already politically weak, feel powerless because the source of the problems lies allegedly "abroad," outside their control. International agreements turn out to be very unstable if it comes to cutbacks. Are we going to repeat the experience of the thirties, when a temporary closing-off allowed national governments to put the house in order? There are some indications for this tendency. Even if such a return to introversion would be at all possible, it might entail a high price in terms of welfare losses and increased nationalism.

Discussion

Alan Peacock

A conference run by the International Seminar on Public Sector Economics presumably allows one to enquire about the role played by the public sector in international linkage models. The example given by Mr. Hickman of a simulation exercise, it is true, involves the public sector at the outset. All linked economies are in equilibrium and then an exogenous change is made in government expenditure on goods and services in several economies and the effects of this change are traced through the linkage system. The subsequent role of the public sector seems to me to be obscure so, in the absence of presentation of the particular model used in each linked economy, let me speculate on the way in which assumptions about the public sector's role may affect the outcome of the exercise.

Let me begin by assuming that once exogenously determined G is changed, there are no changes either in constant terms or in parameters in whatever sets of public budget equations are used. Subsequent effects of the public sector on the economy will then crucially depend on the type of model used. A simple Keynesian type model for an open economy will illustrate the way in which "fiscal drag" will reduce the multiplier effect of the change in G, depending on the progressivity of the tax and transfer system. The linkage effect will be shown in the influence of the change in tax yields (after allowing for negative tax changes) on the level of expenditure and therefore on the demand for imports. However, if we expand the model to include price and wage equations, we are bound to examine the effect of changes in prices and wages on the supply of exports and demand for imports. Expenditure changes which raise prices and wages will induce substitution effects depending on the relation between domestic and overseas price levels. Furthermore, prices may depend not only on expenditure but also cost changes, and particularly wage changes. If, as in some recent attempts to improve the explanatory power of macro-models, unions are assumed to base their wage claims on disposable income, then even with no change in the tax parameters, growing fiscal drag may promote "wage retaliation" in response to the fall in the

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growth rate of disposable income, with consequential effects on prices, employment, and, given our interest in linkage effects, on the supply price of exports and the demand for imports.

However, let us stick to a linked system of the kind illustrated by Messrs. Johnson and Klein, which is a set of simple Keynesian-type models with recursive properties, which can be readily extended to embody price equations. How do we decide whether or not to assume that policy variables should be treated as endogenous or exogenous? There seem to me to be three approaches one can adopt:

(a) *Analytical Convenience*

This is the only approach which can be identified in the papers presented to us. Thus the treatment of the monetary sector is a function of the development of the national models, with money supply and interest rates variables endogenous in some countries and exogenous in others. On the other hand, the exchange rate is treated as exogenous. How budgetary variables are treated is not explained, but it clearly makes a difference to the results of simulation if, for example, government expenditure is made a function of tax yields. It has been reported that this treatment of G as an endogenous variable is what is assumed in the case of W. Germany, and this may explain why that country appears to originate disturbances which are "strong and diffuse" (Hickman). While it is good to know that a LINK system can incorporate quite complex relationships, analytical convenience clearly hampers the extent to which our knowledge of international transmission of fluctuations is enhanced by model-building pyrotechnics.

(b) *No Exogenous Changes*

Such an approach implies the answer to the question: what happens in LINK if there is some exogenous change, as illustrated in the Hickman analysis, and the government takes no corrective action? The answer is a conditional prediction which may be of interest to policy-makers for it indicates how dependent variables of policy interest (e.g., employment) will move as a result of the initial change. The identification of the (unchanged) exogenous variables which are within the control of the public sector or, rather, which the public sector specifically can and wishes to control, clearly depends on special knowledge of the institutions in each member of the LINK and there is no reason to suppose that a list of such variables will be uniform for each member.

(c) *Unchanged Public Sector Policies*

This approach is a much more ambitious one and would entail the introduction of changes in public sector policy parameters in order to influence one or more target variables. In the kind of exercise described by Mr. Hickman, it would be interesting to study the effects of some given corrective action by the public sector in those LINK countries faced with

balance-of-payments deficits without taking on the enormous task of predicting how policy-makers would actually behave if committed to avoiding such deficits. I can imagine that LINK pundits will groan at this suggestion but the development of LINK projects in a form which will arouse the interest and support of policy-makers clearly calls for an approach along these lines.

Reply to Mr. Peacock's Discussion

Hickman, Johnson, and Klein

The purpose of Mr. Peacock's comment is to query the role of the public sector in simulations of the LINK system. He stresses that the multiplier responses to an exogenous shock will depend on the assumptions made about endogenous or exogenous policy actions in the various national models. This is, of course, entirely correct, and explains why we took pains in our papers to note some crucial features of the fiscal and monetary sectors of the various national models insofar as they affect the multiplier results.

The questions raised by Mr. Peacock concerning public policies are relevant, interesting, and important. They were not, however, within the purview of the topics we were asked to analyze for the conference. The contribution by Hickman is concerned with the international transmission mechanism. Such induced domestic policy responses as are built into the national models form part of that mechanism, but discretionary policies do not. It is true that government expenditure was chosen as the variable to be shocked in the simulations, but this was done for the sake of uniformity — government spending is exogenous in most of the models — rather than as a realistic exercise in policy analysis.

The Johnson-Klein simulations deal with *hypothetical* change to a system that is finely tuned to estimate the current realistic state of the world economy. The hypothetical disturbances in wages, raw material prices, or autonomous expenditures are designed to throw light on stability properties and the transmission mechanism; they are not designed to show the consequences of the kinds of public sector policies that interest Peacock. The LINK system and numerical methods of analysis that we have designed are general enough so that policy analysis suggested by Peacock could, in principle, be undertaken.

It is worth mentioning also that the linked economies are not in equilibrium and are not assumed to be. The LINK system is solved and simulated as realistically as possible. That means comparing disturbed solutions with a realistic baseline case for 1973-75. These years are anything but equilibrium situations for the world economy in any of the cases we consider. The models have a solution but with imbalances that are serious departures from equilibrium.

Space limitations prevented more than a brief description of the structures of the national models entering the linked simulations presented in our papers. More details are available in the volume edited by Ball and cited by Hickman, and the complete models will soon be published in a volume edited by Waelbroeck. Generally speaking, however, the various models contain all of the features discussed in Mr. Peacock's second paragraph, including wage and price equations. The actual LINK system is not limited to the simple Keynesian models. These simple models were used by Johnson and Klein purely to illustrate some theoretical issues in an expository way. Their simulations, and those by Hickman, are based on the larger national models actually embodied in the LINK system, and used regularly in individual countries for forecasting with extensive policy analysis.

We are in complete agreement with the suggestion made by Mr. Peacock that it would be interesting to study the effects of unchanged public sector policies in pursuit of one or more target variables, and such studies are high on the LINK research agenda. It will be most welcome if these studies arouse the interest and support of policy-makers in our approach to world modelling through a linked system of national models incorporating important policy instruments and targets. It should be stressed that there is nothing inherent in the structure of the LINK system to prevent our carrying out the kinds of calculations needed to take up Peacock's lines of research; it is only a matter of time involved in our getting round to the precise set of calculations implied.

International Transmission of Economic Fluctuations and Inflation

Bert G. Hickman

This paper is concerned with the international transmission of fluctuations in prices, income and employment. A satisfactory model of the transmission mechanism must embody the income, price and monetary channels by which a disturbance in one country may be propagated abroad. The main channels have been exhaustively analyzed in the literature on balance-of-payments adjustment. Simple two-country models may be used to isolate the effects of induced changes in money stocks and price levels to restore external balance when full employment and fixed exchange rates are assumed. Correspondingly rudimentary Keynesian models may be used to derive static or dynamic income multiplier responses to disturbances originating at home or abroad under conditions of fixed prices and interest rates. Price and income determinants have been considered together particularly in the synthesis of the elasticity and absorption approaches to the analysis of devaluation. An excellent survey of these simplified models may be found in Stern (1973) and there is no point in replicating them here. What can be done with profit is to (a) specify the structural features that should be included in a realistic multinational model of the transmission mechanism for forecasting and policy analysis and (b) present quantitative estimates of international multipliers.

When writing on this subject in 1962, Polak and Rhomberg lamented the lack of national econometric models that could be hooked together into a world model by linking their international trade connections. Since that time an efflorescence of national econometric models has occurred, and many of the best of these have been welded together in a functioning world model under the auspices of Project LINK. The first part of this paper is devoted to a description of the LINK system as it existed in early

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1974 and to an examination of its multiplier properties for the light they may cast on the quantitative aspect of the contemporary transmission mechanism. A concluding section summarizes some alternative theoretical approaches to the analysis of world-wide inflation in relation to the present properties and projected improvements in the LINK system.

In its international aspects the LINK system may be regarded as a generalization and empirical implementation of Metzler's 1950 model of a multiplier region theory of income and trade. Earlier econometric treatments include the models of Beckerman (1956), Polak and Rhomberg (1962) and Morishima and Murata (1972). In comparison with these forerunners, Project LINK features greater geographical detail and a richer collection of constituent national models, especially as concerns sectoral disaggregation and lag structures. As we shall see, the system also differs from its predecessors in the use of a trade matrix instead of bilateral import functions for the international linkage.

The LINK System

At the time of writing, 31 nations or regions are distinguished in the system. Full-blown structural models are included for the following 12 developed market economies: Australia, Austria, Belgium, Canada, France, West Germany, Italy, Japan, The Netherlands, Sweden, United Kingdom, United States of America.[1] Thirteen other developed economies are represented merely by reduced form equations for import quantities and export prices: Denmark, Finland, Greece, Iceland, Ireland, New Zealand, Norway, Portugal, South Africa, Spain, Switzerland, Turkey, and Yugoslavia.[2] The less developed countries (LDCs) are represented by four regional structural models for Africa, Asia, the Middle East, and Latin America.[3] The socialist economies are treated as a self-contained bloc in the world trade calculations, using essentially reduced form trade relationships, as are a few other countries in the "rest of the world."

[1]The models are built and maintained in the following institutions: Reserve Bank of Australia; Institute for Advanced Studies, Vienna; Free University of Brussels (for the Belgian and French models); Institute for the Quantitative Analysis of Social and Economic Policy, University of Toronto; University of Bonn; Instituto di Scienze Economische, University of Bologna; Institute of Economic Research, Kyoto University; Central Planning Bureau, The Hague; National Institute of Economic Research, Stockholm; Econometric Forecasting Unit, London Business School; Economics Research Unit, Wharton School of Finance and Commerce, University of Pennsylvania.

[2]The Bank of Finland has built a structural model for that country which has been added to the system since the simulations reported herein were prepared.

[3]These models were built at the Secretariat of the United Nations Conference on Trade and Development. At the time of writing, the UNCTAD group had completed a number of new LDC models for early incorporation in the LINK system. These include models for Argentina, Brazil, Mexico, the Andean countries, and the rest of Latin America; for India, Ceylon, Bangladesh and Pakistan, Korea, Malaysia, the Phillipines, and the rest of Asia; and for the oil and non-oil regions of the Middle East.

The 12 structural models for developed market economies are the backbone of the LINK system.[4] They are large, disaggregated, demand-oriented dynamic models of Keynesian persuasion. Output in each national model is proximately determined by real effective demand, and most of the models include distributed lag functions for consumer expenditures, business fixed investment, residential construction, inventory investment, imports and exports. In most of the models, inverted short-run production functions, which may or may not incorporate capital stock explicitly, are used to determine employment as a function of output. Wages are usually explained by some version of the Phillips curve, whereas domestic prices are directly determined as a mark-up on unit labor-cost, often with an allowance for varying demand pressures as reflected in an unemployment or utilization rate. With two exceptions (Australia and Germany), import prices are also a direct determinant of domestic prices in the models, since they appear as arguments in some or all of the price equations.

The monetary sectors of the various national models are also specified along Keynesian lines. Investment expenditures, consumption expenditures, or both, are a function of interest rates in most of the models, and several of them include liquid assets in the expenditure functions as well. Because of the importance of monetary policy as an instrument of economic stabilization, and because the money supplies of the various nations may be linked through the balance of payments, it has been agreed that the LINK models should have monetary sectors to determine the money stock and interest rates as endogenous variables unless one or both are exogenous policy instruments. This is true only for Italy, the United Kingdom and the United States in the simulations reported below, however. Bank deposits are endogenous in the Australian and Dutch models but interest rates are not, whereas the reverse is true of the models for Canada and Japan. Both interest rates and money stocks are exogenous in the remaining models. Complete monetary sectors have recently been developed for the Austrian, German and U.K. models but they have not yet been programmed into the LINK system.

With regard to the balance of payments, the national models currently included in the LINK system explain merchandise and service flows, but not capital movements. Work is progressing rapidly in the latter area, however, and complete models of the balance of payments have recently been developed for Canada, Germany, Japan, the United Kingdom and the United States, and soon will be programmed into the system. Meanwhile, simulations with the present system must be evaluated without monetary feedbacks from payments imbalances with other countries.

Prices and quantities of merchandise imports and exports therefore provide the principal connections between the national models in the

[4]The characteristics of most of these models are described and compared in articles by Ball (1973b) and Waelbroeck (1973a).

LINK system as presently constituted.[5] The typical import equation in a national model is[6]

$$m_{ik} = m_{ik}\,(y_i,\ p_{ik},\ p^m_{ik},\ r_i,\ z_i) \qquad (1)$$

where m_{ik} is the real quantity of imports of commodity k into country i, measured in local currency units; y_i is a real activity variable for country i, such as gross domestic product or industrial production; p_{ik} is the domestic price index of close substitutes for commodity k; p^m_{ik} the import price index of commodity k in U.S. dollars; r_i is the exchange rate of local currency in terms of U.S. dollars; and z_i are other variables affecting imports, possibly including lagged values of the dependent or independent variables.

Equation (1) is a structural demand function for imports and is homogeneous of degree zero in prices and incomes in accord with the classical assumption of absence of money illusion. Imports are assumed in infinitely elastic supply, so p^m_{ik} is exogenous to each national model. Close but not perfect substitution is assumed between domestic and imported goods, so the quantity of imports depends on relative prices as shown. The exchange rate r_i is an exogenous parameter, permitting simulations of the effects of devaluations or revaluations on trade flows between countries.[7] All the national models in LINK contain import demand functions for four commodity classes: food and agricultural products (SITC 0+1), raw materials (SITC 2+4), fuel and lubricants (SITC 3) and manufactured products (SITC 5-9).

On the side of exports, one approach would be to obtain the exports of one country from the import demand functions of the other countries. This would be possible for a small system of, say, three of four regional models,[8] but it is impracticable on the scale of the LINK system, since n(n-1) bilateral import demand functions would be needed for each of the m commodities distinguished in a n-country model, and in principle each demand function would depend on mn prices.[9]

As a result of these considerations, it was decided to develop the export demand functions in LINK by a two-step procedure using a utility-tree approach.[10] At the first step, total imports of a given commodity class

[5]See Sawyer (1973), for a discussion of the treatment of invisibles on current account in the LINK system.

[6]For a detailed discussion of the commodity trade equations of the LINK system, see Basevi (1973).

[7]See Moriguchi (1973) for an example relating to the Smithsonian currency realignments in 1971-72.

[8]As an example of such a system, see Polak and Rhomberg (1962).

[9]Cf. Rhomberg (1973).

[10]The basic theoretical structure is set forth in Hickman (1973). It is a modification and generalization of Armington's 1969 trade model.

are determined by the import demand function (1). The quantity of imports so determined is then allocated among the supplying countries by estimated market shares. Let x_{ijk} be the exports of country i to country j for the kth commodity class. Then the total imports of the commodity by country j are $m_{jk} = \Sigma_i\, x_{ijk}$, and the market shares are $\alpha_{ijk} = x_{ijk}/m_{jk}$. Given the α coefficients and the predetermined import quantities, the exports of country i are:

$$x_{ik} = \sum_j x_{ijk} = \sum_j \alpha_{ijk} m_{jk}.$$

The share coefficients do not remain constant from period to period, however, and in the LINK model the current shares are a function of relative export prices and time. Thus the export demand function for country i and commodity k is

$$x_{ik} = x_{ik}(\alpha^o_{ilk} \ldots \alpha^o_{ink},\ p^x_{ik},\ p^{xc}_{ik},\ t,\ m_{lk} \ldots m_{nk}) \qquad (2)$$

In this expression the α^o_{ijk} are base period market shares, p^x_{ik} is the export price of commodity k from country i, and p^{xc}_{ik} is a weighted index of competing countries' export prices as faced by country i.[11]

The trade system is completed by two sets of price equations for exports and imports. The export prices are endogenously determined in each national model. If perfect competition were assumed, they would be ordinary supply functions normalized on price, but in the LINK models they are more apt to be price mark-up equations. Prices of competing exports sometimes appear as explanatory variables, and other variables appearing in various combinations in the several models include labor costs, raw material prices, and utilization indexes.[12] At present, export prices are disaggregated in only a few of the LINK models, but separate price equations are under development for each model on the same SITC breakdown as used in the import side.

The import price indexes are weighted averages of the export prices, with weights given by the same market share coefficients used to allocate import quantities:

$$p^m_{jk} = \sum_i \alpha_{ijk}\, p^x_{ik}.$$

[11]See Hickman (1973) for the theoretical derivation of the weights for P^{xc}_{ik}. Alternative formulations of equation (2) are discussed in Klein et al (1972), Moriguchi (1973), and Hickman and Lau (1973). The complete version of equation (2) was used only for manufactured products in the simulations reported below. The current-price market shares were held constant for the other commodity groups, which amounts to assuming a unitary elasticity of substitution with respect to changes in relative export prices.

[12]See Basevi (1973), pp. 269-73.

The four regional models for developing countries (Africa, Asia, Middle East, and Latin America) are designed to bring out the essential features which distinguish the developing countries from the industrialized ones.[13] First, real GDP is supply-determined in the Asian and Latin American models because constraints from imported capital goods and raw materials are assumed to be binding. Second, apart from the Middle East model, the import functions differ from those of industrialized countries because they include the level of foreign exchange reserves as a restraint on import demand. Exchange reserves are endogenous in the African model but exogenous for Asia and Latin America. Third, the LDC models differ in their treatment of money and prices. Domestic prices are determined by capacity utilization, import prices, and the ratio of money stock to GNP, with export prices in turn a function of the domestic price level and export volume. The money stock is exogenous and interest rates are excluded from the models. This approach to price determination is not entirely along quantity-theory lines, however, since the liquidity ratio is only one argument in the price equations and there is no explicit demand function for money in the models.

As mentioned earlier, the remaining industrialized countries and the socialist economies figure in the world trade solutions through reduced-form trade equations, but the absence of structural models precludes measurement of multiplier effects on GNP and prices for those areas. Multipliers may be calculated for the regional LDC models, but none are presented herein because of the absence of country detail and because the models were structured for forecasting purposes rather than simulation exercises.

Details of the solution algorithm for the entire world system of linked national and regional models are to be found in several publications, and will not be discussed here.[14] It is sufficient to note that for a given set of domestic predetermined variables in the several national models and a given set of exchange rates, the system can be solved for all endogenous variables including a consistent set of trade flows and export and import price indexes, and satisfying the world trade constraint that $\sum_i x_i = \sum_i m_i$ as well as all domestic constraints.

It is apparent that the LINK system provides a number of channels for the international propagation of disturbances originating in a particular country. An exogenous change in domestic expenditure, for example, will affect domestic incomes and prices, which in turn will affect incomes and prices abroad directly by changing the export demands and import prices of other countries and indirectly by the consequential induced movements of incomes and prices in those countries. The price

[13]See Ball (1973a), Ch. 6, especially pp. 170-76.

[14]A sampling includes Klein and van Peeterssen (1973), Waelbroeck (1973b), and Moriguchi (1973).

linkages include direct effects — prices of imported materials are determinants of domestic prices in many of the models — as well as indirect connections via the influence of aggregate demand on wages and prices through the wage and mark-up equations. The magnitude of the induced responses at home and abroad will depend on the various elasticities and propensities in the models and cannot be inferred analytically in such a large and interdependent system. They can be estimated numerically by multiplier techniques, however, and some simulations of the system are presented and discussed in the next section.

The International Income Multipliers

Own and cross-country income multipliers for many of the countries included in the LINK system ar presented in this section. These are dynamic multipliers for a three-year span. They are computed as follows. A dynamic control solution is calculated first for the entire linked system. Exogenous expenditures are then increased in country A and maintained at the higher level over the same three-year interval, and a new solution obtained. The induced changes in incomes and prices in all countries are then calculated as the difference between the control and shocked solutions. The procedure is repeated with separate shocks in countries B, C, . . ., in order to provide a matrix of own- and cross-country multipliers for each of the three years. These are standard procedures for non-linear models in which an explicit reduced-form solution does not exist. Like all non-linear multipliers, the numerical results may differ according to the initial conditions and the magnitude of the shocks. The present set is based on a control solution for 1973-1975.

Multipliers are usually presented as marginal responses per dollar of increase of autonomous expenditure. Thus, in the case of impact of single-period multipliers, one might calculate:

$$k_{ij} = \frac{\Delta Y_j}{\Delta A_i}, \tag{4}$$

where ΔA_i is the autonomous expenditure change in country i, ΔY_j is the induced income response in country j, and the own-country multipliers obtain when $i = j$. This formulation does not allow for differences in size among the various countries, however. It measures the absolute income change in j induced per unit of expenditure change in i, but it does not indicate whether the income increment in j is large or small in relation to j's income level. A preferable measure is given by the elasticity multipliers:

$$K_{ij} = \frac{\Delta Y_j}{Y_j} \Big/ \frac{\overline{\Delta Y_i}}{Y_i}, \tag{5}$$

where $\Delta\overline{Y}_i = \Delta A_i$ is the autonomous income change in country i. Expression (5) gives the percentage change in the income of country j induced by a given autonomous percentage change of income in country i. When i = j, (5) reduces to (4), so that the own-country absolute and elasticity multipliers have the same value. When $i \neq j$, however, we see that

$$K_{ij} = \frac{\Delta Y_j}{\Delta \overline{Y}_i} \cdot \frac{Y_i}{Y_j} = k_{ij}\, y_{ij}\,, \qquad (6)$$

where y_{ij} is the ratio of incomes in countries i and j. Thus the cross-country elasticity multipliers are larger or smaller than the absolute cross-country multipliers according to whether income in the disturbing country is greater or smaller than in the disturbed country. An apparently small multiplier in absolute terms may actually imply a substantial relative income change when a small country is disturbed by a shock from a large country, and vice versa.[15]

A shock of 10 to 15 percent of GNP or GDP was employed in all simulations except for Canada and the United States, for which 1 percent was used.[16] Wherever possible the shock was applied to government expenditure, but in a few cases, another component of aggregate demand was perturbed. For Austria, Canada, Germany, Italy and the United States the shock was applied to current dollar expenditure, and for other countries, to real expenditure. In the former cases, the income multipliers were converted to constant prices for greater comparability with the other models. These are particular examples of a general problem in comparing simulations for different models, since it is seldom possible to impose a completely uniform set of shocks on models with differing structural specifications.

The multiplier estimates may also be sensitive to the lack of uniformity in the monetary sectors of the models. For the models with endogenous interest rates (Canada, Italy, Japan, the United Kingdom and

[15]Elasticity multipliers could also be defined with respect to the percentage change in autonomous expenditure itself:

$$\frac{\frac{\Delta Y_j}{Y_j}}{\frac{\Delta A_i}{A_i}} = k_{ij}\, a_{ij}$$

where a_{ij} is the ratio of autonomous expenditure in country i to income in country j. The formulation in the text is preferable in that it standardizes the autonomous shock according to the size of GNP and is not affected by differences among countries in the shares of autonomous expenditures in GNP.

[16]Shocks of 10 percent for Canada and the United States were too large to yield usable solutions.

the United States), the own-country multipliers implicitly assume the absence of an accommodating monetary policy to keep interest rates constant as government expenditures are incremented, so that some "crowding out" of private investment or consumption expenditure will mitigate income expansion, whereas this is not true of the models with exogenous interest rates. Similarly, the cross-country multipliers will be affected by these differences insofar as both the magnitudes of external impulses from differing countries, and their own response mechanisms, are modified by monetary influences.

No multipliers may be presented for the Netherlands model, owing to technical programming difficulties. The own-country dynamic income multipliers for the 11 remaining models are presented in Table 1. The impact multipliers range between zero and two.[17] Apart from the models for

Table 1

Elasticity Multipliers for Income, Own-Country, Three Years

(Percentage income change per unit percentage income shock in same country)

Country	First Year	Second Year	Third Year
Austria	.79	1.14	1.86
Belgium	1.10	.98	.86
France	1.21	1.19	1.22
Germany	.98	1.38	1.20
Italy	1.30	1.51	1.80
Sweden	1.12	1.12	1.12
United Kingdom	1.24	1.69	1.51
United States	1.18	1.87	2.58
Canada	1.15	1.15	.79
Japan	1.18	1.50	1.50
Australia	.79	.71	1.03

[17]These impact multipliers include feedback effects from other countries. A separate calculation excluding the international feedback linkages yields virtually the same values: Austria, .75; Belgium, 1.10; France, 1.20; Germany, .94; Italy, 1.29; Sweden, 1.09; United Kingdom, 1.17; United States, 1.19; Canada, 1.08; Japan, 1.12; and Australia, .79. Insofar as own-multipliers are concerned, therefore, induced feedbacks from abroad may safely be ignored in individual national models, as concluded earlier by Morishima and Murata (1972).

France and Sweden, the multipliers change over time in dynamic simulations owing to lagged responses in the behavioral equations. The typical pattern shows rising income multipliers over the three-year horizon (Austria, Italy, United States, Japan). The multipliers for Belgium and Canada decrease over time, however, whereas those for Germany, the United Kingdom and Australia oscillate.[18]

The full multiplier matrices for three years are presented in Tables 2-4. These tables contain a wealth of detail that can only be extracted by close inspection on the reader's part. Some general observations and conclusions may be offered, however.

The own-multipliers from Table 1 are reproduced on the main diagonals of the new tables for convenient comparison with the cross-country effects. The cross-country impact multipliers are much smaller, with many values close to zero. A cross-country value of .1 is in an important sense as large as an own-country multiplier of 1.1, however, since the latter includes an autonomous income shock of 1 percent which is excluded from the former. Viewed this way, many of the cross-country multipliers imply a substantial induced income response to disturbances from abroad. Again it is found that the cross-multipliers vary over time as lagged effects work through the system.

The magnitude of the cross-country effects is partly determined by the trade relationships connecting each pair of countries. A country with a high marginal propensity to import and an inelastic supply of exports will transmit large shocks abroad. Its trading partners will receive these shocks in proportion to their importance as suppliers of its imports and demanders of its exports. Thus one expects to find relatively large cross-multipliers between countries with close trade ties, as between Germany and its European trading partners and between Canada and the United States. The cross-multipliers are also affected by the own-multipliers of the initiating and receiving countries, however, and these are dependent on internal as well as external leakages. One may mentally control this effect in scanning Tables 2-4 by dividing the cross-multipliers in a given row by the own-multiplier for that row. The resulting normalized cross-multipliers will more nearly isolate the basic trade relations among the various countries.

Another factor influencing the cross-elasticity multipliers is the relative size of the two countries in question. Thus, despite its low absolute import propensity, the United States has a fairly substantial impact on

[18]Government expenditure is partly endogenous in the German model, owing to lagged terms for induced increases in tax revenues and the rate of change of GNP. If the endogenous increments in government expenditure are included, the multipliers for the second and third years become respectively 1.75 and 1.94. The values in Table 1 are corrected for the induced increase in government expenditure for greater comparability with other countries. A similar correction was made for induced government spending in the Austrian model.

Table 2

International Elasticity Multipliers for Income, First Year

(Percentage income change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.79	.01	.01	.03	.02	.03	.02	.00	.00	.00	.00
Belgium	.01	1.10	.01	.01	.01	.01	.01	.00	.00	.00	.00
France	.03	.08	1.21	.04	.07	.06	.04	.01	.02	.01	.01
Germany	.16	.18	.08	.98	.19	.17	.10	.04	.05	.04	.03
Italy	.04	.03	.02	.02	1.30	.04	.03	.01	.02	.01	.01
Sweden	.01	.01	.00	.01	.01	1.12	.01	.00	.00	.00	.00
United Kingdom	.02	.03	.01	.02	.03	.09	1.24	.01	.03	.01	.02
United States	.05	.05	.02	.04	.08	.10	.08	1.18	.31	.13	.03
Canada	.03	.02	.01	.02	.03	.05	.05	.08	1.15	.02	.02
Japan	.01	.01	.00	.01	.01	.02	.02	.02	.02	1.18	.04
Australia	.01	.01	.00	.01	.01	.02	.03	.01	.01	.02	.79

Table 3

International Elasticity Multipliers for Income, Second Year

(Percentage income change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	1.14	.02	.01	.03	.04	.04	.03	.01	.01	.01	.01
Belgium	.01	.98	.01	.01	.02	.02	.02	.01	.01	.01	.00
France	.03	.07	1.19	.05	.08	.05	.05	.02	.01	.01	.01
Germany	.39	.35	.16	1.38	.42	.35	.25	.11	.10	.09	.07
Italy	.07	.04	.03	.03	1.51	.06	.06	.03	.02	.02	.02
Sweden	.02	.01	.00	.01	.01	1.12	.02	.01	.01	.01	.00
United Kingdom	.06	.05	.02	.03	.06	.14	1.69	.04	.06	.03	.04
United States	.11	.09	.04	.08	.17	.19	.21	1.87	.56	.27	.09
Canada	.05	.02	.01	.03	.05	.07	.09	.12	1.15	.05	.04
Japan	.02	.02	.01	.01	.02	.04	.04	.04	.04	1.50	.08
Australia	.02	.01	.01	.01	.02	.03	.05	.02	.02	.03	.71

Table 4

International Elasticity Multipliers for Income, Third Year

(Percentage income change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	1.86	.03	.02	.06	.07	.07	.05	.02	.01	.01	.01
Belgium	.02	.86	.01	.02	.02	.02	.02	.01	.00	.01	.00
France	.03	.08	1.22	.06	.11	.05	.04	.01	.00	.00	.01
Germany	.78	.66	.21	1.20	.81	.73	.53	.26	.35	.18	.24
Italy	.12	.05	.04	.05	1.80	.09	.08	.05	.03	.03	.04
Sweden	.03	.01	.01	.01	.02	1.12	.02	.01	.00	.01	.00
United Kingdom	.09	.05	.02	.04	.08	.14	1.51	.05	.05	.03	.06
United States	.24	.15	.06	.14	.31	.33	.35	2.58	.86	.40	.24
Canada	.07	.02	.01	.03	.06	.07	.08	.13	.79	.04	.03
Japan	.04	.02	.01	.02	.03	.05	.06	.06	.04	1.50	.13
Australia	.02	.01	.00	.01	.02	.02	.03	.02	.01	.02	1.03

economies abroad owing to its large size. This contradicts the earlier finding of Morishima and Murata (1972), which, however, referred to absolute rather than elasticity multipliers and was based on a much smaller and simpler system of expenditure functions.[19] Note also that these empirical multipliers do not allow for the influence of U.S. deficits on the expansion of international monetary reserves, and hence exclude another potentially powerful propagation channel, as discussed below.

Disturbances originating in Germany would be strong and widely diffused. Other large European countries could have a substantial impact on their close neighbors.

Apart from the caveats expressed in earlier and later portions of this paper, it is important to remember that the multiplier simulations measure only the potential for the spread of disturbances from one country to another, and imply nothing about the origin or size of actual disturbances. It is true that a single country cannot have much impact on the rest of the world unless its cross-multipliers are substantial. Its foreign impact will also depend on the magnitude of its domestic disturbances, however, so that a well-managed economy in which private disturbances were quickly neutralized by policy, and in which disturbances originating in government actions were themselves unimportant, would not be a serious threat to world stability even if its external multipliers were large.

Propagation of Inflationary Impulses

As discussed earlier, the LINK system as presently constituted contains channels by which prices as well as real incomes may be affected by disturbances originating at home or abroad. These include the effects of induced changes in aggregate demand on unemployment and wages and also on profit markups, plus the direct impact of increases in prices of imported goods and materials on domestic prices in most models. In order to measure the strength of these effects we turn to the same simulations as reported in the preceding section and compute elasticity multipliers for prices by dividing the induced percentage change in the price level of country j by the given autonomous percentage change of income in country i.

But what index should be used to measure the general price level for this purpose? Although the GNP deflator is the most general price index available for most economies, it may sometimes understate the impact of foreign developments on domestic prices. Thus, the identity for the deflator is:

[19]Only consumer expenditures and imports are endogenous in their system. Several of the other principal findings of Morishima and Murata are generally confirmed by the LINK results, however.

$$PGNP = \frac{PC(C) + PI(I) + PG(G) + PX(X) - PM(M)}{GNP} \tag{7}$$

with obvious symbols for quantities and prices.

The prices of final goods for domestic sale or export include the costs of imported materials or goods, which accordingly must be subtracted to avoid the inclusion of value added by foreign producers in the national product. This means that, *ceteris paribus*, an exogenous increase in import prices which was passed through to final goods prices without affecting domestic value added would leave the GNP deflator unchanged. This condition is unlikely to be met in practice, however, because of attempts to preserve profit margins as import prices rise. In the LINK models, these influences would be reflected in the coefficients of the import price terms of the equations explaining prices of final demand components.

Even if there were no direct effect of import prices on domestic value added, however, the GNP deflator could respond to foreign shocks in the general equilibrium context of this paper, for two important reasons. First, changes in consumer prices will induce wage increases in the models for Austria, France, the United States, Canada and Japan. Second, in the present simulations, the external shock to import prices will be accompanied by a simultaneous external shock to export demand, and the consequent expansion of real income will tend to raise domestic wages and prices independently of the exogenous import price increase.

All this means that the GNP deflator may rise either more or less than an index of prices of final goods under inflationary shocks from abroad, depending on the response mechanism as modelled. The elasticity multipliers for prices presented in the following tables are derived from the GNP deflators. However, some additional calculations were done for comparative purposes and are reported in Appendix A. They are based on the following deflator for final expenditures:[20]

$$P = \frac{PY(Y) + PM(M)}{Y + M} \tag{8}$$

Although calculated by formula (8), the new deflator is readily seen to equal

$$P = \frac{PC(C) + PI(I) + PG(G) + PX(X)}{C + I + G + X} \tag{9}$$

a weighted average of the components of final expenditures for domestic use and export. Since 9 of the 11 models allow for the direct effects of import price increases on one or more of the sectoral deflators in equation

[20]This form was suggested to me by Lawrence R. Klein.

(9), the calculations using the expenditure price index should reveal any substantial bias from using the GNP deflator as an index of inflation, although leaving open the possibility that the strength of the direct price linkages themselves may be underestimated in the models.

It is convenient to study the own-multipliers for the GNP deflators before considering the cross-effects. Table 5 reveals a wide disparity in the estimated sensitivity of prices to domestic expenditure shocks in the various national models. In two cases, prices actually fall in response to the simulated increase in autonomous demand. (1) In the French model the decline results from a decrease in unit labor cost owing to a low estimated elasticity of labor input with respect to output. Thus, even though wages increase in response to higher production and employment, prices fall because of the large induced improvement in labor productivity. (2) The straight-time money wage is exogenous in the forecasting version of the U. K. model used in these simulations, so that the impact effect of the real income increase is to reduce prices by raising output per man-hour. Overtime earnings increase in subsequent years, however, thereby raising unit labor costs and prices despite the fixed wage rate. At the time of writing, a new U. K. model has been substituted in the LINK system, but the calculations could not be redone for this paper. Among other new features, the revised model includes an endogenous wage equation, so that future simulations will incorporate induced wage-price interactions.

Table 5

Elasticity Multipliers for Prices, Own-Country, Three Years

(Percentage price change per unit percentage income shock in same country)

Country	First Year	Second Year	Third Year
Austria	.20	.39	.75
Belgium	.07	.13	.09
France	-.08	-.83	-1.73
Germany	1.10	2.02	2.38
Italy	.08	.05	.38
Sweden	NA	NA	NA
United Kingdom	-.36	-.12	.63
United States	.31	.29	.69
Canada	.03	.69	1.30
Japan	.04	.04	.10
Australia	.12	.24	.18

The largest price response to domestic expansionary shocks is found in the German model. The impact effect of demand on prices is small in the Canadian model, but it builds to a high value in the second and third years. The models for Belgium, Japan and Australia imply considerable price stability at the capacity levels assumed in the control solutions, whereas Austria, Italy (in the third year), and the United States occupy an intermediate position.

With regard to price changes induced by disturbances from abroad, it is apparent from Table 6 that they are usually negligible in the first year. They become somewhat larger in subsequent years, and in some cases assume substantial proportions, as in the special relationship of the U. S. and Canadian economies and several less spectacular examples. For two countries — Germany and Canada — the cross multipliers for prices are usually larger than for real incomes, just as was true of the own-multipliers for these models. Generally speaking, however, as modelled in the LINK system, the international propagation of price disturbances through trade channels is weaker than for real incomes. This conclusion is also supported by the results for the alternative price indexes in Appendix A.

Apart from the basic finding that price responses to external shocks are generally small, it will be noted that for some countries they are frequently or always negative. The negative response for the United Kingdom is due to the exogenous treatment of wage rates, as previously discussed. The reasons for other negative signs can be ascertained without a detailed investigation of the individual models and their response mechanisms, a task which cannot be undertaken here. However, one possibility — that the negative changes in the GNP deflators are due to the subtraction of import proceeds from final expenditures in equation (7) — is discussed in Appendix A, where it is shown to be an incomplete explanation of the observed behavior.

In conclusion, the foregoing simulations suggest that the observed worldwide inflation of recent years should not be attributed to the spread of demand impulses from one or two dominant countries via foreign trade in merchandise, since the cross-multipliers for prices are generally small. Transmission of cost-push inflation conceivably could be stronger, however, especially if the exogenous shock to wages or prices were accompanied by accommodating demand policies to prevent an induced fall in real income. Unfortunately, the present simulations cast little light on this question, since the observed price responses are normalized on income shocks and are heavily influenced by propagation through income-induced increases in export demands as well as by the concomitant increases in foreign trade prices.

Even the conclusion that the international propagation of inflation from demand impulses is generally weak, may be wholly or partly reversed by improvements now underway in the LINK system, including the incorporation of international capital flows and domestic monetary sectors and improved explanations of commodity prices and linkages. There

Table 6

International Elasticity Multipliers for Prices, First Year*

(Percentage price change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.20	.00	.00	.03	.00	NA	.00	.00	.00	.00	.00
Belgium	.00	.07	.00	.02	.00	NA	.00	.00	.00	.00	.00
France	.00	-.01	-.08	.05	-.01	NA	-.01	.00	.00	.00	.00
Germany	.02	-.02	.01	1.10	-.03	NA	-.02	.01	.00	.00	-.01
Italy	.00	.00	.00	.03	.08	NA	-.01	.00	.00	.00	.00
Sweden	.00	.00	.00	.01	.00	NA	-.01	.00	.00	.00	.00
United Kingdom	.00	.00	.00	.02	-.01	NA	-.36	.00	.00	.00	.00
United States	.01	.00	.01	.05	-.01	NA	.00	.31	.00	-.02	-.01
Canada	.01	.01	.01	.02	.00	NA	.00	.01	.03	.01	-.01
Japan	.00	.00	.00	.01	.00	NA	.00	.00	.00	.04	-.01
Australia	.00	.00	.00	.01	.00	NA	-.01	.00	.00	.00	.12

(*) Price index is implicit deflator for GNP or GDP.

NA — Not available.

Table 7

International Elasticity Multipliers for Prices, Second Year*

(Percentage price change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.39	.00	.00	.05	-.01	NA	-.01	.00	.00	.00	.00
Belgium	.00	.13	.00	.02	.00	NA	-.01	.00	.00	.00	.00
France	.00	.01	-.83	.06	-.01	NA	-.01	.00	.01	.00	.00
Germany	.04	-0.5	.00	2.02	-.05	NA	-.04	.01	.03	-.01	-.02
Italy	.00	.00	-.01	.05	.05	NA	-.01	.00	.01	.00	-.01
Sweden	.00	.00	.00	.02	.00	NA	-.01	.00	.00	.00	.00
United Kingdom	.01	-.01	.00	.06	-.01	NA	-.12	.00	.03	.00	-.02
United States	.01	-.01	.00	.11	-.02	NA	-.06	.29	.17	-.03	-.03
Canada	.00	.02	.01	.04	.00	NA	-.06	.02	.69	.01	-.02
Japan	.00	.00	.00	.02	.00	NA	-.01	.00	.01	.04	-.02
Australia	.00	.00	.00	.01	.00	NA	-.01	.00	.01	.00	.24

(*)Price index is implicit deflator for GNP or GDP.

NA — Not available.

Table 8

International Elasticity Multipliers for Prices, Third Year*

(Percentage price change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.75	.00	.00	.08	.00	NA	.00	.00	.03	.00	-.01
Belgium	.00	.09	.00	.03	.00	NA	.01	.00	.02	.00	.00
France	.00	.03	-1.73	.08	.04	NA	.02	.01	.02	.00	.00
Germany	.14	-.29	.10	2.38	-.14	NA	-.05	.03	.10	-.01	-.10
Italy	.02	-.01	-.01	.09	.38	NA	.01	.00	.03	.00	-.01
Sweden	.01	.00	.00	.02	.00	NA	.01	.00	.01	.00	.00
United Kingdom	.03	-.01	.01	.11	.01	NA	.63	.01	.09	.00	-.04
United States	.04	-.01	.02	.23	.01	NA	.00	.69	.64	-.03	-.10
Canada	.01	.02	.02	.06	.01	NA	.00	.04	1.30	.01	-.03
Japan	.00	-.01	.00	.03	.00	NA	.00	.01	.03	.10	-.03
Australia	.00	.00	.00	.02	.00	NA	.02	.00	.03	.00	.18

(*) Price index is implicit deflator for GNP or GDP.

NA — Not available.

is scope within the present system for at least a partial explanation of world-wide inflation owing to synchronization of disturbances across many countries, however, with induced trade flows serving to amplify and reinforce the common impulses.

In the first place, the own-country price multipliers are predominantly finite and positive, as we have seen. Thus domestic price levels do respond to demand stimuli in the LINK country models, and a set of synchronized demand shocks would generate synchronized price inflation in the various models. Synchronized autonomous shocks to the wage equations would also result in widespread price increases, although real incomes would probably fall if expansionary fiscal and monetary policies were not assumed as a complement to the cost-push from the wage side. In their paper "Stability in the International Economy: The LINK Experience," also included in this conference volume, Johnson and Klein report on several simulations with synchronized shocks and show how the effects are amplified in the linked solutions.

If world-wide price inflation is indeed due largely to synchronized impulses rather than transmission via trade flows or some other mechanism, two further questions must be asked. First, why should the shocks in the various countries be synchronized? Second, what assures the provision of sufficient additional liquidity to support the price increases?

Several plausible hypotheses may be advanced with regard to the synchronization of shocks, although it is beyond the scope of this paper to assess their likely importance or to test them empirically.

1. International political events may affect many countries simultaneously. Recent potent examples are the Vietnam War and the oil embargo and OPEC price increases.

2. The widespread political commitment to full employment in the industrialized economies implies a rather continuous use of expansionary fiscal and monetary policies in the several countries. To the extent that fluctuations in real income are synchronized by the international multiplier mechanism, so also will tend to be variations in the intensity of use of fiscal and monetary instruments to augment or diminish demand. Demand policy may be expected to be expansionary in most years, however, because of the full employment commitment.

3. Synchronization of wage and price increases in imperfect markets may result from the activities of international labor organizations and multinational corporations. Widespread attempts to implement incomes policies in the western democracies may have increased labor's relative income consciousness and augmented the tendency toward synchronization of cost-push pressures.

Whatever the degree and importance of synchronization of shocks from these and other sources, it remains true that their inflationary effects could be offset by restrictive monetary policies. If the money supply is expanded in the interests of full employment policy, either as a direct demand stimulus or to accommodate inflationary impulses from the private

or foreign sectors, the liquidity is provided to sustain the higher price level. Even allowing for induced variations in income velocity, there is some degree of restraint on the money supply that would prevent the price level from rising. At bottom, then, the explanation for inflation rests on those motivations which determine the unwillingness of monetary authorities to curb inflation. These motivations include, but may not be restricted to, the unwillingness to augment unemployment and reduce real incomes in order to restrain prices.

Alternative Approaches and Weak Links

The domestic challenge of Keynesian models by the monetarists has also spilled over into the international sector. According to Mundell and Johnson, for example, the world-wide inflation since 1965 is the consequence of excessive growth of the world money supply, which in turn is attributed to the chronic U.S. balance-of-payments deficit and the resulting growth of international dollar reserves.[21] That is to say, in this view, the United States was not subject to balance-of-payments discipline and the Federal Reserve could and did pursue an inflationary monetary policy which led the public to export the excess supply of money through the payments deficit.

Using a small general equilibrium model of an open economy in which markets for goods and services, bonds, and money are distinguished, it can be shown that the balance of payments is equal to the excess demand for (domestic) money less the amount of money created by the bond purchases of the banking sector. (Komiya, 1969) The counterpart to a positive excess demand for money must be an excess supply of goods, bonds, or both, leading to corresponding surpluses on current account, capital account, or both, and thereby enabling the private sector to acquire foreign exchange for conversion into the desired increment in domestic money balances. Conversely, if the monetary authority creates an excess supply of money, the result must be a balance-of-payments deficit at home and hence an inflationary flow of reserves into one or more surplus countries abroad. Frequently, money only is made to matter in these models by assuming continuous full employment and perfect world-wide markets for tradable goods and services and for capital, so that the individual country has no control over prices or interest rates and the only equilibrating mechanism affecting the balance of payments consists of the induced changes in the money supplies of deficit and surplus countries, which eventually restore portfolio balance at the fixed levels of prices and interest rates.

One need not accept the most extreme assumptions of the monetarists in order to agree that the monetary implications of external surpluses and

[21]See the panel discussion on world inflation in Claassen and Salin (1972), especially pp. 310-313 and 323-324, and also Johnson (1972), Ch. III.

deficits should be incorporated into any complete model of the transmission mechanism. Those LINK models which already include a monetary sector to determine the nominal money stock and interest rates generally assume that the central bank has control over the monetary base, so that an independent monetary policy may be pursued, if desired, by sterilizing the effects of inflows and outflows of international reserves on the domestic money supply. The capacity for sterilization is certainly finite, however, and it would be well to model the process by incorporating complete balance-of-payments sectors in the national models so as to allow explicitly for flows of international reserves and their effect on the monetary base and monetary policy. As mentioned above, it has been agreed among LINK participants to push ahead as rapidly as possible on the monetary and balance-of-payments sectors of the national models, but the LINK system as represented in the simulations reported herein is incomplete in these respects. In view of the contemporary importance of the Eurodollar market for international finance and interest rates, it will probably be necessary to model it as well as the domestic monetary sectors. Once all models have complete monetary and balance-of-payment sectors, multiplier simulations can readily be made for exogenous changes in the monetary base in order to test some of the monetarist assertions about monetary mismanagement as the fundamental cause of world inflation.

With regard to external determinants of domestic inflation, three principal transmission channels have been discussed thus far: the direct impact of import prices on domestic prices, the indirect multiplier effects of export demands on domestic incomes and prices, and the indirect effects of reserve inflows on the money supply and hence on domestic incomes and prices. The "Scandinavian" model of imported inflation suggests a fourth channel involving export prices.

According to this model,[22] an economy is divided into an export sector which is competitive in world markets and a sheltered domestic sector which is not. Given a fixed exchange rate, prices in the export sector must follow the world export price level. Money wages in the export sector are then determined by export prices and by productivity growth in the export industries, assuming a bargaining mechanism for a constant wage share. The sheltered sector must match this rise in money wages to retain its labor force, but its prices rise even faster than in the export industries, owing to its generally slower rate of productivity growth. Hence the domestic price level is geared to that of internationally traded goods and services, but the domestic inflation rate is higher than the rate of inflation of tradable commodities.

With regard to the LINK system, the models for several countries — Italy, the Netherlands, Sweden and the United Kingdom — incorporate the first part of this mechanism, in the sense that the price of competing exports appears in their own export price equations. Wage rates are not, however, determined by prices and productivity in the export sector in

[22]This discussion is based on Edgren et al (1969), as summarized in Artis (1971).

these models. Presumably if future research validates the hypothesis for particular countries, it will be incorporated in the relevant models in the LINK system. The most likely candidates are small, highly open economies which are essentially price takers selling their basic commodities in competitive world markets, rather than the generality of industrial countries.[23]

The proposition that export prices are set in world markets is a basic ingredient of the "Scandinavian" model, as we have just seen. Presumably the proposition applies with greatest force to homogeneous commodities for which organized world markets exist, and for such commodities, world price determination has implications surpassing those stressed in the Scandinavian model itself.

By and large, export prices are internally determined in the national and regional models in the present LINK system. This is doubtless basically correct for manufactured goods, but it is certainly questionable for foods, fuels and raw materials. What is needed for price determination in these categories are commodity models transcending national boundaries and aggregating international supplies and demands for the given product. The need has been recognized for several years and a few working papers on the subject have been circulated at LINK meetings, but financial constraints have inhibited progress to date. The commodity models would be overlaid on the present LINK system to receive demand variables from the consuming countries and to feed back commodity prices for use in the import functions and domestic price equations of the country models. In this way the system could deal directly with such powerful sectoral inflationary pressures as the run-up of food prices owing to widespread crop failures in 1972-73 and the administered price increases for petroleum in 1973-74. Such sectoral price increases need not result in general inflation, of course, so the effects on the overall price level would depend also on the policy responses of the monetary and fiscal authorities.

If cartels continue to evolve for basic materials, the relevant commodity models must attempt to establish the limits for administered prices rather than provide point predictions for market clearing prices in a competitive framework. International political considerations will also be involved in price determination. Just as in the case of, say, domestic wage-push inflation, the international struggle for income-redistribution from the industrialized developed nations to the developing, raw material producing countries, has varying implications for the absolute price level as well as for relative prices, depending on policy responses around the world.

[23]McKinnon (1972) has also stressed the effects of productivity growth on the relative prices of internationally traded goods and other goods and services. Assuming that international commodity arbitrage keeps the (dollar) prices of tradables tied together fairly closely, he argued that the world (export) price level was essentially set by the U. S. price level as long as the world was on a dollar reserve standard. This view does not restrict the model to the "small country" case, since large economies other than the reserve currency country have internal overall inflation rates that depend on (1) the inflation rate of tradables in the reserve country, and (2) their own rates of productivity growth.

Finally, the reader will recall that exchange rates are exogenous in the present LINK system. The multiplier properties might be very different under a system of floating rates.[24] Freely floating rates could insulate the domestic money supply and price level from incipient surpluses or deficits in the balance of payments and facilitate the pursuit of independent fiscal and monetary policies. Destabilizing exchange speculation and cost-push domestic inflation induced by import price increases for a depreciating country are also possible, however. In any event, the stability properties of a flexible exchange regime cannot be investigated with the LINK system until capital flows and exchange rates are endogenized. In the likely event of floating but partially managed rates, the constituent national models would have to explain official reserve changes as well as exchange rates.

[24]For an interesting comparison of multipliers under alternative exchange regimes, see Rhomberg (1964).

Appendix A

The purpose of this appendix is to examine the relationship between the implicit price deflators for GNP (PY) and final expenditure (PT) and to report price multipliers based on the latter indexes.

The formula for the deflator for final expenditure is repeated here for convenience:

$$PT = \frac{PY(Y) + PM(M)}{Y + M} \qquad (A.1)$$

This expression may be re-arranged as follows:

$$PY = \frac{PT(Y + M) - PM(M)}{Y} \qquad (A.2)$$

Total differentiation of (A.2) yields:

$$dPY = dPT + (M/Y)\,(dPT - dPM) + (PT - PM)Y^{-2}\,(YdM - MdY) \qquad (A.3)$$

The last term measures the direct influence of changes in real income and imports on the relative changes in PY and PT. It is likely to be small since it is the product of two differenced terms and the quotient of squared GNP. (If the average and marginal propensities to import were equal on a *mutatus mutandus* basis — a condition that may be closely approximated in many models — YdM would equal MdY and the income term would be zero.) If the income term is ignored, dPY = dPT whenever dPT = dPM. If dPM > dPT, then dPY < dPT, whereas the reverse is true if dPM < dPT. When the income term is not ignored, the condition for dPY = dPT is more complicated, but it is still possible for dPY to be either smaller or larger than dPT.

A comparison of Tables A-1 — A-3 and 6 — 8 shows that the GNP deflator increases more than the final expenditure index in the simulations for Austria, Germany and Canada, so that the former actually overstates the increase in the latter. The direct cost impact of import price increases is doubtless to increase domestic prices by a lesser amount, but the indirect effects of higher import prices and larger export demands outweigh the direct impact. Further decomposition of the income and price impacts would require knowledge of the reduced forms relating PT , Y and M to the exogenous foreign variables, X (or PX(X)) and PM.

The simulations for Italy, the United States, and Japan reveal smaller price increases as measured by the GNP deflator, but the disparities are minor and the multipliers are weak on either measure.

Tables A-1 — A-3 contain a substantial number of negative entries, although they are less numerous and smaller than in Tables 6 — 8. Thus the earlier negative entries were partly the result of the deduction of import costs from the GNP deflator, but it is clear that domestic prices of final purchases also declined in most of the same instances.

Appendix Table A-1

International Elasticity Multipliers for Prices, First Year*

(Percentage price change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.08	.00	.00	.02	.00	NA	NA	.00	.00	.00	.00
Belgium	.00	.07	.00	.01	.00	NA	NA	.00	.00	.00	.00
France	.00	-.01	-.07	.04	.00	NA	NA	.00	.00	.00	.00
Germany	.02	-.01	.01	.83	-.02	NA	NA	.01	.01	.00	.00
Italy	.00	.00	.00	.03	.07	NA	NA	.00	.00	.00	.00
Sweden	.00	.01	.00	.01	.00	NA	NA	.00	.00	.00	.00
United Kingdom	.00	-.01	.00	.02	-.01	NA	NA	.00	.00	.00	.00
United States	.00	.00	.01	.04	-.01	NA	NA	.30	.00	-.02	-.01
Canada	.01	.01	-.09	.02	.00	NA	NA	.02	.01	-.01	.00
Japan	.00	.00	.00	.01	.00	NA	NA	.00	.00	.05	-.01
Australia	.00	.00	.00	.01	.00	NA	NA	.00	.00	.00	.07

(*) Price index is implicit deflator for final expenditure (equation 8).

NA — Not available.

Appendix Table A-2

International Elasticity Multipliers for Prices, Second Year*

(Percentage price change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.19	.00	.00	.04	.00	NA	NA	.00	.00	.00	.00
Belgium	.00	.11	.00	.02	.00	NA	NA	.00	.00	.00	.00
France	-.01	-.02	-.72	.04	-.02	NA	NA	.00	.01	.00	.00
Germany	.04	-.02	.01	1.41	-.03	NA	NA	.01	.03	.00	-.01
Italy	.00	.00	-.01	.04	.03	NA	NA	.00	.01	.00	.00
Sweden	.00	.00	.00	.01	.00	NA	NA	.00	.00	.00	.00
United Kingdom	.00	.00	.00	.05	-.01	NA	NA	.01	.02	.00	-.01
United States	.00	.00	.01	.09	-.01	NA	NA	.29	.12	-.01	-.02
Canada	.00	.02	.02	.03	.01	NA	NA	.03	.53	.03	-.01
Japan	.00	.00	.00	.02	.00	NA	NA	.00	.01	.04	-.02
Australia	.00	.00	.00	.02	.00	NA	NA	.00	.01	.00	.15

(*) Price index is implicit deflator for final expenditure (equation 8).

NA — Not available.

Appendix Table A-3

International Elasticity Multipliers for Prices, Third Year*

(Percentage price change of country in column induced per unit percentage income shock of country in row)

	Austria	Belgium	France	Germany	Italy	Sweden	U.K.	U.S.	Canada	Japan	Australia
Austria	.42	.00	.00	.06	.00	NA	NA	.00	.01	.00	.00
Belgium	.00	.10	.00	.02	.00	NA	NA	.00	.00	.00	.00
France	-.01	-.06	-1.50	.02	.00	NA	NA	.00	.00	.00	.00
Germany	.13	-.01	.14	1.71	-.07	NA	NA	.04	.09	.00	-.05
Italy	.01	.00	-.01	.07	.30	NA	NA	.01	.02	.01	-.01
Sweden	.00	.00	.00	.02	.00	NA	NA	.00	.00	.00	.00
United Kingdom	.02	.00	.01	.09	.02	NA	NA	.01	.07	.01	-.02
United States	.03	.02	.04	.19	.03	NA	NA	.69	.46	.00	-.05
Canada	.01	.03	.02	.06	.02	NA	NA	.05	.94	.01	-.01
Japan	.00	.00	.00	.02	.00	NA	NA	.01	.02	.09	-.03
Australia	.00	.00	.00	.01	.00	NA	NA	.00	.02	.00	.16

(*) Price index is implicit deflator for final expenditures (equation 8).

NA — Not available.

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Discussion

R. J. Ball

The theory of the international transmission of fluctuations in income and prices has been examined extensively since the nineteen thirties. Inevitably perhaps the number of pages devoted to theory have far outweighed those given to reporting the results of measurement and attempts to put some quantitative skin onto the well-structured bones that our theories have provided. Sometimes we do not always agree about the theory and that heightens the need for more empirical work and testing of the nature of the relationships between countries.

That this is so, however, is not because of any inherent desire to theorize rather than to apply the results of theory but in large part because of the enormity of the task involved in what, in the end, amounts to modelling the economic world at large. We entertain reasonable doubt often about our capacity to reproduce the economic behaviour of small sectors of our economies let alone the economic environment as a whole while in addition the sheer magnitude of the research effort required to model individual economies in any detail before linking them together is extremely inhibiting. It is, therefore, little wonder that the empirical contributions made so far in trying to string the world together have been relatively simplified in structure.

In his paper today, Professor Hickman describes some results with regard to the transmission of changes in exogenous expenditures for several different country models engaged in the research project, Project LINK, and their impacts on incomes and prices in the domestic and the linked economies. The general outline of this project has been described in Ball (1973a) and is briefly summarized by Hickman in his paper. In general terms there is, therefore, little need for further discussion of the project, although one or two specific points are worth underlining as a background to the interpretation of Hickman's results.

The first is that the LINK system is in statistical terms like Jacob's coat of many colours. Some of the structural models contained in the Project are based on annual time series, and some are based on quarterly.

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Some of the models for different parts of the world are not structural at all, but are simply reduced-form expressions. Some of the models have been built relatively explicitly for forecasting purposes in the short term and are obviously used as such, while others are not used or tuned up to be operational on a day-to-day basis. This creates, of course, considerable managerial difficulties which in many respects in my view currently represent the most serious constraints on the speed of development within the Project.

The second point that is related to the first, is that inevitably the models themselves contain many special features and adjustments which operate satisfactorily within the framework of a given forecasting run but which are often less than satisfactory when we turn to the problems of simulation. As a single example one may refer to the fact that in the U.K. model there is no equation explaining the wage rate. Wage rates are forecast as exogenous variables, which may be quite reasonable within the framework of a specific forecast, but as Hickman's results show, produce a comparatively meaningless result with regard to price level effects when simulations are made. Thus, it is fair to say that currently the system as a whole is not tuned up as well as one would hope it will be in the longer run for simulation purposes. Professor Hickman's results must therefore be looked at in terms of a progress report about the kinds of numbers that currently tend to emerge from the machine, from a system that is under continuous development and which is by no means a finished product. The system continues to have weaknesses on other accounts, most of which are referred to in the Hickman paper. Even since the Project was described in Ball (1973b) the individual models have themselves undergone considerable development and there have been further changes even since the Hickman results were generated.

The Nature of the Multipliers

Despite the heterogeneity of the models contained in the LINK system, the structural models for the major industrial countries have many elements in common which have been described at length in Ball (1973b). They are broadly speaking Keynesian-type expenditure models which suggest that, leaving the problem of lags on one side for the moment, the own-country multipliers are related to generalized Keynesian multipliers which include not only income-induced effects, but also effects resulting from changes in prices, monetary variables, and exchange rates, and feedback effects of the changes in these variables in other countries. In the context of balance-of-payments adjustment, multiplier analysis of the open economy has been examined by Stern (1973) while generalized multiplier analysis allowing for both price and monetary effects in a closed economy was presented in an earlier paper by Ball and Bodkin (1963). With some modification it may be useful to extend the results by Ball and Bodkin to the open economy in the case of the static multiplier, adopting in broad measure the assumptions that seem most common to the structural models of the LINK system.

The national income identity in the open economy can, as usual, be written in real terms as

$$Y = C + I + G + X - M \tag{1}$$

where Y = national income, C = consumption, I = investment, G = government expenditure, X = exports of goods and services, M = imports of goods and services. The LINK models do not by and large include monetary variables in the consumption function , so that consumption can in the main be assumed to be a function of income. So we have

$$C = C\,[(1 - t\,(PY))\,Y] \tag{2}$$

where P is the general price level and the function t(PY) reflects the existence of a progressive tax structure.

The bulk of the LINK investment functions are derived from versions of the capital stock adjustment principle, where the optimal stock of capital depends on output and cost of capital variables. For the purpose of short-term analysis, little harm is done by encapsulating the nature of behaviour in the familiar Keynesian investment function (i = rate of interest)

$$I = I\,(Y,i) \quad I_Y > 0 \quad I_i < 0 \tag{3}$$

In general one would expect the volume of imports to depend on both income and relative price, but this is not the case in all the LINK models. Generally speaking where they do exist, import price elasticities are relatively small — in total less than a half. To simplify matters here we express import volume solely as a function of income:

$$M = M(Y) \quad M_Y > 0 \tag{4}$$

Exports, on the other hand, are price sensitive in nearly all the LINK structural models, so we express the export function in the general form

$$X = X\,(P_x, P_w, W) \quad X_{px} < 0,\ X_{pw} > 0,\ X_w > 0 \tag{5}$$

where P_x = export price, P_w = world export price, W = volume of world trade.

The wage and price sector raises certain problems if the treatment of Ball and Bodkin (1963) is to be extended, which demand far greater discussion than can be given here. Consequently I simply follow the general description given by Hickman of the price and wage sectors in most of the LINK models. In particular for short-period purposes the wage price sector is represented by the set of equations

$$P_x = g\,(P, P_w) \tag{6}$$

$$w = w\,(P, Y) \tag{7}$$

where w = average money wage

$$P = P\,(w, Y, P_m) \tag{8}$$

where P_m = import price.

The export price equation relates the export price to the domestic and world price levels. The wage equation is intended to capture the short-term Phillips curve effect through the income variable Y (which implicitly assumes that short-run changes in labor supply are negligible). Equation (8) represents a form of mark-up equation described by Hickman where the activity variable Y is assumed to be positively correlated with average productivity. For the purpose of simplifying the analysis I assume that equations (5) and (6) can be consolidated into

$$X = F\,(P, P_w, W) \quad F_p < 0 \quad F_{pw} > 0 \quad F_w > 0 \tag{9}$$

and (7) and (8) into

$$P = H(Y, P_m) \quad H_y > 0 \quad H_{pm} > 0 \tag{10}$$

This implies the weak assumption that the effect of a rise in the world price on own-country export price is not large enough to offset the positive effect of such a price rise on own-country exports. It implies the stronger assumption in (10) that the net effect of a rise in the level of activity will be to raise domestic prices.

Finally we introduce monetary effects through the familiar equation for monetary equilibrium so

$$L = L\,(PY, i) \tag{11}$$

where L = supply of money. Thus the complete model when finally assembled takes the form

$$Y = C + I + G + X - M$$

$$C = C\,[(1 - t\,(PY))\,Y]$$

$$I = I\,(Y, i)$$

$$X = F\,(P, P_w, W)$$

$$M = M\,(Y)$$

$$P = H\,(Y, P_m)$$

$$L = L\,(PY, i)$$

Given this system generalized multipliers can be devised as in Ball and Bodkin (1963), with the assumption that the system is well-behaved and stability exists. For present purposes it suffices to state and consider certain results. To simplify the multiplier expression we define

$$\alpha_1 = C_y [1 - t(PY) - t_y Y] - C_p t_p Y^2 H_y$$

$$\alpha_2 = I_y$$

$$m_1 = L_{ym} Y H_y + L_{ym} P$$

where $L_{ym} = \delta L / \delta(PY)$.

In this case the government expenditure multiplier in the closed economy can be written in the form

$$\frac{dY}{dG} = \frac{1}{(1 - \alpha_1 - \alpha_2) + m_1(I_i/L_i)} \tag{12}$$

Thus we see that the multiplier can be partitioned into components, part of which is the traditional simple Keynesian income multiplier (allowing for taxation) and part of which represents the monetary effect on the system. In deriving this multiplier it is of course assumed that the quantity of money is held constant by the authorities. It follows that the greater the degree of sensitivity of investment to the interest rate the smaller the multiplier effect is likely to be. Thus strong monetary effects tend to damp down the multiplier and this would be true *a fortiori* if a real balance term were included in the consumption function.

In the open economy with no feed-back into external countries the government multiplier takes the form

$$\frac{dY}{dG} = \frac{1}{(1 - \alpha_1 - \alpha_2) + \beta_1 + m_1(I_i/L_i)} \tag{13}$$

where $\beta_1 = M_y - F_p H_y$

The multiplier in the open economy is of course dampened not only by the leakage in imports, but also by the effect of the rise in domestic activity on export prices. Incorporating feed-back effects on the multiplier when external variables are allowed to vary is not so easy to handle. These effects can be formally if trivially introduced by defining the set of variables k_i as

$$k_{pm} \equiv \frac{dP_m}{dY} \quad k_{pw} \equiv \frac{dP_w}{dY} \quad k_w \equiv \frac{dW}{dY} \tag{14}$$

and expressing the multiplier in the form

$$\frac{dY}{dG} = \frac{1}{(1 - \alpha_1 - \alpha_2) + \beta_1 - f + [(I_i/L_i)(m_1 + m_2)]} \tag{15}$$

where

$$f = F_p H_{pm} k_{pm} + F_{pw} k_{pw} + F_w k_w$$

$$m_2 = L_{ym} H_{pm} k_{pm}$$

The net effect of the feed-back on the sign of the multipliers is *a priori* unclear. The k variables could be expected to be non-negative. On this assumption, taking the terms one by one, one might suspect that the net effect would be to raise the multiplier but the question remains strictly open.

By and large, leaving the lags on one side, it is not unreasonable to treat the LINK system own-country multipliers of being of this general type. It is not always the case that monetary effects are well-treated by the individual countries, and some tendency to overestimate the multipliers may occur as a result of not building in appropriate assumptions about these effects. However, in many of the individual country cases these effects are by and large captured which represents, in principle at any rate, a considerable advance on the earlier work of Morishima and Murata (1972). In their case investment was treated as exogenous, there were no monetary effects, and the effects of taxation were excluded from the calculations. Under these circumstances it is extremely difficult to know what credibility can be assigned to their empirical results.

Empirical Results

Given what has already been said about the heterogeneity of the system it is also difficult to assess the multipliers given by Professor Hickman. It is difficult to test for reasonableness except perhaps to query some of the results that look palpably out of line with other countries and for which no special explanation can be found.

It would appear from the Hickman results that the feed-back effects on own-country multipliers are relatively small. That is to say the f term in equation (15) above is not of great significance. Taking the numbers given for comparison in footnote 17, there is a tendency for the multiplier on balance to be larger with linkage, but not significantly so. This seems to confirm the speculation above that linkage if anything would tend to raise the own-country multiplier. However, it might be worth considering how this conclusion holds over time rather than simply for the one-year multiplier, since the feed-back effects could probably become greater in the longer term.

With regard to the cross-country elasticity multipliers, the assumption would be that countries with obviously closer trading relationships with certain others should have larger mutual effects. The patterns of linkage are not very clear except for the outstanding effect of the U. S. economy on Canadian income. In principal the LINK system should capture the linkages through activity, as in effect the activity variable determining each country's exports is an appropriately weighted average of the import demands of the different component countries.

In response to the specific conclusion drawn by Professor Hickman on the basis of the income calculations, I make only two points. One is that I do not really follow the argument that says that the United States materially affects overseas countries because of its large size. How does one then explain the kind of impact made in these calculations by Germany? Equally, it could be argued that the Australian external effects look relatively large insofar as Australia is of course relatively small. Secondly while it was not possible for Professor Hickman to do otherwise, experience in some cases suggests that a much longer period than three years is required to get to some kind of equilibrium picture. On some future occasion an extension of the period of simulation would be helpful.

Unfortunately, at the present time one must have some doubts as to whether the LINK system adequately captures the essential inter-connections between prices. While there have been attempts in the past to model the interrelationships of income, little work has been done on prices and perhaps the LINK system as it is at present is as good as there is. But as of now, the limitations of the modelling of the monetary flows combined as Professor Hickman points out with a lack of well-developed models for the world's major commodities make it difficult to replicate adequately the recent sharp movements in world prices.

What currently emerges from the LINK system simulation of own-country prices multipliers are indeed positive price effects from shocks to government expenditure (with the exception of the odd cases of France, the Middle East and the United Kingdom). The remaining results are so diverse that it is difficult to say anything very significant. But they tend to confirm the general assumption imposed earlier on the simple model of the economy that $H_y > 0$.

The results as expressed by the cross-multipliers deepen rather than enlighten with regard to the mystery as to international price linkage. Any suggestion that world inflation might result from a concomitant and independent set of exogenous shocks on cost levels within countries does not square with many people's intuition. Hickman concludes that the results suggest that world inflation cannot be attributed to the spread of demand impulses from one or two countries via foreign trade in merchandise. They are certainly consistent with that view but with the admitted non-existence of adequate modelling of both monetary effects and commodity markets it can hardly be a definitive conclusion. Moreover it is likely that the actual course of world prices has been a more complex interaction of

world demand pressures, monetary policies and cost inflation elements than can at present be replicated by LINK systems.

There is, however, a further price simulation which might be of interest. A curious theory has been propounded in the United Kingdom by Neild and others that suggests that a country's balance-of-payments difficulties cannot be attributed to exogenous shifts in the import price level. The crude version of the argument suggests that the deflationary effect of rising import prices will offset the price effect on the current account of the balance of payments. What began as a parochial argument in the context of the U.K. economy is however of wider significance when we come to consider the impact of the rise in the price of oil and its deflationary effects on the economics of the non-oil producing world.

Using the simple model set out earlier it can be shown that the own-country multiplier with respect to import prices (and a second party feedback) can be expressed in the form

$$\frac{dy}{dP_m} = \frac{H_{pm}(F_p + C_p t_p Y^2) - (I_i/L_i)(L_{ym}Y)}{(1 - \alpha_1 - \alpha_2) + \beta_1 + m_1(I_i/L_i)} < 0 \qquad (16)$$

Thus import prices squeeze real income through the effect on export prices, the effect on consumption through fiscal policy and the effect on investment from higher interest rates. It is not easy to apply any immediate orders of magnitude to the individual elements of (16). However, some further insight may be obtained by differentiating the balance-of-payments current account identity

$$B = P_x X - P_m M \qquad (17)$$

which gives us

$$\frac{dB}{dP_m} = \frac{dP_x}{dP_m} X(1 + E_x) - M(1 + E_{pm}E_{my}) \qquad (18)$$

where E_x is the total elasticity of exports with regard to export price. E_{pm} represents the total elasticity of imports with respect to import price, and E_{my} the income elasticity of imports. Clearly the import price simulations for an individual country are crucial to determining the long-term effect of the external price rise, in particular to the extent to which the natural deflationary forces set up by the price increase will offset the impact effect of the price rise on the current account of the balance of payments. There is certainly no *a priori* presumption that the permanent effect on the balance of payments will not be substantial. Strictly speaking, the extent to which this is so would have to be established country by country by simulation. However, in terms of (18), preliminary simulations of the U.K. economy suggest that the total import price elasticity is likely to be of the order of -0.25. If this were a fairly general result across countries, and

given that the income elasticity for most countries is likely to be of the order of 1 — 1.5 it seems *a priori* unlikely that less than half of the impact effect of an exogenous change in import prices on the balance of payments will be avoided.

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Trade, Capital Flows, and Migration As Channels for International Transmission of Stabilization Policies

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In this paper, a model of the economic transmission process is dissected to reveal the separate importance of trade, capital flows, and migration. Our experiments make use of the Canadian quarterly model RDX2 linked to the MPS model of the United States.[1] The simulations extend for eight years, tracing the effects of stabilization policies (mainly changes in Federal Government expenditures) originating in the United States or Canada. Two alternative systems are used to determine the exchange rate linking the Canadian and U. S. dollars; the managed peg exchange system adhered to by Canada between mid-1962 and mid-1970, and a flexible exchange system modelled using data from Canada's experience before 1962 and after 1970.

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[1]References to the two models are given in the Appendix. The project has been the work of many hands over several years. Among the authors of papers noted in the next footnote, Ian Stewart, Fred Gorbet, and Tom Maxwell were especially large contributors. The main participants in the current simulations are J. L. Bolduc, John Lester, and Robert McRae. Financial support from the Canada Council has made the project possible, and the continued cooperation of the special studies group at the Bank of Canada has been vitally important. Albert Ando and Robert Rasche have assisted us greatly by providing various versions of the MPS model, along with advice and early drafts of model documents. Helpful comments by discussants Lawrence Klein and Stephen Goldfeld, and by other participants at the conference, led to substantial post-conference revisions. The most important alterations include a more strict monetary rule for RDX2, (which dampens employment and output multipliers considerably), the treatment of the Eurodollar interest rate as an endogenous variable, the addition of an equation for U.S. exports of goods and services to countries other than Canada, re-estimation of the main equation for exports of goods from Canada to the United States, and the use of a more flexible exchange rate in the simulations reported in Tables 4 and 5. Details are described in the appendix.

In section 1, we describe the elements of modelled linkages between Canada and the United States, and present results showing the full transmission process in action. In sections 2, 3, and 4, we examine the effects of suppressing migration, long-term capital flows, and both long- and short-term capital flows. In section 5, we present results with migration and all capital flows suppressed, for easier comparison with the parallel results from the Project LINK system (as described in the papers in this volume by Keith Johnson and Lawrence Klein, and by Bert Hickman) and from the set of Common Market models described in the paper by Waelbroeck and Dramais. Section 6 and the accompanying Table 6 show the hypothetical closed economy results of fiscal policy, obtained by making all international influences exogenous to both models. We conclude, in section 7, with a discussion of some of the more promising avenues for future research.

1. *Features of the Full Transmission Process*

RDX2 and MPS are linked by many equations for trade flows and trade prices, short- and long-term capital flows, and migration. Earlier papers[2] describe the structure of the linkage and contain results from previous linked simulations.

In the present paper, we use revised versions of both models, including improvements in the determination of trade prices, parallel definitions of monetary policy in the two models, and an improved determination of equity prices in MPS. The revised models are described in section 1 of the appendix, while section 2 of the appendix describes the mechanics of the linked simulations.

The chief purpose of the paper is to unravel the contributions of trade capital flows, and migration in the international transmission of the effects of stabilization policies. For this purpose, our main example policy is a sustained reduction of constant-dollar Federal Government expenditure. For each country, the accommodating monetary policy is assumed to be an unchanged supply of currency and demand deposits (M1). In MPS this is accomplished by setting M1$ exogenous in shock and control solutions alike. In RDX2, a rule is imposed in the shock solutions that forces the short-term interest rate to move so that M1 is the same in shock and control solutions. These monetary policy assumptions are used

[2]Chapters 4, 5, 10 and 11 of Helliwell et al, 1971 describe the trade, migration, capital flows and exchange market in some detail. Chapter 12 of Ball, ed., 1973 contains a broad description of these equations, and a comparison of the structures of RDX2 and MPS. Two other papers (Helliwell, 1972 and Helliwell and Maxwell, 1974a) provide earlier results of linked simulations; the first of these shows the transmission of monetary and fiscal policies, while the second is concerned with monetary interdependence under five alternative exchange rate systems.

for the country initiating the fiscal policy as well as for the reacting country; in both cases the implication is that induced changes in the Federal Government's borrowing requirements lead to corresponding changes in interest-bearing Federal debt. Over the 1963-1970 simulation period, these monetary policy assumptions are not very realistic for either country. Our purpose in using them is to achieve more comparability between the two models, not to show how the monetary authorities in either country responded in fact to domestic or foreign fiscal policies. The nature and effects of alternative monetary policy strategies are important enough to be a subject of a separate paper (Helliwell and McRae, 1974).

In our earlier linkage experiments, we used an estimated monetary policy reaction function for RDX2 and an exogenous supply of unborrowed reserves (ZMS) for MPS. This made our fiscal policy results for the two countries somewhat difficult to compare. To avoid this problem, we have settled, for now, on M1 as a monetary policy instrument (or "intermediate target") that has a roughly similar meaning and role within the two economies.

Table 1-A shows the effects on selected variables of a sustained cut in constant-dollar U. S. Federal Government expenditure. The cut is equal to 1 percent of U. S. constant-dollar gross national expenditure (GNE) in 1963. For all domestic variables but the GNE multipliers, unemployment rates, and short-term interest rates, the consequences are shown as percentages of the control solution values. The multipliers are pure numbers, being the change in the initiating country's real GNE (usually negative) divided by the sustained change in constant-dollar Government expenditure (always negative). For the country not initiating a cut in Government expenditure, the induced changes in real GNE (usually negative) are shown as a percentage of that country's 1963 real GNE. For the unemployment rate, the shock minus control results are the differences between the two percentage unemployment rates. The interest rate differences are also shown in percentage points.

Among the international variables, the change in the Canadian annual balance of trade with all countries (XBAL$) is shown in millions of Canadian dollars, the change in Canadian foreign exchange reserves is shown (only for the fixed exchange rate system) in millions of U. S. dollars, and the Canadian price of U. S. dollars is shown (only for the flexible system) as the percentage difference between the shock and control solutions. The changes in northbound and southbound trade flows are shown both as percentages of the control solution and in millions of Canadian dollars, at annual rates of flow.

Now for some results. The traditional theory of transmission of economic fluctuations under fixed exchange rates, with mobile goods and capital, indicates that a fiscal cut in one country will cause downward movements of income and employment in the home and foreign economies (see, e.g., Kenen, 1972). Our results demonstrate that proposition, but show that induced effects at home and abroad follow cyclical patterns including sign changes.

The dynamic multipliers for real GNE are smaller and less cyclical for RDX2 than for MPS, as befits a more open economy.[3] Although the U.S. economy is more than 11 times as large as the Canadian, U. S. trade is only three times as large as Canadian trade.

One cause of the greater cyclicity in MPS is the much greater effect of fiscal policy on prices in MPS, which in turn is related to the effect of the unemployment rate on the wage rate. In RDX2, the increase in the unemployment rate causes, after some lags, substantial increases in emigration and decreases in immigration. After six years of expenditure cut, the Canadian population is lower by 90 thousand persons, more than .4 percent of the 1968 population. Thus the reductions in real output per capita in the RDX2 are not as great as indicated by the aggregate figures at the top of Table 1-B.

Another interesting feature of the results is that Canadian fiscal policy with a fixed money supply leaves external balance affected only slightly. Reserves are down slightly for the first six years and then up. For the United States, this conclusion cannot be established, because MPS does not have equations for movements of long- and short-term capital to countries other than Canada.

Given our result that neither Canadian nor U. S. fiscal policy with M1 constant quickly affects the level of reserves under a fixed exchange system, it is not surprising that the exchange rate does not move quickly under a flexible system. This result does not follow of necessity, however, as the determination of short-term capital flows is different under the two exchange systems. Without substantial exchange rate movement, it follows directly that the effects of fiscal policy are fairly similar under fixed and flexible exchange systems.

The Canadian price of U. S. dollars gradually decreases under U. S. fiscal cut. Under Canadian fiscal shock it increases for the first six years and then decreases. Thus for both countries the apparent effect of domestic expenditure reduction is to decrease the value of the domestic currency. This result arises because the induced capital outflow (due to decreased expenditure and interest rates) exceeds the induced surplus on trade account (caused by lower domestic prices and demand). For the United States, the conclusion can apply only to the bilateral flows between the United States and Canada, as reflected by the exchange rate linking the two currencies. For Canada, the result relates to the links between Canada and all countries. The net effect is not very strong for either country, and is subject to reversal with different assumptions about the accommodating monetary policy, or with alternative specifications for the trade and capital flow equations.

[3]The RDX2 multipliers reported in the first version of the paper were significantly higher than those reported here, because the money supply rule used in the first version was loose enough to permit some contraction in the money supply. In Helliwell and McRae (1974) it is shown that real expenditure multipliers are three to four times greater if the nominal interest rate rather than M1 is pegged at its control value.

Table 1-C records the last of our simulations with the full transmission mechanisms in operation. The U. S. monetary policy depicted involves a reduction of 1 percent in the annual rate of growth of the U. S. money supply (M1$). As expected, monetary contraction has a substantial balance-of-payments impact, because the direct trade and capital account effects are in the same direction. Taken together, Tables 1-A and 1-C raise the presumption that, for the United States, monetary policy has a strong comparative advantage in dealing with the balance of payments. This advantage extends over the whole eight-year simulation period, despite the fact that all of the major capital movements fulfill portfolio adjustment conditions, and that the bilateral flows of interest and dividends are endogenously determined from the simulated interest rates applied to the relevant portfolio totals. Numerous experiments with RDX2 indicate that a similar comparative advantage exists for Canadian monetary policy with respect to external balance.

The substantial bilateral balance-of-payments impacts of U. S. monetary policy imply that the flexible exchange rate will move, thus permitting the effects on Canada to be different under the two exchange rate systems. The results in the two right hand columns of Table 1-C show that the transmitted expenditure, price, and employment effects are generally one-half to three-quarters as large under flexible as under fixed exchange rates. The fact that output and prices move in the same direction in Canada as in the United States overturns a theoretical presumption (e.g. Mundell, 1968, p. 269) that monetary contraction lowers income at home and raises it abroad, if capital is interest-sensitive and the exchange rate flexible. The basic reason for our result is that private short-term capital moves to offset exchange rate changes, thus restoring the possibility that expenditure and employment should move in the same direction in both countries.[4]

Finally, the results in the three parts of Table 1 may be compared with results based on earlier versions of MPS and RDX2. The expenditure, employment, and price effects of monetary and fiscal policies in MPS are now about one-half as large as in the version we used previously, and the cyclical response, although marked, is less explosive. The chief cause of the unsatisfactory performance of the earlier version lay in our use of a particular version of the dividend-price equation used to determine the market value of equities in MPS. The new version of RDX2 has a much longer cyclical response than the original version, and shows somewhat more sustained effects for fiscal policy. The flexible exchange rate equation has been re-estimated using more data from the 1970s, and shows less response to payments imbalance, and hence diminishes the short-run differences between the fixed and flexible exchange rate versions of the model. The linkage between the models especially the determination of trade flows and prices, has been improved, so that our present linkage results have slightly more claim to reliability.

[4]This result is discussed more fully in Helliwell and Maxwell (1974a), and is placed in the context of a survey of other studies of the Canadian experience in Helliwell (1974).

2. *Transmission with Migration Suppressed*

The simulations reported in Tables 2-A and 2-B use the same control solutions and fiscal policies used for Tables 1-A and 1-B. Migration is suppressed in the fiscal simulations by setting Canadian migration flows equal to their control solution values. These flows are not split between the United States and the rest of the world, because the existing data do not permit the separation to be made. Migration is not endogenous to MPS.

Canadian immigration is influenced strongly by the Canadian unemployment rate, the U. S. unemployment rate, and the ratio of the real wage rate in Canada to a corresponding weighted average for the main countries (including the United States) supplying migrants to Canada. Canadian emigration, which is primarily to the United States, is explained by the unemployment rates in Canada and in the United States. Based on a 1970 labor-force population of 15 million persons, an increase of the Canadian unemployment rate from 4 percent to 5 percent would lead eventually to an annual decrease in immigration of about 50 thousand persons. Subject to slightly shorter lags, there would be an increase of 20 thousand in the annual flow of emigrants. An increase of 10 percent in the Canadian real wage relative to the foreign real wage increases annual immigration by about 35 thousand.

These are dramatically large effects. An attempt to reduce Canadian unemployment by 100 thousand, given the 1970 labor force of about 8.4 million, would lead, after about two years, to an increase in annual net immigration about four-fifths as large, were not the migration raising the unemployment rate again so as to choke off the induced flow. These calculations suggest that without a substantial change in migration policy there is little chance of long-term success for fiscal policies intended to reduce the Canadian unemployment rate, which is traditionally very high by international standards.

The calculations above are based solely on the unemployment effects in the migration equations, and neglect the influence of real wage rates on migration, the effects of changes in population on aggregate demand, and so on. To get a more comprehensive view of the relation between migration and the effects of fiscal policies, we must compare the simulation results in Table 2-B with those in Table 1-B. For the first two years, induced migration has little impact on the results of fiscal policy. Thereafter, the differences become marked. Without migration the aggregate expenditure effects are smaller and more short-lived, while the effects on the unemployment rate, wages, and prices are substantially larger and more sustained. If the output changes in Table 1-B are expressed in per capita terms they become, in the fixed exchange rate system, -1.24 percent, -.60 percent, -.40 percent, and -.59 percent in the 2nd, 4th, 6th, and 8th years, much closer to the path followed in Table 2-B. Even in per capita terms, the aggregate output effects are initially larger with than without induced

migration, chiefly because aggregate supply (UGPPD) drops faster if induced migration takes place, thus reducing the extent to which price and wage changes serve to limit the real multiplier process.

The effect of migration on the supply of labor is the primary reason that fiscal policy in Table 1-B has substantially smaller effects on the unemployment rate, and hence on wage rates and price levels. From the comparison of Tables 1-B and 2-B, it appears that migration policy would have a comparative advantage in the attainment of employment and real wage objectives.

The substantial importance of migration in RDX2 suggests that further work be done to attempt a separation between the possible effects of past changes in migration policies and the corresponding macroeconomic influences. There may also be some gain from attempting to build migration explicitly into MPS for linkage purposes; this is even more likely to be true for migration among European countries. At present, the only effects of migration in MPS are rather second-hand; if a U.S. policy affects Canada differently with the migration equations in play, then the reflected repercussions on the United States will be different. A comparison of Tables 1-A and 2-A shows that these secondary effects are small enough to be ignored.

3. *Transmission with Long-Term Capital Flows Suppressed*

The two parts of Table 3 show the consequences of U.S. and Canadian fiscal policies with all Canadian and U.S. long-term capital flows treated as exogenous. The structure of RDX2 is further altered to remove the U.S. supply price of capital from its direct role in the definition of the implicit rental price of capital goods used by Canadian business.[5]

Comparing Table 3-A with Table 1-A, it can be seen that the suppression of capital flows does not materially alter the domestic impact of U.S. fiscal policy under either fixed or flexible exchange rates. Capital flows have no direct impact on any of the variables of the MPS model. Thus the differences in U.S. effects reflect the consequences for the U.S. trade account of the substantial influence that U.S. fiscal policy has on the Canadian economy. The trade account effects differ in principle under fixed and flexible exchange rates. The exchange rate does move further when long-term capital is not available to flow north to offset the net reduction in southbound flows of goods, but the difference is slight. Under either exchange rate system, the effects of suppressing long-term capital flows are larger for the more open Canadian economy.

[5]This direct role is related to the proportion of Canadian capital expenditures financed by U.S. direct investment, for which the relevant supply price of capital is that applying in U.S. financial markets. To undertake simulations assuming no long-term capital flows, we use the Canadian supply price of capital in place of the usual weighted average of Canadian and U.S. values.

The effects of U.S. fiscal policy on Canadian real output, under fixed exchange rates, are initially smaller but eventually larger if long-term capital flows are suppressed. The initial effect is smaller because the link is cut that usually joins U.S. final demand to Canadian business capital expenditures through changes in U.S. direct investment in Canada. The larger long-term effect arises because the lower U.S. interest rates no longer have their usual direct but lagged expansionary effect on Canadian business investment. Under flexible exchange rates, the pattern is fairly similar; the price of the U.S. dollar (PFX) is slightly higher when long-term capital flows are exogenous, but not enough to make much difference.

The effects of Canadian fiscal policy on Canadian expenditures and employment are for at least four years slightly smaller if there are no induced long-term capital flows. Under full transmission, the Canadian expenditure cut leads at first to reductions in several forms of capital inflow, some of which reductions lead directly to further cuts in Canadian investment expenditure. With these capital flows, Canadian financial markets become tighter, or less easy, than they would have been with capital flows suppressed. Thus the monetary offset to the fiscal policy has more effect without long-term capital flows, and plays a larger role in moderating the decline in investment expenditure.

The broad conclusion from the results in parts A and B of Tables 1 and 3 is that long-term capital flows have a fairly modest role in the transmission of the effects of fiscal policy. It is perhaps surprising that the Table 1 similarity between fixed and flexible exchange rates does not disappear when long-term capital flows are suppressed. The suspicion immediately arises that short-term rather than long-term capital is flowing to make the fixed and flexible rate systems operate in such a similar fashion; which leads us into the next section.

4. *Transmission with All Capital Flows Suppressed*

The suppression of short-term capital flows is tied up closely with the specification of the foreign exchange market. The fixed rate model in RDX2 includes separate private and official demand equations for foreign exchange, which are solved jointly to determine the exchange rate and the change in foreign exchange reserves. To conduct the experiments underlying Table 4, we replaced the usual private demand equation by an expression equal to the negative of the U.S. dollar equivalent of current quarter's Canadian balance on trade and long-term capital accounts, thus eliminating private short-term capital flows. The official demand equation was left untouched, thus permitting the price of foreign exchange to move between its support margins.

For the flexible exchange rate system, the complete suppression of short-term capital flows is not consistent with short-term stability in a quarterly model. A devaluation leads immediately to an increase in the demand for foreign exchange by the devaluing country in order to pay its larger import bill. After some lags, export prices and quantities increase, and import volumes drop, but in the current quarter the exchange market is unstable if capital flows are eliminated entirely. We altered the structure of the estimated spot foreign exchange rate equation by removing all interest rate effects, and by shortening the lags and increasing the current responses of the rate to any imbalance of trade. Part 2 of the appendix describes these adjustments, the corresponding adjustments to the forward rate equation, and the changes to both spot and forward exchange rates under the fixed rate system. The figures for the Canadian current-dollar trade balance (XBAL$) in the flexible exchange rate part of Table 4 indicate the extent to which our revised model of the flexible exchange rate still permits short-term capital flows (the "leads and lags") to remain in the model.

The simulation results show much greater movement of the foreign exchange rate, especially under the influence of Canadian fiscal policy. In the 4th year of Canadian fiscal cut the price of U.S. dollars (PFX) is down by 2.4 percent, compared to increases of 1.27 percent with full transmission and 1.04 percent with long-term capital flows suppressed. There are correspondingly larger differences between the fiscal policy effects under fixed and flexible exchange rates. Under flexible rates, the effects of Canadian fiscal policy on domestic real output, employment, and prices are much larger without capital flows, especially after four years or more, and are substantially larger than the effects under fixed exchange rates.

With fixed exchange rates, the removal of capital flows gives fiscal policy a substantial impact on foreign exchange reserves. After eight years of Canadian fiscal policy, Canadian reserves are up by $1200 million, more than 20 times as much as with full transmission. The real expenditure and employment effects are slightly greater at first and then smaller than with full transmission. Except for the change in reserves, the fixed exchange rate results with all capital flows suppressed are very similar to those with just long-term flows suppressed. In part this reflects the fact that short-term capital flows, which must be treated on a net basis, cannot be integrated fully into the private sector asset and liability accounting of RDX2. The additions to foreign exchange reserves influence monetary conditions by increasing the supply of Government interest-bearing debt, which alters the relative supplies of Government debt and private real capital, thus reducing the supply price of capital to business relative to interest rates on government securities.

The movements in the exchange rate are large enough to make the choice of exchange system alter the effects on the United States of either country's fiscal policy. Under flexible exchange rates, the United States is slightly more influenced by its own fiscal policy and less affected by Canadian fiscal policy. The suppression of all capital flows makes the Canadian economy more responsive to U.S. fiscal policy (but not at first) under fixed exchange rates and less responsive under flexible rates.

Table 4-C shows the impact of U.S. monetary policy with no capital flows. The effects in the United States do not differ markedly from those in Table 1-C except for the stock of short-term claims held by foreign governments, including Canada. With no capital flows, the effects on Canada of U.S. monetary policy differ from the effects of U.S. fiscal policy chiefly because of the different expenditure composition and price effects of the two policies.

5. *Transmission with Migration and Capital Flows Suppressed*

The two parts of Table 5 contain results from simulations combining the assumptions of Tables 2 and 4. The only remaining linkages are through trade flows and prices, as in the experiments described in the papers by Waelbroeck and Dramais, Johnson and Klein, and Hickman.

This section contains a comparison of the results of Tables 5-A and 5-B with the corresponding Project LINK results reported in this volume by Bert Hickman. The LINK system used by Johnson and Klein is slightly more up to date than that used by Hickman, but Hickman's simulation assumptions and methods of tabular presentation correspond more closely with those used for the current experiments with the RDX2-MPS system. Detailed comparison of our results with the Common Market simulations undertaken by Waelbroeck and Dramais will be deferred until more comparable material is available.

The comparison of our results with those based on the U.S. Wharton model and the Canadian TRACE model used in Project LINK will be in two parts. First, the fixed exchange rate results in Tables 5-A and 5-B. will be compared to the U.S. and Canada own-country and cross effects reported by Hickman. Then the fixed and flexible exchange results from the RDX2-MPS system will be compared to corresponding results from the TRACE model recently reported by Carr, Jump, and Sawyer (1974).

First, the own-country results of fiscal policy. In MPS, the real GNE multipliers for the first three years are 1.53, 2.02, and 1.64, compared to 1.18, 1.87, and 2.58 for the LINK simulations of the Wharton Model.[6] The Wharton Model apparently does not have as strong cyclical responses as does MPS. M1$ (currency plus demand deposits) is exogenous in MPS, and the monetary base is exogenous in the Wharton Model, so that the financial concomitants of fiscal policy are roughly the same in the two models.

[6]The LINK results are "elasticity multipliers," which become increasingly smaller than true multipliers if the simulation proceeds in a context of growth. Offsetting this effect is the definition of the expenditure change in nominal terms in the LINK simulations of U.S. and Canadian fiscal policy, which implies a smaller real change as time progresses. If prices and real GNE are growing at about the same rate, then Hickman's calculations will be close in nature to the multipliers reported in Table 5. Another non-comparability arises from the use of an expenditure increase in the simulations reported by Hickman, and by Carr et al, while RDX2 and MPS are simulated with an expenditure cut.

In the Table 5-B simulations of RDX2, the real GNE multipliers for the first three years are .86, .94, and .53, compared to 1.15, 1.15, and .79 for the LINK simulations of the TRACE model. However, Hickman's simulations were apparently run with a slightly out-of-date version of the TRACE model. If the latest version of TRACE is simulated with a rigidly fixed exchange rate and M1 held constant, as reported by Carr et al (1974, Table 3), the real GNE multipliers are .79, .48, and .25 for the first three years.[7] Thus the TRACE multipliers are less than one-third as large, in the third year of simulation, if the latest version of TRACE is used instead of that employed by Hickman. These differences are disturbingly large. If periodic revisions to model structure can lead to substantial changes in multipliers, we must be cautious when interpreting the resulting calculations in the magnitude of international transmissions.

In the second year of Hickman's LINK simulations of U.S. fiscal shock, Canadian real GNE has changed by .56 percent, compared to .08 percent in the Table 5-A results and .19 percent in Table 1-A.[8] If the LINK results are restated to roughly correspond to the TRACE multipliers reported by Carr et al, they become .23 percent, not strikingly different from the results from the fully linked RDX2-MPS system. The dynamics remain noticeably different, however.

Dealing with the effects of Canadian fiscal policy on the United States, Hickman reports second year effects of .12 percent of U.S. GNE compared with .04 percent to .05 percent from the RDX2-MPS system, depending on the degree on linkage. The figures come into close correspondence when we note that the effects of fiscal policy in TRACE become .48 percent rather than 1.15 percent of GNE if the Carr et al multipliers are used.

[7]The simulations by Carr et al make use of version IIIR of TRACE, while Hickman uses version II. There are several differences in structure between the two versions. Among others, the consumption, investment, and interest rate equations are specified differently. Detailed study of comparable simulations would be required to find which are the more important causes of the large discrepancies between the Hickman and the Carr et al results, especially in the second and third years. Version II is described in Choudry et al, 1972. The TRACE econometric model of the Canadian economy, (University of Toronto Press, Toronto), while version IIIR is described in Jack Sawyer's Februrary 1974 Report referred to by Carr et al. The simulations by Carr et al use a constant-dollar expenditure increase, so that true multipliers can be calculated by multiplying the total GNE effects by 2.0, because the size of shock is .5 billion 1961 dollars.

[8]The Table 5 results for the Canadian effects of U.S. fiscal policy reflect an understatement, as the weighted average of U.S. final demands (where the weights depend on import coefficients from the U.S. input-output table) used in explaining Canadian exports to the United States does not include Federal Government expenditure. If the export equation is re-specified to include a weighted average of all major U.S. final demands in the current period, including Federal expenditure and inventory accumulation, the second-year Canadian effect of U.S. fiscal policy rises from .08 percent to .20 percent, and subsequently reverses much faster than in the present system. The revised system described also includes a re-specified export price equation, removing energy exports and the influence of U.S. capacity utilization.

Turning finally to the comparison of fixed and flexible exchange rates, the Table 5 results can be related to those reported by Carr et al. They report that in the second year of expenditure increase under flexible exchange rates the multiplier is .85, compared to .48 under fixed exchange rates with constant M1. For RDX2, the second year GNE multipliers are smaller under flexible exchange rates than under pegged rates if capital flows are endogenous (as in Tables 1-B and 2-B) and about equal if capital flows and migration are suppressed. Capital flows are apparently substantially more responsive to interest and income in RDX2 than in TRACE, and trade flows less quickly responsive to changes in the exchange rate. A further difference is posed by the different specification of short-term capital flows in the two models. In TRACE, short-term capital flows are influenced only by short-term interest rates. In RDX2, however, short-term capital flows play a crucial buffer-stock role in smoothing the clearance of trade and long-term capital flows through the foreign exchange market. Indeed, without such a role for short-term capital flows (which exists in all the quarterly Canadian models surveyed in Helliwell (1974)), the foreign exchange market would be unstable in a quarterly model because of the lags in the effects of prices on trade flows.[9] Even in Table 5-B, in which the role of short-term capital flows is minimized, there is still some buffer-stock role for short-term capital, thus deferring the time when differences between fixed and flexible exchange rate systems become large.

6. *Fiscal Policies in Closed Economies*

The natural terminus for our series of experiments is a pair of fiscal policy simulations in which there are no international linkages in play. The links are cut by performing separate single-model simulations for RDX2 and for MPS, with the trade sector exogenous in MPS and all trade, capital flows, capital balances, and migration exogenous in RDX2. Other adjustments were made consistent with the ones underlying Tables 2 through 5, but there are still some respects in which the simulations do not represent the operation of fully closed economies. Despite these problems, the results of the closed economy simulations are strikingly different from the results in any of the other tables. Naturally, the differences are greater for RDX2 than for MPS, because trade flows are four times larger, relative to GNE, in Canada than in the United States.

Table 6 is more abbreviated than the other tables, as there remain no distinctions between fixed and flexible exchange rates, no effects of one country's policies on domestic variables in the other country, and there are no international variables to report. The extra space has been put to use in reporting some of the domestic consequences for the average of the quarterly values in each year of the simulation.

[9] In a footnote, Carr et al criticize RDX2 for using a "reduced form" equation for the foreign exchange rate and ignoring the restrictions imposed by the structure of the model. In fact, the RDX2 exchange rate equation is just a re-normalization of the equation for the private demand for foreign exchange, and contains all of the determinants of that demand. Presumably, Carr et al would like to see the restriction imposed that the exchange rate move far enough to clear all trade and long-term capital flows through the foreign exchange market in the current period. As noted in the text and the appendix, this apparently is inconsistent with exchange market stability in a quarterly model.

7. *Prospects for Future Research*

Within the historical simulation context used for this paper, we are interested in performing a range of experiments designed to unravel past policy choices to assess their consequences within the linked system. Studies have already been undertaken using RDX2 alone to assess the Canadian effects of the U.S. DISC program (Helliwell and Lester, 1972), the U.S. Interest Equalization Tax (Grady, 1974), changes in the exchange rate linking Canada and the United States (Helliwell, 1972), and the Canadian Conversion Loan of 1958 (Christofides, 1973). These and other studies of economic policies with international ramifications can be enriched by using the linked RDX2-MPS system, especially where the policies have substantial direct effects within the United States.

To get a clearer idea of the dynamics of the transmission process, we have been developing simulation environments in which all of the exogenous variables follow mutually consistent but steady growth paths. We plan to do this in a general enough way that any or all of the basic causes of economic growth can be set to arbitrary values. It is naturally more of a job to obtain model specifications that are consistent with no-growth as well as steady growth conditions. So far, we have made the no-growth adjustments separately from the steady growth adjustments, but eventually we would like to be able to study the pure dynamics of the system for any pattern of assumptions about birth rates, monetary growth, and disembodied technical progress.

We would like to be able to study the implications of large and sharp changes in the price of oil and other widely traded raw materials. Short of building natural resource inputs more securely into national models, there is still much that can be done to trace the balance of trade and payments implications of big shifts in raw material prices. The data problems here are well-known, so that we do not expect to make much progress soon. Our first step has been to isolate Canadian exports of oil and natural gas from other exports of goods to the United States.

A separate paper (Helliwell and McRae, 1974) assesses the domestic and foreign consequences of alternative monetary policy strategies in the two countries. Two polar strategies are tested within the context of a flexible exchange rate system. The first involves keeping M1 equal to control, as in this paper, while the second involves a policy directed to holding a short-term nominal interest rate at its control solution values. In general, the M1 rule provides the best protection against domestic expenditure consequences of foreign fiscal policies, regardless of the monetary rule used by the initiating country. The exchange rate effects are minimized by using the opposite monetary strategy to that employed by the initiating country.

In the future, we hope to assess alternative monetary strategies under exchange systems involving official support of the exchange rate, where the monetary strategies must be broadened to encompass links between foreign exchange reserves and the national money supply.

We have not lost sight of the possibilities for more comprehensive linkage on a balanced multilateral basis, but that must be a very long-term goal, and will probably best be accomplished by adding new features to the various national models in the Project LINK system, or by starting from scratch with symmetric systems of the sort described by Waelbroeck and Dramais. Within the RDX2-MPS framework, however, there are nevertheless some obvious possibilities for establishing links with a balanced set of European models, a Japanese model, and various commodity models being developed within Project LINK.

There is substantial scope for assessing policy strategies with international repercussions in a game-theoretic context, as suggested by Hamada (1974).

For most of the experiments described above, a long and relatively noise-free simulation environment is required. Therefore we are placing high priority to efforts to tie our historical and forecasting contexts together, so that we can run experiments from the early 1960s to 1985 and beyond. RDX2 is safely simulating to 1985 in its current version, but we have not yet been able to develop sound control solutions for MPS that far into the future. For this we hope to draw more heavily on the skills of the U.S. users of the model, who no doubt have other reasons for wishing to use MPS to depict some of the possibilities beyond 1980.

Appendix

This appendix has two sections. In the first, we describe the versions of RDX2 and MPS used in our simulations, and indicate the changes that have been made to the most recently published versions. In the second section, we describe the mechanics of the linkage simulations, including the methods that we have used to implement policies and suppress transmission mechanisms.

1. *RDX2 and MPS*

The model is basically that described in Helliwell et al (1971), as revised and estimated to 4Q70 and presented in Helliwell and Maxwell (1974). The main change we have made for our linked simulations is to build in a new equation for Canadian exports of goods to the United States, excluding motor vehicles and energy products. Energy exports to the United States increased rapidly after 1970, and we wish to be able to simulate easily within the linked system the consequences of alternative policies relating to energy trade between the two countries. By treating energy exports as a separate exogenous series, we are able to facilitate these simulations and to obtain a more satisfactory equation for the main southbound flow of goods. The price elasticity of the new equation is -1.09 with respect to a 16-quarter moving average of the ratio of the Canadian export price to the Canadian dollar equivalent of the price of U.S. non-farm business product. Interestingly enough, this same long lag on relative prices also worked best in explaining exports of goods from the United States to countries other than Canada.

We are using version "S" of the MPS Model, with a mimeographed equation list dated January 1973. The equation for the dividend/price ratio dates from mid-1973. Our earlier experiments used a version for which the equation list was dated January 1971. There is no published version of the current model, but Albert Ando (1974) has recently described the theoretical features of the model, and Ando and Modigliani (1975) are working on a monograph describing the structure and properties of version S. MPS has four equations for imports, split between goods and services and between Canada and other countries. For our current simulations, the model was run with M1$ exogenous and the residuals added back to the RTB equation. Structural alterations made especially for our simulations include:

1. The equations for imports from Canada are replaced by the RDX2 equations for the same flows, with an exogenous series used to adjust for data discrepancies.

2. All U.S. exports of goods and services are now endogenous to the linked system. The constant-dollar total of Canadian imports from the United States, as determined from the nine RDX2 equations for these items, is adjusted by fixed proportionate seasonal adjustment factors and

divided by 258.05 to convert the flow into U.S. exports to Canada, measured as a quarterly flow at annual rates. This series is subtracted from EEX, the series for total U.S. exports, to obtain X23, a new series for exports to countries other than Canada. This series is explained by a log-linear equation showing an elasticity with respect to total world imports (excluding North America) of .77, and a price elasticity of -.90 with respect to a 16-quarter moving average of PEEX/PWXG. This lag length gave better fit and higher price elasticity than did longer or shorter lags, whether based on moving averages or Almon variables. The dock strike variable JDOCK also contributes significantly to the equation, which has an RB2 of .969 in its log form.

3. The MPS export price index is made endogenous by an estimated equation that explains PEEX in terms of the main U.S. price PXBNF and the U.N. index for the price of world exports of goods. That index (PWXG in RDX2) is defined in terms of U.S. dollars, so that no exchange rates are used in the equation for PEEX. The MPS export price index is not used in explaining trade flows to Canada, because RDX2 makes use of more disaggregated import prices, but is needed to obtain an appropriate distinction between changes in the value and volume of trade in the U.S. national income and expenditure accounts.

4. The MPS import price is left exogenous for imports from countries other than Canada. To deflate imports from Canada for national accounts purposes, PEIM is replaced by EPEIM*PXNMV12/PFX, where EPEIM is a new exogenous series defined so as to make the substitution exact in terms of historical data.

5. The 90-day London Eurodollar rate (REUR in RDX2) is made endogenous for our linked simulations by means of an identity: REUR = .72*RTB2 + EREUR where EREUR is a new exogenous series defined to make the equation fit exactly over the historical period. The coefficient on the U.S. Treasury bill rate is based on recent work by Herring and Marston. We selected a coefficient that excludes periods of extreme credit tightness in the United States and abstracts from the effects of U.S. interest rates on European central bank discount rates.

In the course of further research we intend to make the structure of MPS more compatible than that of RDX2, and to complete the linkage between MPS and the non-Canadian world. Some notable prospects for change include:

1. The wage/price dynamics and theory differ too much between the models. The main MPS price equation is constrained to have an elasticity of 1.0 with respect to normal unit labor costs, while the wage rate has an elasticity much less than 1.0 with respect to consumer prices, even after all lags are worked out. In RDX2, by contrast, the long-term elasticity of the wage rate with respect to consumer prices is constrained to be 1.0, while the average elasticity of the aggregate output price with respect to normal unit labor costs is about equal to labor's share in value-added. John Lester has been experimenting with a number of alternatives for MPS that are more consistent with RDX2.

2. Possible explanation of migration, or at least an attempt to allocate some of Canadian migration to U.S. sources or destinations.

3. Modelling U.S. capital flows, and integrating them with a more fully specified portfolio model of U.S. wealth allocation among domestic and foreign assets.

4. Development of measures of capacity output more closely related to aggregate factor supplies. The present variable (XBC) is a slowly moving weighted average of past levels of actual output.

5. Perhaps an application of the RDX2 factor demand and disequilibrium adjustment framework to MPS.

We hope to encourage some of the U.S. proprietors or users of MPS to direct some of their efforts to certain of the areas outlined above.

2. *Mechanics of Linkage and Policy Simulations*

Thanks to efforts over the years by Ian Stewart, Al Coombs, Tom Maxwell, and Robert McRae, our simulation program has the ability to simulate RDX2 and MPS together or separately, and to accept new versions of either model quickly into the linkage framework. In each quarter, MPS is solved first; then subroutines are called to define the U.S. variables used in RDX2 in terms of the solution values from MPS. RDX2 is then solved, and subroutines called to translate the RDX2 output to the form required for MPS. MPS is then solved again, and the process continues until the linked system converges The procedure is repeated for each quarter.

The suppression of certain elements of the linkage is fairly straightforward. Migration is suppressed by altering SOLV26 and using POLICY to get NIMS and NEMS equal to their control solution values. Long-term capital flows are suppressed by declaring exogenous the sectors CAPACT and CAPBAL, and by substituting .668*RHO for RHO2 in the equations for RCME and RCNR. Short-term capital flows are suppressed in the fixed rate model by using FXP = -UBAL/PFX instead of the usual equation, and by setting at zero the coefficient on the interest rate term in the PFXF equation. In the flexible rate model, a similar change was made to the PFXF equation, and the following equation was used for the spot exchange rate:

$$PFX = .25 + .75*J1L(PFX) - .2(UBAL/PFX) + .03*J1L(ULS)$$

the equation used for the simulation reported in the first version of the paper had coefficients only one-quarter as large for UBAL/PFX and half as large for ULS. In the course of revision, we experimented further by doubling the speed of response of the exchange rate until the exchange market in the control solution became unstable. We adopted the fastest successful rule for the simulations reported in Tables 4 and 5. The exchange rate now moves faster and reverses its movement sooner than in the results reported earlier.

The closed economy simulations involved single-model solutions of MPS with the FORGN subroutine exogenous. For RDX2, the above adjustments for RCME, RCNR, NIMS, and NEMS were supplemented by making four sectors exogenous — CAPACT, CAPBAL, FOREXC, TRADE.

Canadian monetary policy was modelled in the control solutions by replacing the estimated reaction function for RS by the following equation based on a target rate of growth for the sum of currency held by the non-bank public and demand deposits at the chartered banks.

$$RS = J1L(RS) - .001*(1.065*J4L(ANFCUR+DDB) - (.963*Q1 + 1.048*Q2 + 1.009*Q3 + 1.046*Q4) *J1L(ANCFUR + DDB))$$

In the first version of this paper, the above monetary policy rule was also used for the shock simulations, as a reasonably operational counterpart of the MPS monetary assumption that M1$ is held constant when fiscal policy is changed. In this final version of the paper, the Canadian money supply M1$C is forced to be identical in shock and control solutions. Although this type of accommodating monetary policy may be harder to put into practice, given the lags between monetary changes and the final adjustments to M1, it makes the RDX2 results more closely comparable to the MPS results.

The U.S. monetary policy was modelled by removing the historical series for M1$ and substituting a series with the same value in the fourth quarter of 1962, growing thereafter at an annual rate 1 percent slower than the actual rate of growth.

The U.S. fiscal shock was accomplished by subtracting 5.51 from the exogenous series for constant-dollar Federal Government expenditure.

The Canadian fiscal policy was modelled by subtracting 111.*J1L*PGCNWF from the equation for GCNWF. For both models, the changes had the effect of subtracting, on a continuing basis, a constant-dollar amount equal to 1 percent of the country's 1963 constant-dollar GNE.

Table 1-A

U.S. Fiscal Policy with Full Transmission

Reduction of U.S. Federal Government Expenditure, 1963-1970
Sustained Cut Equal to 1% of 1963 U.S. GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-2.12	-2.11	-0.19	-0.21
4th Year	-0.84	-0.84	+0.27	+0.19
6th Year	-1.66	-1.99	-0.01	-0.09
8th Year	+0.85	+0.92	+0.83	+0.80
Real GNE Multiplier (US), or Induced Effects As % of 1963 GNE (Canada)				
2nd Year	+2.03	+1.97	-0.15	-0.16
4th Year	+0.93	+0.88	+0.28	+0.22
6th Year	+1.95	+2.31	+0.10	+0.05
8th Year	-1.07	-1.09	+1.19	+1.25
Price of GNE (% of Control)				
2nd Year	-0.21	-0.21	+0.02	+0.01
4th Year	-1.08	-1.08	-0.11	-.20
6th Year	-2.78	-2.88	-0.44	-0.54
8th Year	-5.11	-5.55	-1.14	-1.14
Unemployment Rate (Percentage Points)				
2nd Year	+0.49	+0.48	+0.10	+0.11
4th Year	+0.37	+0.36	-0.06	-0.02
6th Year	+0.46	+0.53	+0.17	+0.19
8th Year	+0.10	+0.11	-0.01	+0.02
Short-term Interest Rate (Percentage Points)				
2nd Year	-0.29	-0.29	-0.02	-0.02
4th Year	-0.32	-0.32	-0.01	-0.03
6th Year	-0.87	-0.99	-0.06	-0.09
8th Year	-1.61	-1.79	—	-0.06

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X BAL $	PFX % ch	X BAL $
Can. Reserves in Mill $ U.S. X BAL $ Is Change In Can. Total Trade Balance in Mill $ Can. PFX Is $ Can./$ U.S.				
2nd Year	+4.	+9.	-0.37	-1.
4th Year	—	-170.	-0.35	-178.
6th Year	+5.	-155.	-0.79	-191.
8th Year	+11.	-277.	-1.86	-480.

Southbound Trade Flows
(Canadian Current-Dollar Exports to U.S.)

	% Change	Mill$	% Change	Mill$
2nd Year	-0.48	-30.	-0.63	-39.
4th Year	-1.43	-118.	-1.71	-135.
6th Year	-2.43	-270.	-2.90	-314.
8th Year	-2.31	-342.	-3.35	-501.

Northbound Trade Flows
(Canadian Current-Dollar Imports from U.S.)

	% Change	Mill$	% Change	Mill$
2nd Year	-0.36	-27.	-0.42	-31.
4th Year	+0.32	+32.	+0.18	+17.
6th Year	-0.79	-95.	-0.93	-112.
8th Year	-0.37	-59.	-0.53	-85.

Table 1-B

Canadian Fiscal Policy with Full Transmission

Reduction of Canadian Federal Government Nonwage Expenditure, 1963-1970
Sustained Cut Equal to 1% of 1963 Canadian GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.04	-0.06	-1.35	-1.28
4th Year	-0.08	-0.09	-1.19	-0.89
6th Year	-0.07	-0.40	-0.95	-0.83
8th Year	+0.06	+0.11	-0.66	-0.94
Real GNE Multiplier (Canada), or Induced Effects As % of 1963 GNE (US)				
2nd Year	-0.04	-0.06	+0.89	+0.83
4th Year	-0.09	-0.10	+0.80	+0.58
6th Year	-0.08	-0.48	+0.65	+0.63
8th Year	+0.08	+0.14	+0.52	+0.84
Price of GNE (% of Control)				
2nd Year	—	—	-0.66	-0.61
4th Year	-0.02	-0.03	-1.37	-1.06
6th Year	-0.09	-0.21	-1.12	-0.73
8th Year	-0.19	-0.64	-0.58	-0.67
Unemployment Rate (Percentage Points)				
2nd Year	+0.01	+0.02	+0.65	+0.63
4th Year	+0.02	+0.03	+0.25	+0.12
6th Year	+0.01	+0.08	-0.23	-0.19
8th Year	—	+0.01	-0.15	+0.19

Short-Term Interest Rate (Percentage Points)

2nd Year	-0.01	-0.01	-0.52	-0.55
4th Year	-0.02	-0.02	-0.69	-0.59
6th Year	-0.04	-0.15	-0.39	-0.33
8th Year	-0.05	-0.23	-0.11	-0.12

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X BAL $	PFX % ch	X BAL $
Can. Reserves in Mill $ U.S.				
X BAL $ Is Change In Can. Total Trade Balance in Mill $ Can.				
PFX Is $ Can./$ U.S.				
2nd Year	-11.	+153.	+1.23	+199.
4th Year	-9.	+298.	+1.27	+327.
6th Year	-1.	+312.	+0.32	+318.
8th Year	+57.	+246.	-1.00	+184.

Southbound Trade Flows
(Canadian Current-Dollar Exports To U.S.)

	% Change	Mill$	% Change	Mill$
2nd Year	-0.42	-26.	+0.18	+11.
4th Year	-0.17	-13.	+0.81	+65.
6th Year	+0.27	+30.	+0.66	+70.
8th Year	+0.29	+42.	-0.39	-60.

Northbound Trade Flows
(Canadian Current-Dollar Imports From U.S.)

	% Change	Mill$	% Change	Mill$
2nd Year	-1.45	-111.	-1.30	-98.
4th Year	-1.92	-196.	-1.37	-136.
6th Year	-1.53	-183.	-1.26	-149.
8th Year	-0.93	-145.	-1.24	-195.

Table 1-C

U.S. Monetary Policy With Full Transmission

Reduction in Rate of Growth of M1$, 1963-1970
New Exogenous M1$ Grows 1% Less Fast Than Historical Series

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.64	-0.65	-0.17	-0.14
4th Year	-1.79	-1.81	-0.47	-0.30
6th Year	-3.36	-3.70	-0.96	-0.69
8th Year	-3.91	-3.88	-0.83	-0.60

Induced Effects As % of 1963 GNE				
2nd Year	-0.62	-0.62	-0.13	-0.11
4th Year	-1.96	-1.99	-0.40	-0.27
6th Year	-4.05	-4.47	-0.80	-0.63
8th Year	-4.84	-4.81	-0.62	-0.47
Price of GNE (% of Control)				
2nd Year	-0.03	-0.03	—	+0.02
4th Year	-0.37	-0.37	-0.07	+0.09
6th Year	-2.02	-2.12	-0.25	+0.08
8th Year	-5.36	-5.82	-0.87	-0.57
Unemployment Rate (Percentage Points)				
2nd Year	+0.13	+0.13	+0.06	+0.05
4th Year	+0.40	+0.41	+0.22	+0.14
6th Year	+0.75	+0.82	+0.37	+0.32
8th Year	+0.93	+0.95	+0.46	+0.52
Short-Term Interest Rate (Percentage Points)				
2nd Year	+0.34	+0.34	—	—
4th Year	+0.63	+0.63	-0.08	-0.02
6th Year	+0.43	+0.32	-0.14	-0.09
8th Year	-0.13	-0.33	-0.26	-0.18

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X BAL $	PFX % ch	X BAL $
Can. Reserves in Mill $ U.S.				
X BAL $ Is Change In Can. Total				
Trade Balance in Mill $ Can.				
PFX Is $ Can./$ U.S.				
2nd Year	-8.	+12.	+0.57	+29.
4th Year	-19.	-19.	+1.14	+10.
6th Year	-32.	-203.	+1.55	-155.
8th Year	-149.	-524.	+1.16	-548.

Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill$	% Change	Mill$
2nd Year	-0.18	-12.	+0.06	+4.
4th Year	-1.16	-96.	-0.56	-45.
6th Year	-3.53	-393.	-2.88	-312.
8th Year	-5.76	-855.	-5.45	-819.

Northbound Trade Flows (Canadian Current-Dollar Imports fromU.S.)				
	% Change	Mill$	% Change	Mill$
2nd Year	-0.21	-16.	-0.13	-9.
4th Year	-0.47	-48.	-0.14	-14.
6th Year	-1.01	-122.	-0.58	-69.
8th Year	-1.36	-213.	-0.88	-139.

Table 2-A

U.S. Fiscal Policy with Migration Suppressed

Reduction of U.S. Federal Government Expenditure, 1963-1970
Sustained Cut Equal to 1% of 1963 U.S. GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-2.12	-2.11	-0.20	-0.22
4th Year	-0.84	-0.84	+0.25	+0.18
6th Year	-1.66	-1.99	-0.14	-0.19
8th Year	+0.85	+0.91	+0.71	+0.70
Real GNE Multiplier (US), or Induced Effects As % of 1963 GNE (Canada)				
2nd Year	+2.03	+2.03	-0.16	-0.17
4th Year	+0.93	+0.93	+0.26	+0.21
6th Year	+1.96	+2.36	-0.03	-0.05
8th Year	-1.07	-1.14	+1.04	+1.12
Price of GNE (% of Control)				
2nd Year	-0.21	-0.21	+0.02	+0.01
4th Year	-1.08	-1.08	-0.11	-0.20
6th Year	-2.78	-2.88	-0.43	-0.53
8th Year	-5.11	-5.55	-1.11	-1.37
Unemployment Rate (Percentage Points)				
2nd Year	+0.49	+0.49	+0.09	+0.10
4th Year	+0.37	+0.37	-0.08	-0.03
6th Year	+0.46	+0.53	+0.08	-0.11
8th Year	+0.10	+0.12	-0.11	-0.08
Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.29	-0.29	-0.02	-0.03
4th Year	-0.32	-0.32	-0.02	-0.04
6th Year	-0.88	-0.99	-0.09	-0.12
8th Year	-1.61	-1.79	-0.01	-0.07

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX %ch	X Bal $
Can. Reserves in Mill $ U.S.				
X Bal $ Is Change in Can. Total				
Trade Balance in Mill $ Can.				
PFX is $ Can./$U.S.				
2nd Year	+4.	+9.	-0.37	—
4th Year	—	-169.	-0.35	-177.
6th Year	+5.	-141.	-0.74	-178.
8th Year	+13.	-264.	-1.85	-464.

Southbound Trade Flows
(Canadian Current-Dollar Exports to U.S.)

	% Change	Mill $	% Change	Mill $
2nd Year	-0.48	-30.	-0.63	-39.
4th Year	-1.43	-117.	-1.71	-135.
6th Year	-2.43	-270.	-2.89	-312.
8th Year	-2.29	-339.	-3.31	-497.

Northbound Trade Flows
(Canadian Current-Dollar Imports from U.S.)

	% Change	Mill $	% Change	Mill $
2nd Year	-0.37	-28.	-0.43	-32.
4th Year	+0.31	+31.	+0.17	+17.
6th Year	-0.88	-107.	-1.00	-120.
8th Yeear	-0.44	-70.	-0.60	-95.

Table 2-B

Canadian Fiscal Policy With Migration Suppressed

Reduction of Canadian Federal Government Nonwage Expenditure, 1963-1970
Sustained Cut Equal to 1% of 1963 Canadian GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.04	-0.06	-1.26	-1.19
4th Year	-0.07	-0.08	-0.73	-0.49
6th Year	-0.06	-0.40	-0.46	-0.48
8th Year	+0.05	+0.08	-0.38	-0.68
Real GNE Multiplier (Canada), or Induced Effects as % of 1963 GNE (U.S.)				
2nd Year	-0.04	-0.06	+0.81	+0.76
4th Year	-0.08	-0.09	+0.37	+0.21
6th Year	-0.07	-0.47	+0.10	+0.22
8th Year	+0.06	+0.10	+0.13	+0.48
Price of GNE (% of Control)				
2nd Year	—	—	-0.66	-0.60
4th Year	-0.02	-0.03	-1.40	-1.11
6th Year	-0.08	-0.20	-1.28	-0.94
8th Year	-0.17	-0.65	-0.82	-0.88
Unemployment Rate (Percentage Points)				
2nd Year	+0.01	+0.01	+0.73	+0.71
4th Year	+0.01	+0.02	+0.63	+0.48
6th Year	+0.01	+0.08	+0.22	+0.20
8th Year	—	+0.02	+0.10	+0.34

Short-Term Interest Rate (Percentage Points)

2nd Year	-0.01	-0.01	-0.46	-0.50
4th Year	-0.02	-0.02	-0.54	-0.47
6th Year	-0.03	-0.15	-0.35	-0.32
8th Year	-0.05	-0.25	-0.14	-0.15

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX %ch	X Bal $
Can. Reserves in Mill $ U.S.				
X Bal $ Is Change in Can. Total Trade Balance in Mill $ Can.				
PFX is $ Can./$U.S.				
2nd Year	-10.	+148.	+1.17	+194.
4th Year	-7.	+259.	+1.02	+283.
6th Year	-3.	+267.	+0.29	+279.
8th Year	+51.	+261.	-0.84	+209.

Southbound Trade Flows
(Canadian Current-Dollar Exports to U.S.)

	% Change	Mill $	% Change	Mill $
2nd Year	-0.42	-26.	+0.16	+11.
4th Year	-0.20	-16.	+0.66	+53.
6th Year	+0.19	+21.	+0.48	+51.
8th Year	+0.25	+38.	-0.37	-56.

Northbound Trade Flows
(Canadian Current-Dollar Imports from U.S.)

	% Change	Mill $	% Change	Mill $
2nd Year	-1.40	-107.	-1.26	-95.
4th Year	-1.63	-166.	-1.15	-114.
6th Year	-1.22	-146.	-1.09	-129.
8th Year	-0.90	-141.	-1.21	-191.

Table 3-A

U.S. Fiscal Policy with Long-Term Capital Flows Suppressed

Reduction of U.S. Federal Government Expenditure, 1963-1970
Sustained Cut Equal to 1% of 1963 U.S. GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-2.11	-2.11	-0.11	-0.13
4th Year	-0.86	-0.87	-0.13	-0.20
6th Year	-1.65	-1.99	-0.09	-0.15
8th Year	+0.83	+0.92	+0.47	+0.23
Real GNE Multiplier (U.S.), or Induced Effects as % of 1963 GNE (Canada)				
2nd Year	+2.02	+2.02	-0.09	-0.11
4th Year	+0.95	+0.96	-0.06	-0.10
6th Year	+1.94	+2.36	+0.03	-0.01
8th Year	-1.05	-1.15	+0.76	+0.59
Price of GNE (% of Control)				
2nd Year	-0.21	-0.21	+0.05	+0.04
4th Year	-1.07	-1.08	-0.22	-0.32
6th Year	-2.77	-2.89	-0.45	-0.55
8th Year	-5.08	-5.57	-0.92	-1.24
Unemployment Rate (Percentage Points)				
2nd Year	+0.49	+0.48	+0.07	+0.08
4th Year	+0.37	+0.37	+0.14	+0.17
6th Year	+0.46	+0.53	+0.08	+0.09
8th Year	+0.10	+0.12	-0.05	+0.08
Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.29	-0.29	-0.01	-0.02
4th Year	-0.32	-0.33	-0.06	-0.08
6th Year	-0.87	-0.99	-0.11	-0.15
8th Year	-1.61	-1.81	-0.07	-0.19

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X BAL $	PFX % ch	X BAL $
Can. Reserves in Mill $ U.S. X BAL $ Is Change In Can. Total Trade Balance in Mill $ Can. PFX Is $ Can./$ U.S.				
2nd Year	+4.	-16.	-0.43	-28.
4th Year	—	-64.	-0.31	-77.
6th Year	+2.	-147.	-0.76	-183.
8th Year	-2.	-202.	-1.80	-331.

Southbound Trade Flows
(Canadian Current-Dollar Exports to U.S.)

	% Change	Mill $	% Change	Mill $
2nd Year	-0.46	-29.	-0.64	-39.
4th Year	-1.54	-126.	-1.82	-143.
6th Year	-2.32	-258.	-2.79	-301.
8th Year	-2.20	-327.	-3.28	-492.

Northbound Trade Flows
(Canadian Current-Dollar Imports from U.S.)

	% Change	Mill $	% Change	Mill $
2nd Year	-0.13	-10.	-0.20	-15.
4th Year	-0.47	-48.	-0.56	-57.
6th Year	-0.73	-88.	-0.87	-104.
8th Year	-0.74	-120.	-1.23	-202.

Table 3-B

Canadian Fiscal Policy with Long-Term Capital Flows Suppressed

Reduction of Canadian Federal Government Nonwage Expenditure, 1963-1970
Sustained Cut Equal to 1% of 1963 Canadian GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.04	-0.06	-1.31	-1.22
4th Year	-0.04	-0.06	-0.81	-0.56
6th Year	-0.06	-0.41	-1.00	-0.98
8th Year	—	+0.06	-0.81	-1.23
Real GNE Multiplier (Canada), or Induced Effects as % of 1963 GNE (U.S.)				
2nd Year	-0.04	-0.06	+0.85	+0.78
4th Year	-0.04	-0.07	+0.44	+0.28
6th Year	-0.07	-0.49	+0.63	+0.71
8th Year	—	+0.07	+0.56	+1.04
Price of GNE (% of Control)				
2nd Year	—	—	-0.69	-0.63
4th Year	-0.02	-0.03	-1.35	-1.05
6th Year	-0.05	-0.19	-1.46	-1.10
8th Year	-0.10	-0.64	-1.30	-1.37
Unemployment Rate (Percentage Points)				
2nd Year	+0.01	+0.01	+0.65	+0.62
4th Year	+0.01	+0.02	+0.11	-0.01
6th Year	+0.01	+0.08	-0.01	+0.06
8th Year	+0.01	+0.02	+0.08	+0.43

Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.01	-0.01	-0.58	-0.56
4th Year	-0.01	-0.02	-0.70	-0.60
6th Year	-0.03	-0.15	-0.46	-0.39
8th Year	-0.04	-0.25	-0.29	-0.29

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X BAL $	PFX % ch	X BAL $
Can. Reserves in Mill $ U.S.				
X BAL $ Is Change In Can. Total				
Trade Balance in Mill $ Can.				
PFX Is $ Can./$ U.S.				
2nd Year	-6.	+138.	+1.20	+186.
4th Year	-1.	+149.	+1.04	+197.
6th Year	+14.	+276.	-0.12	+297.
8th Year	+85.	+320.	-1.35	+271.

Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.45	-28.	+0.17	+11.
4th Year	-0.17	-14.	+0.73	+58.
6th Year	-0.01	-1.	+0.19	+19.
8th Year	+0.07	+10.	-0.80	-122.

Northbound Trade Flows (Canadian Current-Dollar Imports from U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-1.32	-99.	-1.16	-86.
4th Year	-0.93	-94.	-0.58	-57.
6th Year	-1.50	-180.	-1.51	-180.
8th Year	-1.22	-199.	-1.80	-295.

Table 4-A

U.S. Fiscal Policy with all Capital Flows Suppressed

Reduction of U.S. Federal Government Expenditure, 1963 — 1970
Sustained Cut Equal to 1% of 1963 U.S. GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-2.11	-2.11	-0.08	-0.08
4th Year	-0.86	-0.88	-0.07	—
6th Year	-1.65	-2.02	-0.10	+0.29
8th Year	+0.83	+0.95	+0.37	+1.39
Real GNE Multiplier (U.S.), or Induced Effects as % of 1963 GNE (Canada)				
2nd Year	+2.02	+2.02	-0.06	-0.06
4th Year	+0.94	+0.97	-0.02	+0.03
6th Year	+1.95	+2.40	—	+0.32
8th Year	-1.05	-1.18	+0.65	+1.38
Price of GNE (% of Control)				
2nd Year	-0.21	-0.21	+0.06	+0.05
4th Year	-1.08	-1.08	-0.21	-0.14
6th Year	-2.77	-2.90	-0.46	-0.23
8th Year	-5.09	-5.64	-1.02	+0.03
Unemployment Rate (Percentage Points)				
2nd Year	+0.49	+0.49	+0.05	+0.05
4th Year	+0.37	+0.37	+0.12	+0.08
6th Year	+0.46	+0.54	+0.10	-0.03
8th Year	+0.10	+0.11	+0.02	-0.35
Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.29	-0.29	-0.03	-0.01
4th Year	-0.32	-0.33	-0.10	-0.01
6th Year	-0.87	-1.01	-0.14	-0.05
8th Year	-1.61	-1.85	-0.12	+0.23

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX % ch	X Bal $
Can. Reserves in Mill $ U.S.				
X Bal $ is Change in Can. Total				
Trade Balance in Mill $ Can.				
PFX is $ Can./ $ U.S.				
2nd Year	-20.	-19.	+0.21	-17.
4th Year	-124.	-66.	+0.88	-26.
6th Year	-348.	-129.	+3.23	-43.
8th Year	-668.	-162.	+2.31	+25.

Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.43	-28.	-0.38	-23.
4th Year	-1.48	-121.	-1.08	-83.
6th Year	-2.29	-255.	-1.24	-127.
8th Year	-2.20	-326.	-0.48	-63.
Northbound Trade Flows (Canadian Current-Dollar Imports from U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.08	-6.	-0.05	-4.
4th Year	-0.40	-40.	-0.29	-28.
6th Year	-0.83	-100.	-0.16	-18.
8th Year	-0.88	-143.	-0.04	-7.

Table 4-B

Canadian Fiscal Policy with all Capital Flows Suppressed

Reduction of Canadian Federal Government Nonwage Expenditure, 1963 — 1970
Sustained Cut Equal to 1% of 1963 Canadian GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.05	-0.02	-1.55	-1.56
4th Year	-0.03	-0.01	-0.86	-1.20
6th Year	-0.04	-0.02	-0.73	-1.21
8th Year	+0.01	-0.02	-0.56	-1.32
Real GNE Multiplier (Canada), or Induced Effects as % of 1963 GNE (U.S.)				
2nd Year	-0.05	+0.02	+1.02	+1.03
4th Year	-0.03	+0.01	+0.46	+0.62
6th Year	-0.05	+0.02	+0.41	+0.65
8th Year	+0.01	+0.02	+0.31	+0.56
Price of GNE (% of Control)				
2nd Year	—	—	-0.75	-0.78
4th Year	-0.02	-0.01	-1.39	-1.95
6th Year	-0.05	-0.02	-1.22	-2.08
8th Year	-0.10	-0.05	-1.00	-2.47
Unemployment Rate (Percentage Points)				
2nd Year	+0.01	—	+0.76	+0.78
4th Year	+0.01	+0.01	+0.08	+0.28
6th Year	+0.01	—	-0.21	-0.07
8th Year	—	—	+0.03	+0.22

Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.01	—	-0.44	-0.65
4th Year	-0.01	—	-0.78	-0.87
6th Year	-0.02	-0.01	-0.53	-0.70
8th Year	-0.04	-0.02	-0.22	-0.56

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX % ch	X Bal $
Can. Reserves in Mill $ U.S. X Bal $ is Change in Can. Total Trade Balance in Mill $ Can. PFX is $ Can./ $ U.S.				
2nd Year	+231.	+163.	-2.44	+92.
4th Year	+482.	+131.	-2.37	+17.
6th Year	+779.	+195.	-4.43	+27.
8th Year	+1183.	+251.	-3.00	+46.

Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.62	-38.	-1.54	-93.
4th Year	-0.29	-23.	-2.04	-157.
6th Year	+0.05	+6.	-2.09	-216.
8th Year	+0.10	+15.	-2.04	-270.
Northbound Trade Flows (Canadian Current-Dollar Imports from U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-1.68	-127.	-1.91	-143.
4th Year	-0.86	-86.	-1.47	-145.
6th Year	-1.02	+123.	-1.95	-227.
8th Year	-0.94	+153.	-1.81	-277.

Table 4-C

U.S. Monetary Policy with all Capital Flows Suppressed

Reduction in Rate of Growth of M1$, 1963 — 1970
New Exogenous M1$ Grows 1% Less Fast Than Historical Series

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.64	-0.64	-0.16	-0.16
4th Year	-1.77	-1.80	-0.45	-0.46
6th Year	-3.35	-3.74	-0.95	-0.61
8th Year	-3.94	-3.91	+1.18	+0.74

Induced Effects as % of 1963 GNE				
2nd Year	-0.62	-0.62	-0.12	-0.12
4th Year	-1.94	-1.98	-0.37	-0.37
6th Year	-4.04	-4.52	-0.77	-0.44
8th Year	-4.88	-4.85	-0.97	+0.67
Price of GNE (% of Control)				
2nd Year	-0.02	-0.03	-0.01	-0.01
4th Year	-0.37	-0.37	-0.07	-0.09
6th Year	-1.99	-2.13	-0.31	-0.30
8th Year	-5.32	-5.89	-1.05	+0.31
Unemployment Rate (Percentage Points)				
2nd Year	+0.13	+0.13	+0.06	+0.06
4th Year	+0.40	+0.41	+0.20	+0.21
6th Year	+0.75	+0.83	+0.38	+0.27
8th Year	+0.93	+0.95	+0.62	-0.22
Short-Term Interest Rate (Percentage Points)				
2nd Year	+0.34	+0.34	+0.01	—
4th Year	+0.64	+0.63	-0.09	-0.07
6th Year	+0.44	+0.32	-0.33	-0.20
8th Year	-0.12	-0.38	-0.63	+0.07

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX % ch	X Bal $
Can. Reserves in Mill $ U.S.				
X Bal $ is Change in Can. Total				
Trade Balance in Mill $ Can.				
PFX is $ Can./ $ U.S.				
2nd Year	+7.	+6.	-0.08	+5.
4th Year	-33.	-39.	+0.35	-32.
6th Year	-350.	-229.	+4.44	-122.
8th Year	-1136.	-480.	+6.13	-97.

Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.21	-13.	-0.24	-14.
4th Year	-1.22	-101.	-1.17	-91.
6th Year	-3.61	-403.	-2.59	-266.
8th Year	-5.96	-886.	-2.75	-364.

Northbound Trade Flows (Canadian Current-Dollar Imports from U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.17	-13.	-0.18	-13.
4th Year	-0.38	-39.	-0.33	-33.
6th Year	-0.92	-112.	-0.28	-32.
8th Year	-1.65	-268.	+0.30	+44.

Table 5-A

U.S. Fiscal Policy with Migration and All Capital Flows Suppressed

Reduction of U.S. Federal Government Expenditure, 1963 — 1970
Sustained Cut Equal to 1% of 1963 U.S. GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-2.11	-2.11	-0.10	-0.10
4th Year	-0.86	-0.88	-0.10	-0.03
6th Year	-1.65	-2.02	-0.14	+0.21
8th Year	+0.83	+0.95	+0.29	+1.06
Real GNE Multiplier (U.S.), or Induced Effects as % of 1963 GNE (Canada)				
2nd Year	+2.02	+2.02	-0.08	-0.08
4th Year	+0.94	+0.97	-0.04	—
6th Year	+1.95	+2,40	-0.03	+0.24
8th Year	-1.05	-1.18	+0.56	+1.03
Price of GNE (% of Control)				
2nd Year	-0.21	-0.21	+0.06	+0.05
4th Year	-1.08	-1.08	-0.21	-0.14
6th Year	-2.77	-2.91	-0.45	-0.22
8th Year	-5.09	-5.64	-1.00	-0.06
Unemployment Rate (Percentage Points)				
2nd Year	+0.49	+0.49	+0.04	+0.04
4th Year	+0.37	+0.37	+0.10	+0.06
6th Year	+0.46	+0.54	+0.07	-0.10
8th Year	+0.10	+0.11	-0.03	-0.51
Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.29	-0.29	-0.04	-0.02
4th Year	-0.32	-0.33	-0.10	-0.02
6th Year	-0.87	-1.01	-0.15	-0.08
8th Year	-1.61	-1.85	-0.13	+0.15

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX % ch	X Bal $
Can. Reserves in Mill $ U.S.				
X Bal $ is Change in Can. Total				
Trade Balance in Mill $ Can.				
PFX is $ Can./ $ U.S.				
2nd Year	-18.	-18.	+0.20	-16.
4th Year	-118.	-64.	+0.84	-26.
6th Year	-340.	-129.	+3.15	-39.
8th Year	-637.	-151.	+1.88	+37.

Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.43	-28.	-0.38	-24.
4th Year	-1.48	-121.	-1.10	-84.
6th Year	-2.29	-255.	-1.27	-130.
8th Year	-2.20	-326.	-0.66	-86.
Northbound Trade Flows (Canadian Current-Dollar Imports from U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.10	-8.	-0.07	-5.
4th Year	-0.42	-42.	-0.31	-31.
6th Year	-0.83	-101.	-0.22	-25.
8th Year	-0.94	-153.	-0.33	-51.

Table 5-B

Canadian Fiscal Policy with Migration and All Capital Flows Suppressed

Reduction of Canadian Federal Government Nonwage Expenditure, 1963 — 1970
Sustained Cut Equal to 1% of Canadian Constant-Dollar 1963 GNE

Change in Variables	Effects in U.S.		Effects in Canada	
	Fixed	Flexible	Fixed	Flexible
Real Private Business Output (% of Control)				
2nd Year	-0.05	-0.02	-1.44	-1.45
4th Year	-0.02	-0.01	-0.33	-0.62
6th Year	-0.04	-0.02	-0.44	-0.61
8th Year	-0.01	-0.02	-0.35	-0.97
Real GNE Multiplier (Canada), or Induced Effects as % of 1963 GNE (U.S.)				
2nd Year	-0.04	-0.02	+0.94	+0.95
4th Year	-0.02	-0.01	-0.03	+0.10
6th Year	-0.05	-0.03	+0.03	+0.05
8th Year	-0.01	-0.02	—	+0.14
Price of GNE (% of Control)				
2nd Year	—	—	-0.74	-0.78
4th Year	-0.02	-0.01	-1.40	-1.93
6th Year	-0.05	-0.02	-1.41	-2.09
8th Year	-0.08	-0.05	-1.25	-2.53

Unemployment Rate (Percentage Points)				
2nd Year	+0.01	—	+0.85	+0.86
4th Year	+0.01	+0.01	+0.47	+0.67
6th Year	+0.01	+0.01	+0.22	+0.40
8th Year	—	—	+0.23	+0.61
Short-Term Interest Rate (Percentage Points)				
2nd Year	-0.01	—	-0.40	-0.59
4th Year	-0.01	—	-0.64	-0.69
6th Year	-0.02	-0.01	-0.52	-0.59
8th Year	-0.04	-0.03	-0.24	-0.52

International Effects	Fixed Rate		Flexible Rate	
	Reserves	X Bal $	PFX % ch	X Bal $
Can. Reserves in Mill $ U.S. X Bal $ is Change in Can. Total Trade Balance in Mill $ Can. PFX is $ Can./ $ U.S.				
2nd Year	+226.	+157.	-2.38	+87.
4th Year	+408.	+87.	-1.76	-5.
6th Year	+672.	+194.	-3.81	+46.
8th Year	+1082.	+279.	-3.02	+54.
Southbound Trade Flows (Canadian Current-Dollar Exports to U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-0.61	-38.	-1.51	-92.
4th Year	-0.30	-24.	-1.78	-136.
6th Year	-0.05	-5.	-1.74	-180.
8th Year	+0.10	+14.	-1.90	-252.
Northbound Trade Flows (Canadian Current-Dollar Imports from U.S.)				
	% Change	Mill $	% Change	Mill $
2nd Year	-1.61	-122.	-1.84	-137.
4th Year	-0.52	-52.	-1.03	-101.
6th Year	-1.00	-120.	-1.63	-189.
8th Year	-0.96	-155.	-1.67	-256.

Table 6

U.S. and Canadian Fiscal Policies with Closed Economies

Reduction of Federal Government Expenditure, 1963-1970
Sustained Cut Equal to 1% of Each Country's Real 1963 GNE

Change in Variables	Effects in U.S.	Effects in Canada
Real Private Business Output (% of control)		
1st Year	-1.87	-1.53
2nd Year	-2.53	-1.80
3rd Year	-2.13	-1.62
4th Year	-1.31	-1.31
5th Year	-1.61	-0.87
6th Year	-3.03	-0.58
7th Year	-3.45	-0.64
8th Year	-0.89	-0.76
Real GNE Multipliers (both Countries)		
1st Year	+1.69	+1.00
2nd Year	+2.42	+1.16
3rd Year	+2.17	+0.88
4th Year	+1.43	+0.58
5th Year	+1.85	+0.20
6th Year	+3.64	-0.09
7th Year	+4.22	-0.06
8th Year	+1.06	+0.07
Price of GNE (% of Control)		
1st Year	+0.03	-0.25
2nd Year	-0.20	-0.83
3rd Year	-0.57	-1.60
4th Year	-1.14	-2.09
5th Year	-1.94	-2.29
6th Year	-3.18	-2.28
7th Year	-4.92	-2.18
8th Year	-6.74	-1.98
Unemployment Rate (Percentage Points)		
1st Year	+0.36	+0.53
2nd Year	+0.55	+1.06
3rd Year	+0.59	+1.18
4th Year	+0.49	+1.01
5th Year	+0.52	+0.82
6th Year	+0.73	+0.52
7th Year	+0.78	+0.38
8th Year	+0.47	+0.38
Short-Term Interest Rate (Percentage Points)		
1st Year	-0.22	-0.67
2nd Year	-0.34	-0.63
3rd Year	-0.34	-0.72
4th Year	-0.39	-0.81
5th Year	-0.58	-0.71
6th Year	-1.26	-0.65
7th Year	-2.57	-0.62
8th Year	-2.63	-0.54

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Discussion

Stephen M. Goldfeld

The paper by Helliwell is an extremely impressive and carefully done piece of work. It is similar in spirit to a number of studies which have emerged from Project Link, but it differs in a number of important respects as well. For one, it is restricted to two countries, making it somewhat easier to homogenize the models, to carry out the simulations, and to interpret the results. Offset against this is the fact that the two models utilized are considerably more complex than the models found in Project Link, or among econometric models more generally. Indeed, I understand that the computer coding for RDX itself is larger than the coding for all the Link models put together. It is thus all the more impressive that Helliwell was able to carry out a set of well-conceived experiments designed to shed light on a number of important issues. Before turning to the experiments themselves, two general comments are in order.

First, one may ask what one can hope to learn from the experiments. Ideally, of course, one would hope to be able to say something useful about the real world and the structure of the economies involved. In view of the richness of the foreign sector of the RDX model, there would seem to be most hope on this score for Canada. Indeed, the results would seem to bear this out. Policy variations produce appropriately varying results and Helliwell is able to weave quite plausible stories as to why the differences emerge. The results differ to a lesser extent for the United States but these are colored by the fairly rudimentary state of the foreign sector in the MPS model. In other words, for the United States at least, one has to remember that some of the results may be telling us more about the econometric model than the economy per se.

A second general point concerning the experiments is that conceptual problems are often involved in the mechanics of translating verbal intentions into actual procedures. In particular, there is often more than one way in which a change can be introduced and the results may be sensitive to the precise manner in which this is done (e.g., how a given equation or sector is "suspended"). This is probably best illustrated in the present

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paper by the extensive modifications needed to suppress short-term capital flows. The complexity of RDX and my relative unfamilarity with the model make it difficult to discuss these technical aspects but this is probably just as well. The interested reader will find ample details on the procedures in the Appendix and in the various sources cited in the text. From a somewhat casual perusal of this material, my overall impression is that the technical details of the experiments have been handled with a great deal of care. Indeed, in this respect the paper could well serve as a model for other studies.

We turn now briefly to the results. The first thing that is obvious about the results is their sheer quantity. In an admirable attempt to disentangle the causal mechanisms, Helliwell has presented us with an almost overwhelming set of numbers. Despite this, a rather clear picture does emerge. Let us consider the United States first. Domestic fiscal policy generally has the same effect regardless of the underlying assumptions of the simulations. For example, the four-year effects on real private business output all fall in the narrow range 0.84 — 0.88 percent whatever assumptions one makes about capital flows, exchange rates, and the like. The effects of domestic fiscal policy on short-term interest rates are somewhat curious. In particular, following a policy change interest rates steadily decrease over time and at the end of eight years the short rate is about 1 3/4 percentage points below where it would have been. This seems a rather large effect. Canadian fiscal policy, at least of the size envisaged, has rather small effects on the United States although the relative sizes of the two economies must be borne in mind. Finally, the U. S. monetary policy examined differs rather substantially from the fiscal policies considered. For example, after eight years monetary policy leads to a 4 percent reduction in private output in the United States while the basic fiscal experiment leads to a 1 percent increase in private output. This must be borne in mind in interpreting the effects on Canada since these two policies are obviously not substitutes from the U.S. point of view.

Turning to Canada we find that U.S. fiscal policy does have substantial effects on Canadian variables and there are significant variations as the assumptions are altered. The same is true for the effects of domestic fiscal policy in Canada. The roles of short-term capital flows and immigration have particularly important consequences in altering the size of the various multipliers. Both of these factors would seem to warrant some further investigation.

In fact, Helliwell clearly has a sizable amount of additional work in mind. In his concluding section (and in the Appendix) he lays out an impressive agenda for future work. To this list I would add two things. First, it would seem that some increased attention should be devoted to the dynamics of the results. There are a number of mildly puzzling features of the results which seem only to emerge in the eighth year of the simulation and it would be interesting to track these down. Secondly, the simulations have been carried out for a particular historical period, 1963

— 1970. It would be nice to know how sensitive the results are to this choice. I raise this point because I have recently had occasion to compute one-, four-, and eight-quarter multipliers for all monetary and fiscal instruments in the MPS model for each quarter in the period 1958 — 72. As one might suspect with a nonlinear model, there were dramatic variations in the multipliers over time. The consequences of this for the robustness of Helliwell's results need to be examined.

In summary, Helliwell is to be congratulated for the careful job of marrying two monster-sized econometric models and for the reasonable set of experiments he has chosen. This sort of work needs to be encouraged and only when substantial further improvements along the lines he suggests are made, can we be confident that the experiments will move from the realm of telling us about the models to telling us about the real world.

*Discussion**

L. R. Klein

This is an excellent and interesting paper. I am pleased to have the opportunity of studying it critically for commentary. Such bilateral studies, as John Helliwell has prepared, are important methodologically and substantively in the case of U.S.-Canadian relations.

It is noteworthy that the United States turns out in this study to have a competitive advantage in using monetary policy for balance-of-payments problems. This seems to me to be unexpected because I was not aware that our monetary policy had been especially effective for stabilizing movements in the balance of payments.

In the paper, John Helliwell remarks that simulated movements of output and prices in the same directions in both countries overturns a theoretical presumption ". . . that monetary contraction lowers income at home and raises it abroad . . ." Historical experience has been that U.S. and Canadian cycles are largely the same except that amplitudes are smaller in Canada.

The results dealing with migration are unusual and extremely interesting. Migration effects play important roles in European models and in the form of bracero earnings in Mexican models. A question that comes to mind is how are guest workers treated, i.e., Canadian or U.S. citizens who do not register formally as immigrants? Guest worker effects ought to be built explicitly into both U.S. and Canadian models. It would be interesting to see if they have any influence on wage equations, as in some European countries.

Some suggestions for further research are:

1. Intermediate goods imports should be entered as factor inputs in the respective production functions. Much of the bilateral trade in

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*Editor's Note: Professor Klein's discussion originally contained some comments on three additional points: comparison of Helliwell's results with those from the TRACE model; a question of the length of lags associated with fiscal policy actions; and a possibility of insulation of the Canadian economy under the flexible exchange rate system. These points have been taken into account by Helliwell in his revision, and Klein has agreed to eliminate the portion dealing with these points from his discussion.

newsprint, timber, oil, coal, and other goods is undertaken with the expectation of being used in further production.

2. Long-run simulation of the MPS model is possible; it has been done. These simulations can be used together with long-run simulations that are apparently feasible with RDX2.

3. U.S. export price equations should be entered explicitly in the MPS model. In some recent research of this subject, I have found that U.S. export prices depend on unit domestic costs, capacity utilization, and U.S. dollar exchange rates (weighted average). In many countries, export prices are set at levels that are competitive with those of other trading nations. It is doubtful whether this price policy prevails in the United States but it may turn out to be the case that the United States intervenes in the wheat market so as to be competitive with Canada.

4. The fiscal shocks that are introduced ought to have a more rounded structure. The models should be examined to see whether output originating in government, government wages, government employment, defense orders or other related exogenous variables change when public expenditures change. Also the basic fiscal changes ought to be nominal instead of real. That is the way political decisions are made.

5. It is stated that an accommodating monetary policy means that M_1 is unchanged on the supply side. This seems to me to be a strange form of accommodation. I would prefer to see M_1 changed in such a way as to leave the degree of tightness in financial markets unchanged.

6. In the sample period, a number of special factors influenced the bilateral trade and payments of the two countries. These were the Interest Equalization Tax, EXPO, U.S. dock strikes (especially on the West Coast), the oil crisis, the U.S. draft provisions during Viet Nam, the automobile trade agreements, and restraints on timber trade. I would like to know if special adjustments were introduced for these in both models because they could have large effects on estimated coefficients and on some simulation results. Also it would be worth while to design simulation experiments to estimate the effects of some of these events on the economies.

Desmos: A Model for the Coordination of Economic Policies in the EEC Countries*

Jean Waelbroeck
and
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INTRODUCTION

Since the war the extremely rapid and sustained increase in the volume of international transactions has dramatically increased the economic interdependence of countries. This has resulted in a sharply perceived need for better coordination of economic policies. In spite of the progress of international cooperation it cannot be said that this need has been answered.

Part of the problem, we believe, is its complexity. It is difficult to agree to a set of coordinated measures when the gains achieved through coordination are only dimly perceived. Policy coordination is typically one of the economic problems whose complexity is such that ad hoc reasoning cannot grasp it adequately, so that an econometric model is needed to make sense of the multiple interactions involved.

Perhaps in no region has the need for better coordination of economic policies been as sharply perceived as in the EEC; in no region has the inadequacy of coordination attempts been so strongly criticized. It was natural therefore to try to construct a model which might help readers to understand the interaction of policies and economic development in the EEC.

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*Desmos = Link in Greek. The Desmos I model, covering the six initial EEC countries, was built by Mrs. M. Grinwis. Desmos II, the work of A. Dramais, is a substantially elaborated version of Desmos I, extended to cover the nine present EEC countries.

Such a model should be simple. Experience shows that policy advisers — surely wisely — disregard totally the results of models unless their mechanisms can be explained in simple terms. Wisely also they are interested only in models which can be handled rapidly and reliably.

The model should therefore have the following characteristics:

(a) Its equations should be specified in a single and readily understandable way;
(b) The economies of different countries should be described by similar equations: no policy adviser will accept that an unexpected result of the model is due to, say, France having a Phillips curve and Germany a Kuh wage function;
(c) The model should use only readily available data, so that it can be run from a single center, and does not depend on special hard-to-get data and information on economic variables and policy measures;
(d) The model should be reliable and useful not only for short-run, but for medium-run projections;
(e) It should have well-documented properties, so that any results produced can be rapidly understood and explained;
(f) It should be capable of reflecting a wide range of economic policies.

These guidelines explain the design of the Desmos model, which describes the interdependence of real and price variables in EEC countries in terms of four blocks of equations:

(a) a factor demand block;
(b) an income and expenditures block;
(c) a wage price block;
(d) a trade linkage block.

In each case the specification used reflects broadly accepted and well-tested ideas about economic causality.

Desmos does not encompass all relevant phenomena. The most glaring omissions are neglect of linkages which operate via international capital movements and labor migrations. The only study which incorporates such linkages is that by Helliwell, using the linked RDX II + MPS system. As indicated by his contribution to this volume, Helliwell finds that these linkages are not important in the short run; they operate rather slowly and have substantial effects only after a few years. The omission therefore affects the usefulness of Desmos mainly as a tool for medium-run forecasts.[1]

Another deficiency of the model is that economic activity outside of the EEC countries is treated as exogenous. This defect will be removed in

[1]These linkages will be introduced in the future. A. Sapir has worked on labor migrations and A. Dramais has obtained results on interest rate linkages via the Eurodollar rate. This preliminary work has revealed however that the data on labor movements and on capital markets in the EEC is extremely deficient; it will be a long time before a specification for EEC countries' capital and labor linkage systems comparable to Helliwell's will become possible.

the near future by introducing very simple equations reflecting the dependence of the rest of the world on economic trends in the EEC. No attempt has been made to describe precisely the institutional linkages between policy measures and the economy. Desmos does not include sets of fiscal equations indicating how, for instance, tax or social security measures affect different variables: public finance instruments are identified only in an aggregate way as public expenditures and the share of taxes in GNP. Neither does it contain detailed monetary sectors, indicating how, for example, discount rate changes or open market policies affect interest rates: governments are supposed to control in some way which the model does not explain "the rate of interest." We feel that although something is lost by this shortcut, especially on the monetary side, construction of adequate fiscal and monetary submodels was not compatible with the goal of constructing an easily manageable policy coordination model.

In spite of this insistence on simplicity of specification, Desmos is far from having a simple causal structure. This complexity reflects the fact that the commonly accepted macro-economic theory which the model quantifies is far from representing economic causality in simple terms. Also, in spite of the moderate size of individual country models, the total system is large. Desmos covers nine countries and includes linkage equations also. This explains why the total size of the model is 258 equations. There are many ways in which the system could be extended and improved; but before considering each step it is necessary to multiply by nine the number of equations to be added, to identify the new exogenous and endogenous variables needed and examine whether the new data required are found in easily available sources as is required if the model and its data bank are to be operationally maintained from a single center.

SALIENT FEATURES OF MODEL'S STRUCTURE

The equations of the model are given in the Appendix; in the following section of the paper we will try to document the features of the model which simulations have shown to be important.

Factor Demand Block

The factor demand block is neo-classical, allowing substitution between labor and capital along a Cobb Douglas function. This implies that demand for capital and labor depends not only on output, but on factor prices.

A well-known problem in estimation of neo-classical factor demand systems is that the labor and capital demand functions obtained are not consistent with a unique production function. This is a serious defect of these equations if the models are meant to produce satisfactory long-run forecasts. Inconsistent labor and investment demand functions are incapable of generating a coherent picture of the future growth of prices, wages, interest rates, capital and labor use, and production.

There are various ways of enforcing consistency in estimation of capital and labor demand functions. We chose to use the procedure proposed by Coen and Hickman[2] which involves using a maximum likelihood procedure to estimate equations of the type[3]

$$EMPi = (PIBCFi)^b \, (CCAPi/Wi)^c \, 10^{-d \, TEMPS} \, EMPi^e_{-1}$$

$$CAPi = (\rho i PIBCFi + (1 - \rho i) \, PIBCFi_{-1})^b \cdot [ki(CCAPi/Wi) + (1 - ki)(CCAPi_{-1}/Wi_{-1})]^c \cdot 10^{-d \, TEMPS} \, CAPi^e_{-1}$$

$$0 \leqslant \rho_i \leqslant 1$$
$$0 \leqslant k_i \leqslant 1$$

where ρ_i and k_i are weights used in forming weighted averages of variables involved.

under appropriate constraints on the coefficient. The method seemed robust. It has so far been used only for the USA, and it seemed interesting to test its applicability to factor demand in the EEC.

This initial judgment about the method's robustness proved on the whole justified. In spite of the poor quality of data it was possible to obtain good results in estimation for Germany, Belgium, Italy and the United Kingdom. For France and Denmark it was necessary to impose as a constraint constant returns to scale of the underlying production function. For the Netherlands it was found necessary to estimate the production function directly so that only the adjustment lags were left to be estimated in capital and labor demand functions. For Ireland capital demand was estimated using a Jorgenson specification, whereas labor demand was estimated as for the Netherlands. Only for that country do the two demand functions fail to achieve consistency with the same production function. The inconsistency is not very severe however as shown by Table 1.

The underlying production functions are broadly similar. They show evidence of increasing returns, except when constant returns were imposed in estimation.

The chief properties of the estimated factor demand functions are summarized in Table 2. The mean capital adjustment lags seem very long. In judging them it must be borne in mind that — because of the desire for simplicity — only one capital demand function is estimated covering the total capital stock and total output. Although it is expected that adjustment of production capital to output and factor prices is rather fast for directly productive investment, the same is not true of housing and infrastructure investment; the very long lags are not entirely unreasonable therefore.

[2]R.M. Coen and B. Hickman, "Constrained Joint Estimation of Factor Demand and Production Functions," *Review of Economics and Statistics*, No. 3, 1970, pp. 287-300.

[3]Definitions of symbols are given in Appendix.

One question raised by the results is whether the Coen-Hickman specification is flexible enough to allow fully for differences in the speed of adjustment of capital demand to the level of GNP and to factor prices. Adjustment to changes in GNP — capital widening — is probably faster than adjustment to factor prices, which necessitates capital deepening and thus an overhaul of existing facilities. The results reveal such a discrepancy for most of the functions estimated, but the Coen-Hickman specification, which does not permit a difference in mean adjustment lag exceeding one year, may not be flexible enough to reflect the full extent of the difference. For labor the problem arises even more acutely, since the specification does not allow for any difference in adjustment speed to the level of activity and to factor prices.

The attention of the reader is drawn to the differences in adjustment speed of labor and capital between countries. These differences have a significant influence on the simulation behavior of the country submodels.

Table 1

Production Functions Underlying the Capital and Labor Demand Functions

Countries	b	c	b + c	d
Germany	0.98	0.30	1.28	0.0248
Belgium	0.86	0.27	1.13	0.0225
Denmark	0.81	0.19	1.00	0.0218
France	0.86	0.14	1.00	0.0235
Ireland 1	0.66	0.34	1.00	n.a.
2	0.71	0.29	1.00	0.0086
Italy	0.88	0.27	1.15	0.0251
The Netherlands	0.85	0.55	1.39	0.0191
United Kingdom	0.90	0.19	1.09	0.0225

Where the specification is $PIBi = aEMPi^b \, CAPi^c \, e^{d \, TEMPS}$

For Ireland specification 1 is derived from the capital demand function; 2 from the labor demand function.

Table 2

Capital and Labor Demand Functions*

	Capital Demand				Labor Demand		
			GDP	Factor Prices			
	b	c	Mean Lag (years)	Mean Lag (years)	b	c	Mean Lag (years)
Germany	0.049	-0.048	15.9	15.9	0.098	0.298	7.9
Belgium	0.122	-0.105	9.0	9.3	0.318	0.086	2.7
Denmark	0.110	-0.090	8.0	9.0	0.156	0.030	6.4
France	0.044	-0.038	21.7	22.7	0.740	0.104	1.3
Ireland	n.a.	n.a.	n.a.	n.a.	0.243	n.a.	4.8
Italy	0.124	-0.109	8.9	9.3	0.522	0.142	1.6
The Netherlands	0.041	-0.035	16.5	17.5	0.118	n.a.	10.0
United Kingdom	0.092	-0.083	9.0	10.0	0.402	0.076	2.3

Where b, c are the short-run elasticities of capital and labor demand with respect to GDP and relative factor prices.

*As explained, the Coen-Hickman approach did not give results for Ireland and the Netherlands. This explains the lack of a relative price term in the labor demand equation for these countries. This does not mean that demand for labor is wholly insensitive to relative prices, for in both countries labor demand depends on capital stock, which depends on factor price, so that an indirect relation exists. But this is weak, and the different specification adopted for these countries does affect the simulation behavior of the corresponding submodels.

The last important remark is that — because capital and labor demand respond to factor prices and to output with a lag — the Coen-Hickman specification permits substantial variation in the degree of utilization of factors of production. Factor utilization is accordingly an important variable of the Desmos model. As will be seen it plays a significant role in explaining exports. Also, the increase in factor utilization in an upswing leads to an Okun's law type response of productivity to demand, which we feel is empirically realistic.

Income Expenditure Block

The *consumption* functions explain the level of consumption as a function of deflated disposable income, with an exponential lag which can be explained in several ways, e.g., by the permanent income hypothesis.

As the table shows, the long-term propensities to consume differ little between countries — Denmark's high propensity being an exception. They are quite close to the average propensities, as is implied by the permanent income hypothesis. Countries differ substantially however in the speed of adjustment of consumption to changes in income, and these differences affect significantly the dynamic simulation properties of the models. The lags are on the whole rather short: in no case does income appreciably influence consumption after the third year.

The *disposable income* equations are a convenient way of side-stepping the complex task of estimating detailed public sector submodels. What is interesting is that the aggregate behavior of the different governments has been so similar; by and large the net levy of governments on incomes has varied proportionately to GNP; the net tax share is quite similar in the different countries.

The reader should note that it is disposable income in value which is related to the current price GNP, whereas the volume of consumption depends on disposable income deflated by the price of private consumption. Consumer behavior is therefore influenced by the relationship between the price index of private consumption and of GNP. The simulation results show, for example, a clear impact of changes in the terms of trade on the level of private consumption expenditures.

Government consumption is considered as exogenous. As taxes net of transfers are a function of GNP, public savings play the role of an automatic stabilizer of the level of activity. Of course, it is doubtful that government expenditures do not to some extent depend on income, and from this point of view the model is not quite realistic.

Gross domestic fixed capital formation is obtained by a quasi-identity involving the capital stock and the rate of amortization. As already noted, Ireland is an exception in that investment is determined by a Jorgenson function.

Data on *changes in inventories* in EEC countries are extremely unreliable. It is the custom of several statistical offices to include most of the errors and omissions adjustments in this item. It was decided not to attempt a refined estimation, and to assume that changes in stocks equal 10 percent of the changes of GNP plus an estimated constant term.

Wage Price Block

Little refinement has so far gone into this block, which links wages to unemployment and prices by Phillips curves, and explains prices by cost-push formulas. Ideally it would be desirable to connect prices and wages to the Coen-Hickman production function. This could be used to construct an indicator of factor costs, which would determine prices along with disequilibrium variables like unemployment or the degree of use of capacity, along the lines of the RDX II model, for instance. We plan to experiment with such a formulation in future.

Table 3

Consumption and Disposable Income Equations

	Consumption Function		Disposable Personal Income
	Marginal Propensity to Consume		
	Short run	Long run	Regression Coefficient
Germany	0.54	0.83	0.65
Belgium	0.67	0.75	0.72
Denmark	0.58	0.96	0.65
France	0.59	0.83	0.68
Ireland	0.81	0.81	0.74
Italy	0.43	0.81	0.78
The Netherlands	0.51	0.81	0.68
United Kingdom	0.46	0.82	0.67
Luxemburg	0.60	0.92	0.70

The estimated equations for wages given in the Appendix are difficult to compare because the definition and statistical coverage of the wage indices vary from country to country and because "normal" unemployment levels differ among countries. We have computed therefore the values of elasticity at the mean of wages with respect to the chief explanatory variables. The elasticities in Table 4 refer to the semi-reduced form equations obtained by eliminating private consumption prices between the wage and private consumption price equations of the model. As the table shows, Phillips curves for different countries imply broadly similar behavior. The reader is cautioned however that, since the wage equations are nonlinear, the sensitivity of wages to changes in employment is apt to differ substantially from year to year; this once again is a very clear feature of the simulation results.

Table 4

Wages: Elasticities at the Mean with Respect to Explanatory Variables

	Elasticities of Wages with Respect to		
	Employment	Active Population	Import Prices
Germany	2.02	-2.06	—
Belgium	2.93	-3.06	0.15
Denmark	1.06	-1.09	0.21
France	2.72	-2.76	—
Ireland	3.26	-3.45	0.45
Italy	2.08	-2.19	—
The Netherlands	2.12	-2.15	0.21
United Kingdom	1.55	-.157	—

For France the Phillips curve failed to give results. It was necessary to use a different specification, in which wages depend on changes in unemployment. This appears to reflect a pattern of labor market behavior where changes in unemployment have a very rapid but noncontinuing effect on the level of wages.

To understand the behavior of the model, it is useful to relate the "supply curves" for labor which the table represents to "demand curves" represented by the labor demand relations of the factor demand block. The latter are given in Table 5. In the Netherlands, since the employment demand function is a reversed Cobb Douglas with a Koyck lag, employment is not directly a function of wages. Thus, in the short run, it depends only on business fluctuations and not on relative prices.

Prices are explained by wages and import prices. The first variable reflects a cost-push influence, the second translates both push and pull effects. Import prices influence domestic prices both directly, because goods sold in domestic markets incorporate imports, and indirectly to the extent that domestic producers adjust selling prices and profit margins to match the prices offered by foreign competitors. It is clear from the estimated coefficient that the second effect is substantial.

Table 5

Elasticities of Labor Demand

	Short-term elasticities with respect to		Long-term elasticities with respect to	
	Production	Wages	Production	Wages
Germany	0.098	-0.030	0.777	-0.238
Belgium	0.318	-0.086	0.878	-0.237
Denmark	0.156	-0.030	1.000	-0.192
France	0.743	-0.104	1.000	-0.140
Italy	0.522	-0.142	0.872	-0.237
The Netherlands	0.118	n.a.	1.180	n.a.
United Kingdom	0.402	-0.076	0.919	-0.174

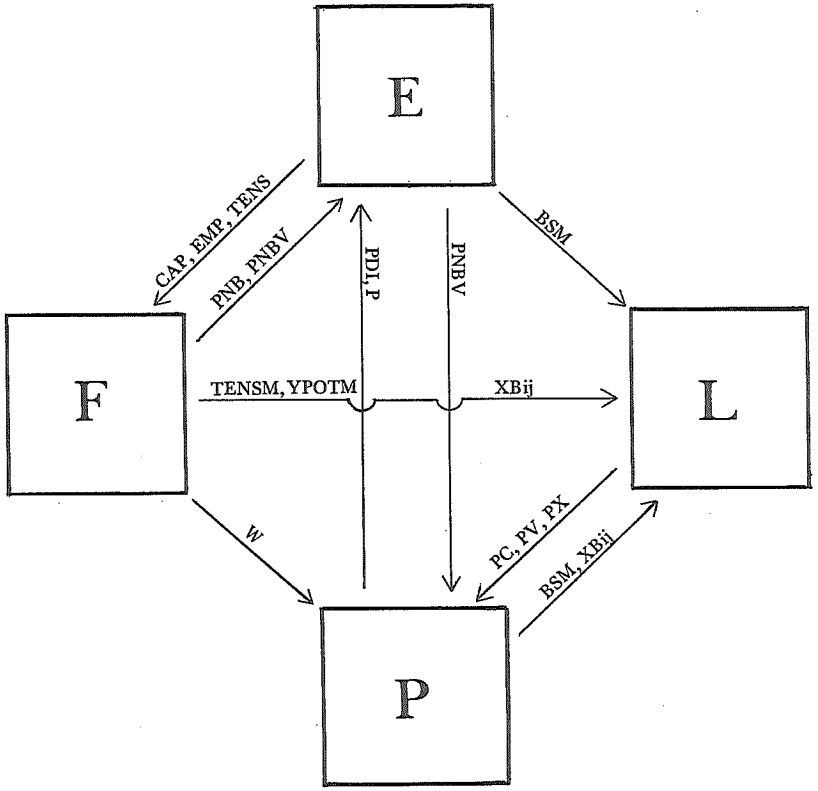
Foreign prices influence consumer prices only in the smaller countries. It was decided not to use a regression for France with a highly significant import price coefficient, to maintain symmetry with the specification for other large countries where domestic consumer prices did not depend significantly on import prices. The table shows that this apparently strong sensitivity of French prices to foreign influences is a general characteristic of the French economy which separates it from those of its Common Market partners.

Another interesting result is the tendency of Italian exporters to behave very competitively and match international prices almost irrespective of changes in their own costs. This is also probably a realistic trait of the Italian economy, which helps to account for the lack of effect of recent devaluations in restoring the balance-of-payments equilibrium.

Structure of the Country Submodels

In spite of our determination to avoid any needless complexity, the structure of the Desmos model is far from simple. The diagram below, which identifies the relation between the blocks of equations in each of the countries' submodels, helps to explain its simulation behavior. In the

diagram the blocks refer to the four categories of endogenous variables identified in the list of notations in the appendix. The variable names above or to the left of each arrow refer to the variables in the block reached by the arrow, which depend on variables in the block from which the arrow originates.



F, E, P, L are respectively the factor demand, expenditure, price and linkage blocks of the model.

The Linkage Block

In Desmos as in other linked models exporters are price setters and quantity takers. Each countries' *imports* are determined by its GNP and by relative prices; these equations are allocated between exports by *bilateral trade flows equations. For export prices* it is exporters who call the tune, their behavior being described by appropriate equations for each country; these prices are averaged to determine *import prices* for each country. Sellers of many manufactured goods are in fact price setters and quantity takers, so that such a system is not unrealistic, at least for developed countries.

As in a recent study by Hickman and Lau,[4] which served as a point of departure, the bilateral flow equations are linearized constant elasticity functions. The underlying functions have the form:

$$\left(\frac{XB_{ij}}{BM^*_j}\right) = \alpha ij \left(\frac{PXC_i}{PMC^*_j}\right)^{\beta_j} \left(\frac{YPOT_i}{YPOTM^*_j}\right)^{\gamma_j} \left(\frac{TENS_i}{TENSM^*_j}\right)^{\delta_j} e^{TIE_{ij}}$$

where BM^*_j, PMC^*_j, $YPOTM^*_j$, and $TENSM^*_j$ are appropriate CES indices of real imports, import prices, supplier capacity output, and supplier capacity utilization in the jth import market.[5] Other variables are defined in the Appendix. We assume $\beta_j = \beta$, $\gamma_j = \gamma$, and $\delta_j = \delta$ for all j, and that $\alpha_{ij} = \alpha_{ij}\,(e^{TIE_{ij}})$ where

$$TIE_{ij} = \alpha^*_1\, BCEEI_{ij} + \alpha^*_2\, BAELE_{ij} + \alpha^*_3\, BCEEX_{ij} + \alpha^*_4\, BAELEX_{ij}$$ [6]

The data are the constant and current price trade matrices built by G. Taplin at the IMF.

The term $e^{TIE_{ij}}$ allows for integration effects, where $BCEEI_{ij}$ and $BAELE_{ij}$ stand for Common Market and EFTA intra-trade dummies and $BCEEX_{ij}$ and $BAELEX_{ij}$ for extra-trade dummies. Of the four coefficients only the first is significant. We plan to experiment with formulations in which the integration effect is represented by a trend. $TENS_i$ is a pressure of demand variable, $TENSM^*_j$ being the weighted pressure of demand of exporters into each market. Pressure of demand is represented by the ratio of GNP to production capacity at full employment, as measured by the models' production functions.

[4]B. Hickman and L. Lau, "Elasticities of Substitution and Export Demand in a World Trade Model," *European Economic Review*, Vol. IV, December 1973.

[5]These indices become trade weighted averages such as PMC_j upon linearization by the Taylor's series expansion around the values of variables for a base year, as is fully described in Hickman and Lau.

[6]The function $\alpha_{ij}\,(e^{TIE_{ij}})$ becomes a simple linear sum as shown in the Appendix upon linearization referred to in footnote 5.

The most novel term of the specification is $(YPOT_i/YPOTM^*_j)$, the ratio of production capacity in the country of origin to a weighted average of its competitors' capacity on each of its markets. This unorthodox term allows for two major misspecifications of export-demand functions of the usual type.

(i) The functions are specified as if countries all exported the same goods, where the manufactures, especially the exports which we measure, are made up of hundreds of thousands of different products. No country exports more than a small fraction of the number of goods exchanged in international trade. The number of products which a country is able to supply should therefore be an argument of the export demand function, for a country which matches its competitors' prices for all products will sell more if it exports many than if it exports only a few products. To the extent that large countries produce a broader range of goods than small ones, because it is uneconomic to produce at a very small scale of output, this factor may be captured by the $(YPOT_i/YPOTM^*_j)$ variable.

(ii) International trade takes place in conditions of very imperfect information, and this makes selling effort perhaps as important as price in the competition for markets. For many products, e.g., machines, importers may know only a few of the potential suppliers of the goods they need. For other goods, e.g., cameras, the final buyer has only a vague understanding of the merits of the goods between which he may choose. Selling effort has a considerable effect on exports and this works to the advantage of the large countries which have larger sales forces than their smaller competitors.

It should be noted that according to both (i) and (ii) it would be expected that exports will depend on the production capacity of the exporter and not on its GNP, and this is reflected in the specification used. The specification differs in this important respect from the so-called "gravity model" in which exports depend on the GNP of the exporter. In the long run, capacity and GNP will move together; but in a short-term model it is essential to distinguish between the two.

It can be shown that if m_j is the share of imports in aggregate expenditures $(PNB_j + M_j)$, the price elasticity of export demand on market j is

$$-\beta + \sum_j a_{ij}\,(\beta - c_j/(1 - m_j\, b_j))$$

where β and c_j are the price elasticities of the bilateral flows and import equations; b_j the income elasticity of import demand, and a_{ij} import shares of country i in market j. Given the import functions estimated, the typical price elasticity of export demand works out to a value of some 1.65. The typical price elasticity of import demand is -0.4. Price adjustment is thus moderately effective as a means of restoring balance-of-payments equilibrium.

Another important part of the bilateral trade equation is the a_{ij} coefficient equal to import shares in the base year. These are the main determinants of the strength of trade linkages between countries. In Table 7 the special relation between the United Kingdom and Ireland is very evident, as are the strong ties between the "DM block" countries (Germany, Belgium, Holland) who have remained in the EEC snake. Another noteworthy feature is the United Kingdom's strong dependence on extra EEC trade.

POLICY RESPONSE OF THE MODEL

Because of the model's complexity it is impossible to predict its behavior from the study of its equations. As explained in the introduction we feel that the properties of a model intended to be used for policy coordination should be thoroughly understood and documented. The best way of doing this, we felt, was to compute a complete set of dynamic policy multipliers.

Examination of computing costs showed that it was possible to produce at low cost tables of dynamic multipliers covering the effect over five years of changes of six policy instruments by each EEC country except Luxemburg, and by all EEC countries together, i.e., a total of 55 simulations. Detailed tables giving some 3,000 dynamic multipliers for all major variables from a 1970-1974 simulation are available; space considerations preclude however a complete reproduction of these results in this volume.

As for the model's structure, the discussion will be confined to highlights. We will discuss in succession:

(a) the mechanisms through which policy instruments affect the economies of the EEC countries;
(b) the "controllability" of the four objective variables of the model;
(c) differences in the response of countries to changes in instruments: does Desmos shed any light on the reason for the strikingly different history of say the German and UK economies in the 1960s and 1970s?
(d) a comparison of the multipliers with the results on international transmission of economic fluctuations presented by Hickman;
(e) in the last section of the paper, finally, we try to indicate how the model's dynamic multipliers might be used to devise a coordinated economic policy which would meet the current economic difficulties of EEC members and reflect their preference as to the choice of instruments used to achieve chosen goals.

Controllability of the EEC Economy

Experience in using models for policy-making indicates that — wisely — policy-makers are not interested in knowing the precise values of policy multipliers; what they are really prepared to discuss and perhaps be persuaded to take into account are signs and orders of magnitude of impacts.

Table 6

Coefficient in Price Equations

	Private Consumption Prices		Public Consumption Prices	Investment Goods Prices		Export Prices	
	Wages	"Import" Prices	Wages	Wages	"Import" Prices	Wages	"Import" Prices
Germany	0.42	—	0.71	0.54	0.18	0.32	0.40
Belgium	0.31	0.29	0.42[x]	0.59	0.23	0.45	0.35
Denmark	0.27	0.19	0.80	0.37	0.31	0.21	0.39
France	0.85	—	0.80	0.60	0.48	0.62	0.62
Ireland	0.44	0.32	0.69	0.36	0.26	0.47	0.49
Italy	0.50	—	0.69	0.37	0.21	0.14	0.76
The Netherlands	0.48	0.19	0.72	0.44	0.29	0.30	0.50
United Kingdom	0.68	—	0.73	0.88	—	0.66	0.51

[x]Long-term coefficient from a Koyck specification; short-run coefficient = 0.22.

They perceive the model not as an exact tool for computation of policies, but as a way of obtaining better qualitative understanding of economic interactions.

It is thus interesting to look at the multipliers in terms of what Lancaster has christened "qualitative economic theory": i.e., theory which takes into account only whether the influence of a variable on another is positive, zero, or negative. Is it possible to decide how instruments should be used to achieve given objectives if all that is known is the signs of their dynamic multipliers? We will call a model with this property strongly controllable. The property is desirable not only because it facilitates discussion of policies with users. But it also implies that the impacts of instruments are sufficiently differentiated to endow policy makers with flexibility in coping with a broad range of possible economic situations.

The sign pattern of policy multipliers is given in Table 9. It is immediately apparent that, since the unemployment and consumer price multipliers have opposite signs for all instruments, they are not separately strongly controllable in the above defined sense. This is of course what

Table 7

Pattern of Interdependence of the EEC Countries; Market Shares in 1963*

Supplier (i) \ Market (j)	G	BLEU	D	F	E	I	N	U	R
G	—	0.2079	0.2277	0.1967	0.0678	0.1840	0.2392	0.0458	0.0808
BLEU	0.0753	—	0.0332	0.0865	0.0237	0.0336	0.1835	0.0230	0.0152
D	0.0266	0.0042	—	0.0070	0.0102	0.0130	0.0070	0.0356	0.0088
F	0.1117	0.1474	0.0412	—	0.0268	0.1002	0.0447	0.0326	0.0448
E	0.0014	0.0008	0.0003	0.0010	—	0.0010	0.0010	0.0337	0.0008
I	0.0771	0.0374	0.0274	0.0653	0.0112	—	0.0314	0.0227	0.0289
N	0.1083	0.1513	0.0478	0.0482	0.0295	0.0309	—	0.0396	0.0168
U	0.0560	0.0604	0.1549	0.0662	0.5597	0.0658	0.0817	—	0.0860
R	0.5436	0.3906	0.4675	0.5291	0.2711	0.5715	0.4115	0.7670	0.7179

*G = Germany, BLEU = Belgium and Luxemburg, D = Denmark, F = France, E = Ireland, I = Italy, N = Netherlands, U = United Kingdom, R = Rest of the world.

Table 8

Effects of Synchronized Changes of Six Policy Instruments on the Main EEC Variables

Measures / Variables		GNP	Consumption	Investment	Export	Import	Employment	Wages	Consumption Prices	Export Prices $	Import Prices $	Balance of Payments
Public Consumption	70	1.56	1.04	0.58	0.51	1.99	0.33	0.49	0.35	0.24	0.13	-0.33
	72	1.92	1.93	1.84	0.16	2.69	0.87	1.70	0.97	0.87	0.41	-0.54
	74	1.91	2.35	2.40	-0.43	3.11	1.21	3.42	1.93	1.91	0.77	-0.71
Taxes	70	-0.71	-1.30	-0.27	-0.36	-1.22	-0.15	-0.22	-0.17	-0.11	-0.07	0.20
	72	-1.23	-2.32	-1.02	-0.42	-2.03	-0.50	-0.64	-0.39	-0.33	-0.17	0.39
	74	-1.35	-2.66	-1.35	-0.30	-2.28	-0.78	-1.07	-0.60	-0.59	-0.27	0.49
Investment	70	1.36	0.84	4.85	0.82	2.45	0.29	0.44	0.33	0.22	0.13	-0.36
	72	3.36	2.76	12.20	1.40	5.67	1.36	1.80	1.22	0.88	0.45	-0.98
	74	4.79	4.56	18.53	0.95	8.21	2.65	4.30	2.96	2.37	0.98	-1.66
Exchange Rate	70	-2.16	-1.06	-0.60	-4.12	0.10	-0.45	-0.78	-0.70	5.90	2.65	-0.36
	72	-2.35	-1.72	-1.36	-3.45	-0.08	-1.12	-1.74	-1.17	5.35	2.40	-0.25
	74	-2.44	-2.02	-1.74	-2.89	-0.28	-1.58	-2.56	-1.59	4.76	2.15	-0.16
Interest Rate	70	-0.28	-0.16	-0.81	-0.37	-0.51	0.07	0.16	0.13	0.11	0.04	0.05
	72	-1.47	-1.11	-4.78	-1.16	-2.33	-0.06	0.21	0.10	0.17	0.04	0.33
	74	-1.65	-1.41	-5.13	-1.21	-2.51	-0.21	0.12	0.04	0.14	0.03	0.39
Immigration of Labor	70	0.44	0.20	0.07	1.50	0.60	0.08	-0.93	-0.57	-0.49	-0.21	0.16
	72	0.46	0.18	-0.14	1.58	0.32	0.17	-1.88	-0.96	-1.00	-0.43	0.20
	74	0.44	0.07	-0.35	1.55	0.10	0.21	-2.39	-1.19	-1.32	-0.55	0.22

economists have in mind when they speak of the "trade-off" between inflation and unemployment. From a mathematical point of view there is no such thing as a trade-off: if there are two instruments, if their dynamic multipliers are not co-linear, and if their values can be changed freely, it is possible to achieve any combination of inflation and unemployment rates. But if, as happens to be the case, the impacts are not strongly differentiated, separate control of unemployment and prices implies very large and politically unacceptable changes of instruments.

If either consumer prices or unemployment are dropped from the list, the remaining objectives are strongly controllable. This is shown in Table 10. The first part of the table shows that — because of the signs of dynamic multipliers — there must be a policy combining demand contraction with revaluation which has no impact on the balance of payments, but decreases both GNP and consumer prices. A drop in the interest rate and a rise in the labor force increase GNP and reduce prices, again with no effect on the balance of payments. As the second part of the table shows, a combination of these four policy measures will reduce inflation without cutting the rate of growth or affecting the balance of payments.

The Phillips curve has become an unfashionable concept, because it does not explain the recent inflation well. It is certainly not as stable a relation as, say, the consumption function. Estimation results suggest that over the sample period, at any rate, it has explained wages reasonably well, with coefficients which are roughly comparable between countries. There is at least historical interest in an examination of the model's inflation/unemployment trade-offs. This is given in Table 11.

Table 9

Sign Pattern of Policy Multipliers

Impact on	Public Consumption, Direct Taxes, Investment	Rate of Exchange	Long-term Interest Rate	Labor Immigration
GNP	+	—	—	+
Unemployment	—	+	0*	+
Consumer prices	+	—	0*	—
Balance of payments	—	—	+	+

*Impacts quite small

Table 10

Impacts of Combinations of Instruments*

Impact on	$\frac{-\Delta EXP}{+\Delta EXCH}$ a	$\frac{-\Delta RL}{+\Delta IMMIG}$ b	$\frac{\Delta EXCH}{-\Delta RL}$ c	$\frac{\Delta EXP}{-\Delta IMMIG}$ d
GNP	—	+	0	0
Consumer prices	—	—	—	+
Balance of payments	0	0	—	—

	$\frac{-\Delta EXP - \Delta RL}{+\Delta EXCH + \Delta IMMIG}$ (a + b)	$\frac{-\Delta EXP - \Delta RL}{+\Delta EXCH + \Delta IMMIG}$ -c — d	$\frac{-\Delta RL + \Delta IMMIG}{-\Delta EXCH + \Delta EXP}$ -(a — b)
GNP	0	0	+
Consumer prices	—	0	0
Balance of payments	0	+	0

* ΔEXP = use of expansionary policies: increases in public consumption, cut in taxes, stimulus to investment

ΔRL = increase in long-term rate of interest

$\Delta EXCH$ = currency revaluation

$\Delta IMMIG$ = import of foreign labor

Because of the nonlinearity of this relation the table distinguishes expansionary measures, which push the economy into the low unemployment zone, and deflationary measures which have an opposite effect. It is wise to avoid comparing dynamic multipliers in the two categories.

What is striking is how unfavorable the trade-off is. It is, roughly speaking, necessary to increase unemployment by 1 percent to reduce prices by 1 percent. It is doubtful whether voters in most countries are willing to pay such a price to combat inflation. The frequent statements that "the Phillips curve does not work any more" to a certain extent reflects the fact that "it does not work as much as we would like." The unemployment price for controlling inflation is so high that after a year of experience with recession political pressure to expand demand becomes overwhelming.

Table 11

Inflation/Unemployment Tradeoffs

(Ratios of private consumption prices to unemployment multipliers of different instruments)

	Expansionary Measures		Deflationary Measures		
Year	Public Consumption	Investment	Direct Taxes	Exchange Rate	Labor Import
1	1.06	1.14	1.13	1.56	0.62
3	1.11	0.90	0.78	1.04	1.10
5	1.60	1.12	0.77	1.01	1.51

The impact profiles in the table are interesting. The trade-off of (expansionary) public consumption increases rises, the trade-offs of (deflationary) tax increases fall, because the first instrument carries unemployment into the steeply rising zone of the Phillips curve, the other into its flat portion. Labor import stands out however for its rising inflation/unemployment tradeoff. Tax increases are the least advantageous method of fighting inflation. In the "expansionary measures" category investment is a way of reducing unemployment which has a lower inflation cost than public consumption.

EFFECT OF SYNCHRONIZED ECONOMIC POLICIES

It is not possible to present in full the close to 3,000 dynamic policy multipliers computed. A useful way of understanding the behavior of the model is however to discuss the impacts of synchronized changes in policy instruments. We will first discuss the impacts on EEC aggregates, shown in Table 8, then the impacts on individual countries. Impacts of public expenditures will be described in some detail, as a device to introduce to the reader the mechanisms of the model.

Impacts on EEC Aggregates

The policy measures considered are sustained changes of six policy instruments:

(a) exogenous changes of aggregate demand components:
  (i) public consumption: increase equal to 1 percent of GNP;
  (ii) direct taxes: increase equal to 1 percent of GNP;
  (iii) investment: increase equal to 1 percent of GNP.

(b) other instruments:
  (i) 10 percent revaluation;
  (ii) 1 percent increase of the long-term interest rate;
  (iii) labor immigration equal to 1 percent of the active population.

Exogenous Changes of Aggregate Demand Components

(i) *Public Consumption*

An increase in public expenditure increases GNP through the multiplier. This influence is somewhat enhanced by the impact of the measure on the terms of trade, which affect consumption through their impact on personal disposable income.

The increase in production sets in motion the accelerator mechanism, causing a rise of investment. Because of the long lags of investment demand, this impact is spread over a fairly long period. As production increases, however, the relative price of labor rises, and this amplifies significantly the increase in investment.

Imports increase both because of the expansion of the economic activity, and because of the increase in domestic prices.

The effect on unemployment is the result of a positive impact of higher GNP, partly offset by factor substitution caused by an increase in the relative price of labor.

The reduction in unemployment causes a sustained increase in wages and prices, which deteriorates the competitive position of the Common Market.

Exports increase at first, because of the rise in intratrade of EEC countries. The unfavorable effect of prices and of increased pressure of demand gradually predominate, and in the fifth year EEC exports have fallen below the level in the control solution.

(ii) *Increase in Direct Taxes*

The effect of higher taxes differs from that of higher public consumption in two ways. The effect of taxes is weaker, because an increase reduces savings and does not lead to an equivalent drop in consumption. The nonlinearity of the wage equation also affects the result: the price repercussions of a cut in expenditures are less than those of an equivalent increase in expenditures. This accounts for the very different time profiles of the GNP and employment multipliers of public consumption and direct taxes.

(iii) *Exogenous Increase of Investment*

This instrument can be used realistically only in countries which have a large and diversified public sector, and systems of investment incentives which are sufficiently powerful to influence productive investments substantially. Only France, Italy, and perhaps Britain fulfill these conditions.

For the sake of comparability, the simulations have been run on the assumption that all countries use this instrument simultaneously.

The impacts are large and suggest that this instrument is a powerful one. Increase in investment has the same impact on demand as increasing public consumption, but it increases production capacity, relieves the pressure of demand and helps exports; increasing the capital stock releases labor and reduces the impact of higher demand on the labor market and on prices.

Other Instruments

(i) *10 Percent Revaluation*

As emphasized by modern balance of payments theory, revaluation has both price and absorption effects.[7] The price effects lead to a deterioration of the balance of payments. This leads to a drop in GNP which sets in motion substantial deflationary forces. The increase in dollar export prices is already in the first year less than is implied by the revaluation; because of the rise in unemployment and its effect on wages, these prices fall even more in the following years. All this explains why the impact of the revaluation on the balance of payments is not lasting.

This result of the model is confirmed by post-war experience.[8]

(ii) *1 Percent Increase in the Long-term Interest Rate*

The main impacts of this instruments are on GNP and on the balance of payments. For employment the impact of a reduction in activity is offset by substitution of labor for capital, induced by the higher price of capital. As unemployment varies little, prices and wages are almost unchanged.

(iii) *Immigration of Foreign Labor*

This is also a measure which cannot be applied in all countries. In the United Kingdom, in particular, strong opposition to labor import makes it impossible to bring in large numbers of workers from developing countries. Most of the continental EEC countries have freely used this instrument to ease inflationary pressures, or to prevent unemployment from increasing in times of recession.

The model confirms that this is an effective and powerful instrument. Import of labor helps the balance of payments through its impact on the pressure of demand; the imported labor force is not absorbed rapidly into production so that the reduction in tightness of labor markets is lasting.

[7]S.S. Alexander, "Effects of Devaluation on a Trade Balance", IMF Staff Papers 2, 1952, pp. 263-276.

[8]The price elasticity in the bilateral export flow equations, which is equal to -1.6, may also be too low. We were not able to experiment with an alternative specification of the bilateral flow equations estimated very recently, which implies a long-term elasticity of approximately -4.

Response of Individual Country Models

Observers of current economic trends tend to speak of countries as though they had unique and very distinct personalities. One hears remarks such as "what else could be the result in Britain," or "of course we must remember that this is happening in Germany." To what extent are such differences captured by models such as ours?

It is convenient to think of personality as being the product of two components, gifts and what a person chooses to do with these gifts. Interpreting the distinction for countries would lead to distinguishing between the countries' structure as they could be described by models, and the preferences of countries as to choice of objectives and instruments.

To what extent do models like Desmos' capture such elusive personality differences between countries? It is clear that for this purpose they are at best imperfect tools. As to structure the models do not cover such an important part of the countries' economies as their financial sectors, the behavior of which is surely an important determinant of economic developments. There are more subtle difficulties, also. For instance it was found necessary to constrain price elasticities of exports and the inventory accelerators to be equal for all countries, and this meant assuming away a possibly important source of inter-country differences. Also, the decision to use as much as possible the same theoretical framework in constructing each model is possibly a limitation: perhaps the very different consumption theories of Keynes and Rueff faithfully reflect very different behavior patterns in the United Kingdom and in France.

What the model does not capture either are the preferences of countries. The German economy's "personality" may be due as much to a distaste for inflation, which leads to ready acceptance of some excess capacity, as to differences in structure. Likewise ready acceptance of immigration by the German and French populations, or the leverage on private investment afforded by the French planning system give policy makers in these countries greater scope in using these instruments than is the case in, say, the United Kingdom.

Since the Desmos concept of constructing similar models offers an exceptional opportunity to compare the behavior of different countries, it has seemed worthwhile to try to extract from the host of estimated dynamic multipliers information which is relevant to this question. We first look at the impacts of changes in a single country on the economy of that country. The most interesting results are those for the investment and revaluation multipliers, presented in Tables 12a and 12b.

The multiplier effects of exogenous changes in investment shed light on what has sometimes been called the "stop-go" feature of UK economic policy. The United Kingdom and also France and Italy are seen to be exceptionally sensitive to cumulative influences caused by shifts in the propensity to invest. This is partly because these countries are large — in the more open economies of the smaller countries inflationary impulses tend to be fairly quickly dissipated. But it is quite interesting that Germany does not share this instability of the three other large countries.

Table 12a

Impact of Autonomous Changes of Investment in One Country on that Country's GNP, Consumer Prices, and Balance of Payments

Impact on		G	B	D	F	E	I	N	U
GNP	1	1.11	0.90	1.00	1.21	0.38	1.23	0.77	1.06
	3	1.51	1.73	2.60	3.96	0.46	3.44	1.08	3.23
	5	1.79	1.91	3.43	6.89	0.41	4.64	1.27	3.87
Consumer Prices	1	0.10	0.07	0.02	0.71	0.04	0.21	0.01	0.06
	3	0.53	0.33	0.15	1.43	0.10	1.27	0.05	1.04
	5	0.85	0.64	0.47	1.61	0.13	2.82	0.10	5.60
Balance of Payments	1	-0.36	-0.72	-0.56	-0.42	-0.74	-0.53	-0.50	-0.39
	3	-0.57	-1.29	-1.30	-1.29	-1.11	-1.64	-0.48	-1.37
	5	-0.72	-1.48	-1.75	-2.24	-1.71	-2.68	-0.49	-2.47

Table12b

Impact of a Revaluation in One Country on the Country's GNP, Consumer Prices, and Balance of Payments

Impact on		G	B	D	F	E	I	N	U
GNP	1	-2.71	-3.70	-2.80	-2.05	-0.84	-1.93	-3.42	-2.38
	3	2.82	-3.43	-2.26	-2.02	-0.72	-2.29	-3.58	-2.64
	5	2.90	-3.06	-2.12	-2.29	-0.66	-2.68	-3.68	-2.28
Consumer Prices	1	-0.23	-3.25	-3.17	-1.55	-4.94	-0.28	-2.58	-0.12
	3	-0.98	-3.81	-3.35	-1.49	-5.35	-1.01	-2.80	-0.80
	5	-1.41	-4.25	-3.62	-1.23	-5.68	-1.68	-3.10	-1.97
Balance of Payments	1	-0.44	1.23	0.32	-0.11	0.11	-0.36	0.11	-0.69
	3	-0.20	1.04	0.10	-0.18	0.07	-0.28	-0.15	-0.40
	5	-0.05	1.21	0.28	-0.23	0.26	-0.08	-0.13	-0.26

Table 13a

Sensitivity of GNP to Policy Instruments in Different EEC Countries

		Germany	Belgium	Denmark	France	Ireland	Italy	The Netherlands	United Kingdom
Public Consumption	70	1.49	1.98	2.20	1.45	1.27	1.76	1.66	1.47
	72	1.89	2.14	3.06	1.67	1.38	2.56	2.12	1.65
	74	2.07	2.13	3.38	1.92	1.36	3.04	2.22	0.79
Taxes	70	-0.69	-1.08	-1.02	-0.78	-0.56	-0.67	-0.73	-0.60
	72	-1.18	-1.40	-1.96	-1.19	-0.69	-1.43	-1.23	-1.11
	74	-1.32	-1.41	-2.26	-1.34	-0.62	-1.76	-1.35	-1.06
Investment	70	1.50	1.44	1.38	1.57	0.64	1.32	1.48	0.96
	72	2.34	3.06	3.56	5.15	1.12	3.24	2.82	2.89
	74	2.97	3.82	5.08	8.84	1.36	4.16	3.88	3.52
Revaluation	70	-2.45	-2.94	-2.51	-1.82	-0.88	-1.68	-2.91	-2.23
	72	-2.59	-2.84	-2.25	-1.97	-0.71	-2.06	-3.26	-2.48
	74	-2.71	-2.63	-2.15	-2.30	-0.53	-2.49	-3.45	-2.15
Long-term Interest Rate	70	-0.11	0.73	-0.07	-0.22	-0.05	-1.01	-0.10	-0.07
	72	-1.26	-1.95	-1.46	-1.24	-0.51	-2.49	-1.10	-1.36
	74	-1.50	-1.96	-1.58	-1.51	-0.29	-2.56	-1.37	-1.45
Labor Immigration	70	0.48	0.48	0.45	0.57	0.42	0.23	0.47	0.36
	72	0.56	0.53	0.39	0.44	0.51	0.14	0.53	0.54
	74	1.51	0.47	0.24	0.39	0.46	0.05	0.57	0.64

Table 13b

Sensitivity of Private Consumption Prices to Policy Instruments in Different EEC Countries

		Germany	Belgium	Denmark	France	Ireland	Italy	The Netherlands	United Kingdom
Public Consumption	70	0.14	0.21	0.07	0.86	0.25	0.34	0.07	0.10
	72	0.76	0.80	0.45	0.89	1.15	1.41	0.36	1.30
	74	1.19	1.38	1.32	0.61	2.58	2.60	0.82	4.75
Taxes	70	-0.06	-0.10	-0.03	-0.46	-0.10	-0.10	-0.03	-0.03
	72	-0.31	-0.34	-0.17	-0.55	-0.41	-0.44	-0.14	-0.33
	74	-0.48	-0.56	-0.41	-0.46	-0.79	-0.82	-0.30	-0.95
Investment	70	0.13	0.16	0.05	0.93	0.12	0.23	0.05	0.06
	72	0.74	0.75	0.37	1.92	0.68	1.18	0.30	0.98
	74	1.18	1.50	1.23	2.12	2.55	2.36	0.77	6.12
Revaluation	70	-0.21	-2.16	-2.18	-1.32	-3.02	-0.25	-1.66	-0.11
	72	-0.89	-2.72	-2.46	-1.30	-3.64	-0.89	-1.98	-0.77
	74	-1.29	-3.17	-2.83	-1.08	-4.32	-1.50	-2.36	-1.90
Long-term Interest Rate	70	0.13	0.08	0.03	0.40	0.03	-0.16	0.02	0.05
	72	0.47	0.12	0.06	0.02	-0.01	-0.41	0.00	0.12
	74	0.58	0.08	0.02	-0.05	-0.11	-0.65	-0.08	-0.01
Labor Immigration	70	-0.62	-0.35	-0.23	-1.08	-0.84	-0.39	-0.23	-0.21
	72	-1.63	-0.76	-0.60	-0.78	-1.82	-0.87	-0.63	-0.74
	74	-2.03	-0.97	-0.92	-0.66	-2.44	-1.17	-0.92	-1.36

The revaluation impacts also correspond roughly with expectations based on historical experience. The German (and Italian) impacts vanish within a few years, whereas in France and in the United Kingdom the impact of exchange rate changes is more lasting. Revaluation has a much stronger impact on prices in smaller than in larger countries; this means that an isolated revaluation imposes much greater strain on producers, say, in the Netherlands than in Germany, even for domestic sales. It is at first sight surprising that revaluation actually improves the balance of payments of the smaller countries. This is both because the absorption effect of revaluation is very strong in their very open economies and hence has a greater effect on imports, and because the drop in consumer prices caused by revaluation limits wage increases and reduces the increase of dollar export prices.

How sensitive are EEC countries to general inflationary and deflationary forces? This may be examined by looking at the impacts on GNP and consumer prices of synchronized changes of policy instruments in all EEC countries. These multipliers are presented in Tables 13a and 13b.

Rather than discussing these figures in detail it has seemed preferable to rank countries on the basis of the sensitivity of their GNP and their consumer prices to different instruments. For each instrument countries were ranked in order of quantity and price impacts in the first and fifth year. The number of times that a country was given ranks 1-2-3, 4-5, or 6-7-8 was then counted. The results are given in Table 14.

Germany seems to have the greatest flexibility in response to policy instruments in that the impact is strongly differentiated, influencing mainly quantities in some cases, mainly prices in others. Belgium is very sensitive in respect to both quantity and price. France reacts strongly in the short run but weakly in the longer run. In Denmark and in the Netherlands the response of quantity variables is strong, that of price variables weak. Ireland, on the other hand, has been weak in quantity, but strong in price response, whereas in the United Kingdom the initial response of both prices and quantities is weak but inflationary forces become strong after a few years.

International Transmission of Economic Fluctuations

What light, finally, does the study shed on the problem of the international transmission of economic fluctuations? Here again we have tried to sift through the lengthy tables of multipliers to extract only the most interesting information.

A detailed examination of multipliers shows that the pattern of interdependence of EEC countries reflects fairly closely the structure of the trade shares matrix underlying the bilateral shares equations (see Table 3). It is thus not necessary to present the full table of cross-impacts between countries. It is more appropriate to concentrate on the important issue of the strength of linkages between countries, also discussed by Helliwell and

Table 14

A Rank Analysis of Sensitivity of GNP and Consumer Prices to Policy Instruments in Different EEC Countries

Country		First Year			Fifth Year		
		Ranks 1 to 3	Ranks 4 and 5	Ranks 6 to 8	Ranks 1 to 3	Ranks 4 and 5	Ranks 6 to 8
Germany	Q	2	4	0	2	2	2
	P	2	3	1	2	1	3
Belgium	Q	5	1	0	3	3	0
	P	2	4	0	1	5	0
Denmark	Q	3	2	1	4	0	2
	P	1	0	5	1	1	4
France	Q	4	0	2	1	3	2
	P	5	1	0	0	1	5
Ireland	Q	0	0	6	0	1	5
	P	4	1	1	6	0	0
Italy	Q	2	0	4	4	1	1
	P	4	1	1	4	1	1
The Netherlands	Q	2	4	0	3	2	1
	P	0	1	5	0	1	5
United Kingdom	Q	0	1	5	1	0	5
	P	0	1	5	4	1	1

Hickman. To what extent are our results comparable to those of Hickman using the LINK model?

Before presenting the results it is necessary to draw attention to differences between the two sets of results. LINK is a world model, whereas in Desmos the rest of the world is exogenous; this means that the latter model will tend to underestimate slightly the strength of linkages. In addition, the LINK results refer to the price index of GNP. This index may be distorted in curious ways by terms of trade changes, and we have preferred to look at consumer prices. The most important difference between the two studies is however that in the LINK system models with a very different structure are used, whereas the Desmos models have been made as comparable as possible. Judgment on the results of the calculation has therefore some bearing on the choice between linking models which reflect very different concepts of economic relationships, and models reflecting a uniform theoretical approach.

For both prices and quantities the Desmos pattern of linkages is much more uniform than implied by the LINK system. The LINK impacts of disturbances in Germany on GNP of other countries are much stronger than those computed using Desmos; for Belgium, France, Italy and the United Kingdom they are weaker. The Desmos multipliers imply a somewhat more strongly dynamic pattern of behavior than those of LINK. For prices the differences between the two sets of results are striking. This time it is the UK and Netherlands LINK models which affect most strongly those of other countries, either positively or negatively.

The Desmos results suggest that it is not true that the transmission of price impulses is weaker than the transmission of quantity impulses. The ratio of the price impact of a disturbance within a country to the average impact in other countries is in fact substantially greater for prices than for quantities. This is of course an important finding for understanding the origins of the present world-wide inflationary trends, and for an assessment of the ease with which individual countries could isolate themselves from world inflation.

THE MODEL AS A TOOL FOR THE COORDINATION OF ECONOMIC POLICIES

Can a model like Desmos, finally, fulfill its aim of clarifying negotiations on the coordination of economic policies? This is a question which can be answered only by an example. Using the dynamic multipliers of Desmos we examine the calculations which negotiators attempting to coordinate policies today might carry out as they seek to work out a balanced package of measures, which improves the situation of all countries and does not require the use of politically unacceptable policy instruments.

As negotiations start, representatives of the different countries might agree to general goals:

Table 15a

Desmos and Link Patterns of GNP Interdependence: A Comparison

(Percentage change of GNP of country in column induced by unit percentage income shock of country in row)

Country	Year	Germany		Belgium		France		Italy		United Kingdom	
		D	L	D	L	D	L	D	L	D	L
Germany	1	1.25	0.98	0.16	0.18	0.08	0.08	0.08	0.19	0.04	0.10
	3	1.56	1.20	0.28	0.66	0.14	0.21	0.16	0.81	0.08	0.53
Belgium	1	0.03	0.01	1.41	1.10	0.01	0.01	0.01	0.01	0.01	0.01
	3	0.03	0.02	1.39	0.86	0.03	0.01	0.02	0.02	0.01	0.02
France	1	0.07	0.04	0.13	0.08	1.46	1.21	0.05	0.07	0.03	0.04
	3	0.09	0.06	0.15	0.08	1.61	1.22	0.08	0.11	0.04	0.04
Italy	1	0.05	0.02	0.05	0.03	0.04	0.02	1.69	1.30	0.03	0.03
	3	0.09	0.05	0.10	0.05	0.08	0.04	2.37	1.80	0.05	0.08
United Kingdom	1	0.02	0.02	0.04	0.03	0.02	0.01	0.02	0.03	1.19	1.24
	3	0.04	0.04	0.07	0.05	0.03	0.02	0.04	0.08	1.29	1.51

(D = Desmos; L = Link)

Table 15b

Desmos and Link Patterns of Price Interdependence: A Comparison

(Percentage price change of country in column induced per unit percentage income shock of country in row. GNP or GDP price for Link results; private consumption prices for Desmos)

Country	Year	Germany D	Germany L	Belgium D	Belgium L	France D	France L	Italy D	Italy L	United Kingdom D	United Kingdom L
Germany	1	0.12	1.10	0.02	-0.02	0.05	0.01	0.01	-0.03	0.00	0.02
	3	0.63	2.38	0.10	-0.29	0.06	0.10	-0.14	0.00	0.03	-0.05
Belgium	1	0.00	0.02	0.11	0.07	0.02	0.00	0.00	0.00	0.00	0.00
	3	0.01	0.03	0.43	0.09	0.02	0.00	0.01	0.00	0.01	0.00
France	1	0.01	0.05	0.05	-0.01	0.87	-0.08	0.01	-0.01	0.00	-0.01
	3	0.03	0.08	0.08	0.03	0.87	-1.73	0.03	0.04	0.02	0.02
Italy	1	0.00	0.03	0.01	0.00	0.02	0.00	0.32	0.08	0.00	-0.01
	3	0.02	0.09	0.03	-0.01	0.03	-0.01	1.29	0.38	0.02	0.01
United Kingdom	1	0.00	0.02	0.01	0.01	0.01	0.00	0.00	-0.01	0.08	-0.36
	3	0.01	0.11	0.04	-0.01	0.01	0.01	0.01	0.01	0.95	0.63

(D = Desmos; L = Link)

(a) an improvement of the French, Italian, and UK balances of payments;
(b) an unchanged basic balance of the EEC as a whole, because it is felt desirable to avoid worsening the position of the dollar and of other currencies;
(c) these goals imply a worsening of the balances of payments of Germany, the Netherlands, and Belgium;
(d) in general it is felt desirable to check demand and prices, but only to a moderate extent because of the danger of causing a grave recession;
(e) the French, Italian, and UK representatives convey the determination of their governments to improve their countries' situation; the representatives of other countries indicate that their governments are willing to go out of their way to facilitate the improvement of these three countries' situation.

Discussions around the table quickly show that the use of available instruments is hampered by institutional factors and taboos, and by some particular countries' dislike of particular types of policies. Thus:

(a) only France and Italy, because of their large public enterprise sectors (and because of the French planning process) are able to change exogenously their level of investment;
(b) in the United Kingdom there is strong prejudice against the import of labor from developing countries; such labor imports are also excluded in Ireland and Italy, which have large surpluses of agricultural labor to absorb;
(c) on the other hand John Bull seems to swallow tax and public expenditures changes with more equanimity than continental tax payers. In Italy the Government is so weak that restrictive fiscal policies cannot be envisaged;
(d) in Belgium revaluation is for obscure reasons blocked by a durable taboo. The French delegate indicates that President Giscard-d'Estaing has decided to use more orthodox policies than his predecessor;
(e) it is not practical to change interest rates by more than 1 percent without disrupting capital markets.

As the discussion proceeds, tentative agreement is gradually reached on a first set of policy measure. The units considered in the Table are:

Public expenditures	: percent of GNP
Taxes	: percent of GNP
Investment	: percent of GNP
Long-term interest rate	: percent
Import of labor	: percent of labor force
Revaluation	: percent

Table 16 gives the combined impact of the measures on targets of economic policy in each EEC country, except Luxemburg.

As the table shows, the result of this first round of policy coordination is obviously unsatisfactory. Belgium is exposed to sharp inflationary pressures. France's and Italy's growth are checked dramatically, and unemployment in these countries rises to politically unacceptable levels. The improvement of the UK balance of payments is felt to be insufficient by this country's negotiators.

This leads to agreement to a change of the initial package of measures. Table 16b documents the new modifications of instrument values, and the forecasts of the impacts on objectives.

As results of the second round are appraised, using the model results, negotiators are pleased to note that the impacts on policy objectives of countries are roughly as desired. The check to French and Italian growth is felt to be the inevitable price of a sounder economic situation; the more favorable UK situation is the reward of extremely austere policies. However, a US Government observer who has been invited to attend the meeting is quick to point out that the large improvement of the EEC balance of payments will be disastrous for his and for other nonmember countries. In fact, as he points out, such an improvement cannot be realized in a world of fluctuating exchange rates: the policies envisaged would lead to a 20 — 30 percent appreciation of EEC currencies versus the dollar.

A third round of modification is then put on the drawing board. Examination of the model's multipliers suggest that the balance-of-payments surplus can be eliminated without undue repercussions on other policy objectives by combining a 10 percent joint revaluation of EEC currencies, with a 1 percent increase in their public expenditures. The result is described in Table 16c.

The prospects suggested by this table are judged generally adequate. They can of course be improved by further refinement of the proposed policies, and I am sure that the dedicated negotiators of this imaginary example would continue to improve the package of measures until a completely satisfactory picture is obtained. In practice also they would not be content with ad hoc computations based on dynamic multipliers, but would want to solve the models for each proposed package of measures. We feel however that the description of these three iterations is enough to suggest how a model like Desmos can assist in working out coherent sets of policies, which reflect widely divergent situations and objectives of a number of countries.

Table 16a

First Round EEC Policy Coordination: Agreed Measures and Computed Effects

Measure	Government Expenditure	Taxes	Investment	Interest Rate	Labor Import	Revaluation %
Germany	+1				+1	+5
Belgium	+1			-1	+1	
Denmark						
France	-1		-1		+1	
Ireland				+1		
Italy			-2			-10
The Netherlands	+1				+1	+5
United Kingdom	-1			+1		-10

Effects in Different Years	GNP			Unemployment			Consumer Prices			Balance of Payments		
	1	3	5	1	3	5	1	3	5	1	3	5
Germany	0.07	0.02	-0.34	-0.08	0.99	0.94	-0.67	-1.63	-2.10	-0.50	-0.56	-0.55
Belgium	2.45	2.81	2.13	0.48	0.16	0.17	-0.17	-0.43	-0.56	-1.14	-1.64	-1.70
Denmark	-0.73	-0.69	-0.98	0.01	0.15	0.22	-0.10	-0.23	-0.44	-0.06	-0.11	-0.15
France	-2.09	-5.23	-8.44	1.24	4.85	8.27	-2.66	-3.17	-2.92	0.11	1.58	-2.76
Ireland	-0.26	-0.76	-0.61	0.04	0.26	0.48	-1.29	-1.59	-2.28	0.04	0.55	-0.24
Italy	-4.48	-4.74	-7.01	0.15	2.13	4.57	-0.14	-1.64	-4.08	1.42	3.53	5.36
The Netherlands	0.10	-0.22	-0.71	1.00	1.10	1.29	-1.44	-1.86	-2.23	-0.26	-0.57	-0.69
United Kingdom	1.10	-0.11	1.66	0.44	0.22	2.59	-0.10	-1.66	-6.18	1.02	0.51	0.88
Common Market	-0.24	-1.88	-3.07	0.16	1.51	2.57	-0.95	-1.73	-2.77	0.54	1.05	1.53

Table 16b

Second Round of EEC Policy Coordination: Modification of Agreed Measures and Computed Effects

Measure	Government Expenditure	Taxes	Investment	Interest Rate	Labor Import
Germany					
Belgium	-1			+0.5	+1
Denmark					
France			+1		-2
Ireland			(years 3 to 5)		
Italy			+1		
The Netherlands			(years 3 to 5)		
United Kingdom		-2			

Effects in Different Years	GNP			Unemployment			Consumer Prices			Balance of Payments		
	1	3	5	1	3	5	1	3	5	1	3	5
Germany	0.01	0.06	-0.04	0.98	0.99	0.94	-0.67	-1.64	-2.06	-0.53	-0.55	-0.45
Belgium	1.17	1.46	1.39	1.60	1.40	1.33	-0.40	-1.28	-1.69	-0.34	-0.68	-0.77
Denmark	-0.85	-0.83	-0.93	0.01	0.19	0.24	-0.07	-0.27	-0.54	-0.10	-0.08	-0.11
France	-3.30	-5.06	-5.42	0.33	3.16	4.54	-1.58	-0.98	-0.21	-0.13	0.92	1.28
Ireland	-0.45	-1.03	-0.78	0.06	0.38	0.68	-1.31	-1.83	-2.84	-0.06	0.45	0.16
Italy	-4.51	-3.57	-3.46	0.15	1.77	2.73	-0.14	-1.45	-2.82	1.42	3.02	3.72
The Netherlands	-0.01	0.02	-0.41	1.00	1.12	1.33	-1.43	-1.93	-2.32	-0.34	-0.56	-0.55
United Kingdom	0.19	-1.72	0.29	0.58	0.79	3.49	0.04	-2.17	-7.68	1.43	1.43	2.12
Common Market	-0.87	-2.08	-2.05	0.49	1.35	1.80	-0.43	-1.26	-2.03	0.55	0.95	1.10

Table 16c

Third Round of EEC Policy Coordination: Modification of Agreed Measures and Computed Effects

Measure	Government Expenditure	Revaluation
Germany	1	10
Belgium	1	10
Denmark	1	10
France	1	10
Ireland	1	10
Italy	1	10
The Netherlands	1	10
United Kingdom	1	

Effects in Different Years	GNP			Unemployment			Consumer Prices			Balance of Payments		
	1	3	5	1	3	5	1	3	5	1	3	5
Germany	-0.95	-0.64	-0.68	1.05	1.15	1.18	-0.74	-1.77	-2.16	-1.34	-1.36	-1.26
Belgium	0.21	0.76	0.89	1.76	1.88	1.91	-2.35	-3.20	-3.48	-1.55	-0.59	-0.53
Denmark	-1.16	-0.02	0.30	0.05	0.18	0.12	-2.18	-2.28	-2.05	-0.55	-0.81	-0.93
France	-3.67	-5.36	-5.80	-0.45	3.79	5.33	-2.04	-1.39	-0.68	-0.60	0.35	0.61
Ireland	-0.06	-0.36	0.05	0.05	0.28	0.39	-4.08	-4.32	-4.58	-0.55	0.00	-0.07
Italy	-4.43	-3.07	-2.86	0.12	1.72	2.62	-0.05	-0.93	-1.72	0.72	1.97	2.35
The Netherlands	-1.26	-1.12	-1.64	1.08	1.33	1.67	-3.02	-3.55	-3.86	-0.85	-1.24	-1.24
United Kingdom	-0.57	-2.55	-1.07	0.68	1.04	4.06	0.03	-1.64	5.01	0.39	1.66	1.06
Common Market	-1.47	-2.51	-2.58	0.61	1.60	2.17	-0.78	-1.46	-1.69	-0.14	0.16	0.23

CONCLUSION

This paper has described a model the aims of which are not so much methodological as practical. The model is meant to represent and quantify commonly accepted beliefs about macroeconomic interrelationships, by using an equation system whose properties are carefully documented. Such a model, it is felt, would be a useful tool in negotiations on the coordination of economic policies. The study does make two methodological contributions. It is the first to apply to a set of countries the Coen-Hickman specification, which ensures consistency of labor and capital demand equations with a single underlying production function. The trade linkage system used also innovates in incorporating the influence of pressure of demand and production capacity effects on exports.

The model, finally, represents a useful point of departure for further research because it has been kept simple and highly manageable. It should prove possible to use it in the future as the centerpiece of a more complex linked system, taking into account financial, labor, and other linkages between countries, or for experiments with alternative explanations of inflation or economic instability.

Appendix I

Factor Demand Block

Demand for Fixed Capital

Germany

$$CAPA = \underset{(0.009)}{10^{0.1086}} \left(PIBCFA_{-1}\right)^{\underset{(0.0062)}{0.0491}} \left(\frac{CCAPA_{-1}}{WA_{-1}}\right)^{\underset{(0.0064)}{-0.0481}}$$

$$\left(10^{\underset{(0.00010)}{-0.00053\ TEMPS}}\right) \cdot \left(CAPA_{-1}\right)^{\underset{(0.018)}{0.937}} + VEXA$$

$$VA = CAPA - 0.935\ CAPA_{-1}$$

$\bar{R}^2 = 0.999$
DW = 1.97

Belgium

$$CAPB = \underset{(0.072)}{10^{0.133}} \cdot \left[0.75\ PIBCFB + 0.25\ PIBCFB_{-1}\right]^{\underset{(0.036)}{0.122}} \cdot$$

$$\left[0.5\left(\frac{CCAPB}{WB}\right) + \left(\frac{0.5\ CCAPB_{-1}}{WB_{-1}}\right)\right]^{\underset{(0.026)}{-0.105}} \cdot \left(10^{\underset{(0.0004)}{-0.0012TEMPS}}\right)$$

$$\cdot \left(CAPB_{-1}\right)^{\underset{(0.138)}{0.872}} + VEXB$$

$$VB = CAPB - 0.916\ CAPB_{-1}$$

$\bar{R}^2 = 0.992$
DW = 2.24

Denmark

$$CAPD = \underset{(0.029)}{10^{0.0824}} \cdot \left(PIBCFD\right)^{\underset{(0.055)}{0.111}} \cdot \left(\frac{CCAPD_{-1}}{WD_{-1}}\right)^{\underset{(0.044)}{-0.090}}$$

$$\left(10^{\underset{(0.0005)}{-0.0011\ TEMPS}}\right) \cdot \left(CAPD_{-1}\right)^{\underset{(0.056)}{0.889}} + VEXD$$

$$VD = CAPD - 0.93\ CAPD_{-1}$$

$\bar{R}^2 = 0.990$
DW = 1.79

France

$$CAPF = \underset{(0.005)}{10^{0.055}}\ (PIBCFF)^{\underset{(0.011)}{0.044}} \left(\frac{CCAPF_{-1}}{WF_{-1}}\right)^{\underset{(0.009)}{-0.038}}$$

$$(\underset{(0.00011)}{10^{-0.00045\ TEMPS}}) \cdot (CAPF_{-1})^{\underset{(0.266)}{0.956}} + VEXF$$

$$VF = CAPF - 0.931\ CAPF_{-1}$$

$\bar{R}^2 = 0.968$
$DW = 1.74$

Ireland

$$CAPE = VE + 0.93\ CAPE_{-1}$$

$$VE = \underset{(17.902)}{-101.677} + \underset{(0.107)}{0.140} \left(\frac{\Delta PIBVE}{CCAPE}\right)_{-1} + \underset{(0.106)}{0.200} \left(\frac{\Delta PIBVE}{CCAPE}\right)_{-2}$$

$$+ \underset{(0.015)}{0.201}\ CAPE_{-1} + VEXE$$

$\bar{R}^2 = 0.947$
$DW = 1.48$

Italy

$$CAPI = \underset{(0.028)}{10^{0.139}} \left[0.75\ PIBCFI + 0.25\ PIBCFI_{-1}\right]^{\underset{(0.034)}{0.124}}$$

$$\left[0.5\ \frac{CCAPI}{WI} + 0.5\ \frac{CCAPI_{-1}}{WI_{-1}}\right]^{\underset{(0.030)}{-0.109}} (\underset{(0.0001)}{10^{-0.0014\ TEMPS}})$$

$$\cdot (CAPI_{-1})^{\underset{(0.019)}{0.857}} + VEXI$$

$\bar{R}^2 = 0.999$
$DW = 1.61$

Luxemburg

$$VL = PNBL - CL - GL - DSTL - XBSL + BSML$$

Netherlands

$$CAPN = \underset{(0.036)}{10^{0.082}}\ (PIBCFN)^{\underset{(0.026)}{0.041}} \left(\frac{CCAPN_{-1}}{WN_{-1}}\right)^{\underset{(0.023)}{-0.035}}$$

$$(\underset{(0.00020)}{10^{-0.00034\ TEMPS}}) \cdot (CAPN_{-1})^{\underset{(0.039)}{0.943}} + VEXN$$

$$VN = CAPN - 0.934\ CAPN_{-1}$$

$\bar{R}^2 = 0.997$
$DW = 1.52$

United Kingdom

$$CAPU = \underset{(0.049)}{10^{0.112}}\ (PIBCFU_{-1})^{\underset{(0.022)}{0.092}} \left(\frac{CCAPU_{-1}}{WU_{-1}}\right)^{\underset{(0.021)}{-0.083}}$$

$$(\underset{(0.0004)}{10^{-0.0009\ TEMPS}}) \cdot (CAPU_{-1})^{\underset{(0.142)}{0.900}} + VEXU$$

$$VU = CAPU - 0.930\ CAPU_{-1}$$

$\bar{R}^2 = 0.986$
$DW = 2.10$

EEC total

$$VT = VA/4.0 + VB/50 + VD/6.90714$$
$$+ VF/4.93706 + VE/357.143 + VI/0.625$$
$$+ VL/50 + VN/3.62 + VU/0.357143$$

Demand for Labor

Germany

$$EMPA = \underset{(0.469)}{10^{0.333}}\ PIBCFA^{\underset{(0.008)}{0.098}} \left(\frac{CCAPA}{WA}\right)^{\underset{(0.006)}{0.030}} \underset{(0.0002)}{10^{-0.0011\ TEMPS}}\ EMPA_{-1}^{\underset{(0.106)}{0.874}}$$

$$CHA = POPACA - EMPA$$

$\bar{R}^2 = 0.94$
$DW = 2.28$

Belgium

$$EMPB = 10^{0.433}\ PIBCFB^{0.318}\left(\frac{CCAPB}{WB}\right)^{0.086}\ 10^{-0.0031\ TEMPS}\ EMPB_{-1}^{0.638}$$
(0.152) (0.052) (0.030) (0.001) (0.119)

$$CHB = POPACB - EMPB$$

$\bar{R}^2 = 0.98$
DW = 2.11

Denmark

$$EMPD = 10^{0.277}\ PIBCFD^{0.156}\left(\frac{CCAPD}{WD}\right)^{0.030}\ 10^{-0.0015\ TEMPS}\ EMPD_{-1}^{0.844}$$
(0.167) (0.096) (0.029) (0.0009) (0.097)

$$CHD = POPACD - EMPD$$

$\bar{R}^2 = 0.93$
DW = 1.69

France

$$EMPF = 10^{1.474}\ PIBCFF^{0.740}\left(\frac{CCAPF}{WF}\right)^{0.104}\ 10^{-0.0076\ TEMPS}\ EMPF_{-1}^{0.257}$$
(0.402) (0.203) (0.028) (0.0004) (0.102)

$$CHF = POPACF - EMPF$$

$\bar{R}^2 = 0.90$
DW = 1.85

Ireland

$$EMPE = 10^{0.077}\ PIBCFE^{0.243}\ CAPE^{-0.071}\ 10^{-0.0021\ TEMPS}\ EMPE_{-1}^{0.828}$$
(0.019) (0.043)

$$CHE = POPACE - EMPE$$

$\bar{R}^2 = 0.93$
DW = 1.88

Italy

$$EMPI = 10^{1.945}\ PIBCFI^{0.522}\left(\frac{CCAPI_{-1}}{WI_{-1}}\right)^{0.142}\ 10^{-0.0056\ TEMPS}\ EMPI_{-1}^{0.402}$$
(1.134) (0.300) (0.099) (0.0007) (0.283)

$$CHI = POPACI - EMPI$$

$\bar{R}^2 = 0.79$
DW = 1.99

The Netherlands

$$EMPN = 10^{0.3279}\ PIBCFN^{0.118}\ CAPN^{-0.066}\ 10^{-0.00098\ TEMPS}\ EMPN_{-1}^{0.90}$$
(0.634) (0.020)

$$CHN = POPACN - EMPN$$

$\bar{R}^2 = 0.93$
DW = 1.83

United Kingdom

$$EMPU = 10^{1.388}\ PIBCFU^{0.402}\left(\frac{CCAPU}{WU}\right)^{0.076}\ 10^{-0.0039\ TEMPS}\ EMPU_{-1}^{0.563}$$
(0.791) (0.125) (0.042) (0.0014) (0.194)

$$CHU = POPACU - EMPU$$

$$EMPT = EMPA + EMPB + EMPD + EMPF + EMPE + EMPI + EMPN + EMPU$$

$\bar{R}^2 = 0.94$
DW = 2.49

Potential GNP, Pressure of Demand

$$YPOTi = (CiPOPACi^{ai}\ CAPi^{bi}\ e^{-giTEMPS}) / VBYi\ 1963$$
$$TENSi = (PIBCFi/VBYi \cdot YPOTi)$$

where VBYi = stochastic term of production function computed as a residual

Income Expenditures Block
Consumption Functions

Germany

$$CA = 8.577 + 0.542\ YDA + 0.344\ CA_{-1}$$
(1.474) (0.070) (0.081)

$\bar{R}^2 = 0.998$
DW = 1.67

Belgium

$$CB = 57.115 + 0.667\ YDB + 0.115\ CB_{-1}$$
(20.229) (0.169) (0.244)

$\bar{R}^2 = 0.995$
DW = 2.24

Denmark $CD = -0.787 + 0.580\ YDD + 0.396\ CD_{-1}$
(0.502) (0.083) (0.098)

$\bar{R}^2 = 0.996$
$DW = 1.84$

France $CF = 16.220 + 0.593\ YDF + 0.286\ CF_{-1}$
(2.169) (0.059) (0.076)

$\bar{R}^2 = 0.999$
$DW = 1.66$

Ireland $CE = 56.472 + 0.711\ YDE + 0.124\ CE_{-1}$
(19.804) (0.114) (0.156)

$\bar{R}^2 = 0.994$
$DW = 2.28$

Italy $CI = 0.706 + 0.431\ YDI + 0.470\ CI_{-1}$
(0.353) (0.127) (0.174)

$\bar{R}^2 = 0.997$
$DW = 1.82$

Luxemburg $CL = -0.132 + 0.595\ YDL + 0.355\ CL_{-1}$
(1.289) (0.217) (0.215)

$\bar{R}^2 = 0.974$
$DW = 1.51$

The Netherlands
$CN = 1.730 + 0.507\ YDN + 0.371\ CN_{-1}$
(0.446) (0.103) (0.140)

$\bar{R}^2 = 0.996$

$DW = 2.06$

United Kingdom
$CU = 1.610 + 0.455\ YDU + 0.443\ CU_{-1}$
(0.322) (0.104) (0.124)

$\bar{R}^2 = 0.997$
$DW = 1.71$

Disposable Income, Current Price

Germany $YDVA = 7.967 + 0.650\ PNBVA - YDEXA$
(1.695) (0.024)

$\bar{R}^2 = 0.979$
$DW = 1.80$

Belgium $YDVB = 22.256 + 0.721\ PNBVB - YDEXB$
(3.470) (0.005)

$\bar{R}^2 = 0.999$
$DW = 2.02$

Denmark $YDVD = 3.660 + 0.648\ PNBVD - YDEXD$
(2.051) (0.009)

$\bar{R}^2 = 0.997$
$DW = 2.25$

France $YDVF = 4.401 + 0.680\ PNBVF - YDEXF$
(1.355) (0.006)

$\bar{R}^2 = 0.997$
$DW = 1.57$

Ireland $YDVE = 49.400 + 0.736\ PNBVE - YDEXE$
(4.146) (0.005)

$\bar{R}^2 = 0.999$
$DW = 1.98$

Italy $YDVI = -0.016 + 0.775\ PNBVI - YDEXI$
(0.160) (0.009)

$\bar{R}^2 = 0.998$
$DW = 1.80$

Luxemburg $YDVL = -1.040 + 0.716\ PNBVL - YDEXL$
(0.923) (0.029)

$\bar{R}^2 = 0.987$
$DW = 1.83$

The Netherlands

$$YDVN = -0.484 + 0.683\ PNBVN - YDEXN$$
$$(0.242)\ \ (0.009)$$

$\bar{R}^2 = 0.997$
DW = 1.61

United Kingdom

$$YDVU = 0.425 + 0.672\ PNBVU - YDEXU$$
$$(0.255)\ \ (0.008)$$

$\bar{R}^2 = 0.998$
DW = 1.90

Disposable Income, Constant Price

$$YDi = 100\ YDVi/PCi$$

Inventory Change

$$DSTi = a + 0.1\ (PNBi - PNBi_{-1})$$

$$DSTT = DSTA/4.0 + (DSTB + DSTL)/50.0 + DSTD/6.90714 + DSTF/4.93706 + DSTE/357.143 + DSTI/0.625 + DSTN/3.62 + DSTU/0.357143$$

Expenditure Identities

$$PNBi = Ci + Gi + Vi + DSTi + XBSi - BSMi$$

$$PNBVi = (PCi.Ci + PGi.Gi + PVi.Vi + Pi.DSTi + PXi.XBSi - PMi.BSMi)/100$$

$$PIBVi = PNBVi + VAEXVi$$

$$PIBCFi = (PIBVi - TinDVi + SUBVi)/(Pi/100)$$

(except Luxemburg)

$$PNBL = (10^{\underset{(0.065)}{0.410}})\ \ PNBT^{\underset{(0.025)}{0.730}}$$

$\bar{R}^2 = 0.986$
DW = 1.80

$$PNBVL = PNBL\ .\ (PL/100)$$

Wage Price Block

Wages

Germany

$$WA = WA_{-1}\ \underset{(0.453)}{(0.390} + \underset{(3.862)}{13.966/CHA} + \underset{(0.443)}{0.606(PCA/PCA_{-1})})$$

$\bar{R}^2 = 0.600$
DW = 1.76

Belgium

$$WB = WB_{-1}\ \underset{(0.262)}{(0.549} + \underset{(1.006)}{6.358/CHB} + \underset{(0.264)}{0.439(PCB/PCB_{-1})})$$

$\bar{R}^2 = 0.861$
DW = 1.85

Denmark

$$WD = WD_{-1}\ \underset{(0.389)}{(0.431} + \underset{(0.521)}{1.137/CHB} + \underset{(0.382)}{0.604(PCD/PCD_{-1})})$$

$\bar{R}^2 = 0.511$
DW = 2.24

France

$$WF = WF_{-1}\ \underset{(0.174)}{(0.494} \underset{(0.020)}{-0.021(CHF/CHF_{-1})} + \underset{(0.168)}{0.581(PCF/PCF_{-1})})$$

$\bar{R}^2 = 0.490$
DW = 1.54

Ireland

$$WE = WE_{-1}\ \underset{(0.307)}{(0.038} + \underset{(3.086)}{7.552/CHE} + \underset{(0.309)}{0.878\ (PCE/PCE_{-1})})$$

$\bar{R}^2 = 0.561$
DW = 2.35

Italy

$$WI = WI_{-1}\ \underset{(0.022)}{(0.933} + \underset{(35.222)}{105.904/CHI})$$

$\bar{R}^2 = 0.424$
DW = 1.77

The Netherlands

$$WN = WN_{-1}\ (0.337 + 1.307/CHN + 0.709(PCN/PCN_{-1}))$$
$$(0.307)\quad (0.288)\qquad (0.288)$$

$\bar{R}^2 = 0.297$
DW = 2.10

United Kingdom

$$WU = WU_{-1}\ (0.274 + 5.306/CHU + 0.733(PCU/PCU_{-1}))$$
$$(0.181)\quad (2.497)\qquad (0.176)$$

$\bar{R}^2 = 0.589$
DW = 1.75

Total EEC

$$WT = (WA.EMPA + WB.EMPB + WD.EMPD + WF.EMPF + WE.EMPE + WI.EMPI + WN.EMPN + WU.EMPU)/EMPT$$

Private Consumption Prices

Germany

$$PCA = PCA_{-1}\ (0.582 + 0.418\ WA/WA_{-1})$$
$$(0.108)\quad (0.093)$$

$\bar{R}^2 = 0.534$
DW = 1.37

Belgium

$$PCB = PCB_{-1}(0.406 + 0.307\ WB/WB_{-1} + 0.287\ PMB/PMB_{-1})$$
$$(0.409)\quad (0.115)\qquad (0.233)$$

$\bar{R}^2 = 0.322$
DW = 1.68

Denmark

$$PCD = PCD_{-1}(0.554 + 0.269\ WD/WD_{-1} + 0.193\ PMD/PMD_{-1})$$
$$(0.117)\quad (0.117)\qquad (0.111)$$

$\bar{R}^2 = 0.465$
DW = 1.84

France

$$PCF = PCF_{-1}(0.151 + 0.849\ WF/WF_{-1})$$
$$(0.254)\quad (0.236)$$

$\bar{R}^2 = 0.470$
DW = 1.86

Ireland

$$PCE = PCE_{-1}(0.250 + 0.436\ WE/WE_{-1} + 0.317\ PME/PME_{-1})$$
$$(0.130)\quad (0.109)\qquad (0.156)$$

$\bar{R}^2 = 0.803$
DW = 2.58

Italy

$$PCI = PCI_{-1}(0.505 + 0.495\ WI/WI_{-1})$$
$$(0.061)\quad (0.070)$$

$\bar{R}^2 = 0.692$
DW = 2.05

Luxemburg

$$PCL = PCL_{-1}(0.164 + 0.901\ PCT/PCT_{-1})$$
$$(0.110)\quad (0.408)$$

$\bar{R}^2 = 0.405$
DW = 1.80

The Netherlands

$$PCN = PCN_{-1}(0.327 + 0.482\ WN/WN_{-1} + 0.191\ PMN/PMN_{-1})$$
$$(0.313)\quad (0.244)\qquad (0.166)$$

$\bar{R}^2 = 0.236$
DW = 1.45

United Kingdom

$$PCU = PCU_{-1}(0.320 + 0.680\ WU/WU_{-1})$$
$$(0.101)\quad (0.184)$$

$\bar{R}^2 = 0.489$
DW = 1.80

Total EEC

$$PCT = [PCA(CA/4) + PCB(CB/50) + PCL(CL/50) + PCD(CD/6.90714) + PCF(CF/4.93706) + PCE(CE/357.143) + PCI(CI/0.625) + PCN(CN/3.62) + PCU(CU/0.357143)]/CT$$

Public Consumption Prices

Germany

$$PGA = PGA_{-1}(0.287 + 0.713\ WA/WA_{-1})$$
$$(0.101)\ \ (0.132)$$

$\bar{R}^2 = 0.225$
DW = 1.32

Belgium

$$PGB = PGB_{-1}(0.301 + 0.219\ WB/WB_{-1} + 0.480\ PGB_{-1}/PGB_{-2})$$
$$(0.061)\qquad\qquad (0.160)$$

$\bar{R}^2 = 0.663$
DW = 2.02

Denmark

$$PGD = PGD_{-1}(0.201 + 0.797\ WD/WD_{-1})$$
$$(0.220)\ \ (0.202)$$

$\bar{R}^2 = 0.491$
DW = 2.17

France

$$PGF = PGF_{-1}(0.197 + 0.802\ WF/WF_{-1})$$
$$(0.276)\ \ (0.339)$$

$\bar{R}^2 = 0.254$
DW = 1.83

Ireland

$$PGE = PGE_{-1}(0.313 + 0.688\ WE/WE_{-1})$$
$$(0.223)\ \ (0.229)$$

$\bar{R}^2 = 0.362$
DW = 1.59

Italy

$$PGI = PGL_{-1}(0.322 + 0.690\ WI/WL_{-1})$$
$$(0.147)\ \ (0.137)$$

$\bar{R}^2 = 0.617$
DW = 1.79

The Netherlands

$$PGN = PGN_{-1}(0.292 + 0.718\ WN/WN_{-1})$$
$$(0.250)\ \ (0.187)$$

$\bar{R}^2 = 0.512$
DW = 1.36

United Kingdom

$$PGU = PGU_{-1}(0.283 + 0.734\ WU/WU_{-1})$$
$$(0.189)\ \ (0.181)$$

$\bar{R}^2 = 0.507$
DW = 2.09

Price of Gross Fixed Capital Formation

Germany

$$PVA = PVA_{-1}(0.264 + 0.538\ WA/WA_{-1} + 0.181\ PMA_{-1}/PMA_{-2})$$
$$(0.120)\ \ (0.106)\qquad\qquad (0.075)$$

$\bar{R}^2 = 0.671$
DW = 2.25

Belgium

$$PVB = PVB_{-1}(0.203 + 0.592\ WB/WB_{-1} + 0.228\ PMB/PMB_{-1})$$
$$(0.107)\ \ (0.191)\qquad\qquad (0.133)$$

$\bar{R}^2 = 0.381$
DW = 1.68

Denmark

$$PVD = PVD_{-1}(0.314 + 0.370\ WD/WD_{-1} + 0.314\ PMD/PMD_{-1})$$
$$(0.088)\ (0.076)\qquad\qquad (0.079)$$

$\bar{R}^2 = 0.810$
DW = 1.97

France

$$PVF = PVF_{-1}\,(-0.073 + 0.595\ WF/WF_{-1} + 0.478\ PMF/PMF_{-1})$$
$$(0.283)\quad (0.238)\qquad\qquad (0.173)$$

$\bar{R}^2 = 0.486$
DW = 1.60

Ireland

$$PVE = PVE_{-1}\,(0.381 + 0.364\ WE/WE_{-1} + 0.257\ PME/PME_{-1})$$
$$(0.197)\quad (0.137)\qquad\qquad (0.170)$$

$\bar{R}^2 = 0.404$
DW = 1.85

Italy

$$PVI = PVI_{-1}(0.415 + 0.373\ WI/WI_{-1} + 0.213\ PMI/PML_{-1})$$
$$(0.085)\quad (0.062)\qquad\qquad (0.091)$$

$\bar{R}^2 = 0.795$
DW = 1.49

The Netherlands

$$PVN = PVN_{-1}(0.270 + 0.435\ WN/WN_{-1} + 0.294\ PMN/PMN_{-1})$$
$$(0.345)\quad (0.209)\qquad\qquad (0.184)$$

$\bar{R}^2 = 0.235$
DW = 1.57

United Kingdom

$$PVU = PVU_{-1}(0.107 + 0.878\ WU/WU_{-1})$$
$$(0.202)\quad (0.197)$$

$\bar{R}^2 = 0.567$
DW = 1.87

Export Prices in National Currency

Germany

$$PXA = PXA_{-1}(0.260 + 0.322\ WA/WA_{-1} + 0.398\ PMA/PMA_{-1})$$
$$(0.071)\quad (0.050)\qquad\qquad (0.063)$$

$\bar{R}^2 = 0.909$
DW = 2.43

Belgium

$$PXB = PXB_{-1}(0.198 + 0.451\ WB/WB_{-1} + 0.351\ PMB/PMB_{-1})$$
$$(0.222)\quad (0.229)\qquad\qquad (0.151)$$

$\bar{R}^2 = 0.516$
DW = 1.54

Denmark

$$PXD = PXD_{-1}(0.385 + 0.213\ WD/WD_{-1} + 0.394\ PMD/PMD_{-1})$$
$$(0.219)\quad (0.187)\qquad\qquad (0.196)$$

$\bar{R}^2 = 0.303$
DW = 2.18

France

$$PXF = PXF_{-1}(-0.267 + 0.615\ WF/WF_{-1} + 0.617\ PMF/PMF_{-1})$$
$$(0.176)\quad (0.189)\qquad\qquad (0.260)$$

$\bar{R}^2 = 0.547$
DW = 1.81

Ireland

$$PXE = PXE_{-1}(0.016 + 0.473\ WE/WE_{-1} + 0.494\ PME/PME_{-1})$$
$$(0.173)\quad (0.142)\qquad\qquad (0.205)$$

$\bar{R}^2 = 0.665$
DW = 1.35

Italy

$$PXI = PXI_{-1}(0.095 + 0.137\ WI/WI_{-1} + 0.756\ PMI/PMI_{-1})$$
$$(0.140)\quad (0.057)\qquad\qquad (0.161)$$

$\bar{R}^2 = 0.830$
DW = 2.13

The Netherlands

$$PXN = PXN_{-1}(0.206 + 0.302\ WN/WN_{-1} + 0.498\ PMN/PMN_{-1})$$
$$(0.131)\quad (0.093)\qquad\qquad (0.107)$$

$\bar{R}^2 = 0.535$
DW = 2.23

United Kingdom

$$PXU = PXU_{-1}(-0.193 + 0.663\ WU/WU_{-1} + 0.511\ PMU/PMU_{-1})$$
$$(0.094)\quad (0.149)\qquad\qquad (0.068)$$

$\bar{R}^2 = 0.911$
DW = 2.04

Dollar Export Prices

$$PXCi = ((PXI/100) \cdot REVALi) \cdot AJPXi$$

Other Prices

$$PDIi = \frac{PCi \cdot Ci + PVi \cdot Vi + PGi \cdot Gi + Pi \cdot DSTi}{(Ci + Gi + Vi + DSTi)}$$

$$Pi = 100(PNBVi/PNBi)$$

Except Luxemburg:

$$PL = \underset{(0.083)}{PL_{-1}}(\underset{}{0.005} + \underset{(0.301)}{0.620}.PCT/PCT_{-1} + \underset{(0.308)}{0.337}PL_{-1}/PL_{-2})$$

$\bar{R}^2 = 0.60$
DW = 2.49

$$CCAPi = PVi\ (RLi + di)/1000$$

$$PXCT = \sum_{i\ (i\ \epsilon\ EEC)} (PXC_i \cdot XBT_i)/(WT - XBTR)$$

$$PMCT = \sum_{i\ (i\ \epsilon\ EEC)} (PMC_i \cdot BM_i)/WT - BMR)$$

Linkage Block

Goods and Services Imports

Germany

$$BSMA = \underset{(0.127)}{10^{-0.594}}\ DMA^{\underset{(0.070)}{1.360}} \left(\frac{PMA}{PDIA}\right)^{\underset{(0.118)}{-0.574}}$$

$\bar{R}^2 = 0.999$
DW = 1.92

Belgium

$$BSMB = \underset{(0.157)}{10^{-0.599}}\ DMB^{\underset{(0.066)}{1.264}} \left(\frac{PMB}{PDIB}\right)^{\underset{(0.171)}{-0.325}}$$

$\bar{R}^2 = 0.996$
DW = 2.28

Denmark

$$BSMD = \underset{(0.129)}{10^{-0.353}}\ DMD^{\underset{(0.097)}{1.211}} \left(\frac{PMD}{PDID}\right)^{\underset{(0.145)}{-0.401}}$$

$\bar{R}^2 = 0.997$
DW = 2.22

France

$$BSMF = \underset{(0.053)}{10^{-0.565}}\ DMF^{\underset{(0.038)}{1.415}} \left(\frac{PMF}{PDIF}\right)^{\underset{(0.302)}{-0.450}}$$

$\bar{R}^2 = 0.993$
DW = 1.90

Ireland

$$BSME = \underset{(0.507)}{10^{-1.588}}\ DME^{\underset{(0.206)}{1.606}} \left(\frac{PME}{PDIE}\right)^{\underset{(0.403)}{-0.316}}$$

$\bar{R}^2 = 0.937$
DW = 1.99

Italy

$$BSMI = \underset{(0.058)}{10^{-0.224}}\ DMI^{\underset{(0.101)}{1.501}} \left(\frac{PMI}{PDII}\right)^{\underset{(0.274)}{-0.550}}$$

$\bar{R}^2 = 0.962$
DW = 1.77

Luxemburg

$$BSML = \underset{(0.043)}{10^{-0.673}}\ (PNBL + BSML)^{\underset{(0.024)}{1.191}}$$

$\bar{R}^2 = 0.994$
DW = 1.82

The Netherlands

$$BSMN = \underset{(0.040)}{10^{-0.158}}\ DMN^{\underset{(0.026)}{1.102}} \left(\frac{PMN}{PDIN}\right)^{\underset{(0.258)}{-0.430}}$$

$\bar{R}^2 = 0.996$
DW = 1.59

United Kingdom

$$BSMU = \underset{(0.161)}{10^{-0.327}}\ \underset{(0.091)}{DMU^{1.431}}\ \underset{(0.357)}{\left(\frac{PMU}{PDIU}\right)^{-0.466}}$$

$\bar{R}^2 = 0.963$
DW = 1.43

Total EEC

$$BSMT = BSMA/4.0 + BSMB/50 + BSMD/6.90714 + BSMF/4.93706 + BSME/357.143 + BSMI/0.625 + BSMN/3.62 + BSMU/0.357143$$

$DMi = a_{1i}\,Ci + a_{2i}\,Gi + a_{3i}\,Vi + a_{4i}\,DSTi + a_{5i}\,XBSi$

where a_{ji} = import content of demand component j, whose numerical values are given in the following table.

Import Contents of Final Demand

	Private Consumption	Public Consumption	Gross Fixed Capital Formation	Change Inventories	Export Goods Services
Germany	0.172	0.134	0.151	0.213	0.156
Belgium	0.289	0.120	0.410	0.460	0.371
Denmark	0.315	0.140	0.430	0.560	0.340
France	0.119	0.060	0.170	0.130	0.125
Ireland	0.340	0.160	0.450	0.660	0.370
Italy	0.141	0.038	0.176	0.295	0.163
The Netherlands	0.337	0.162	0.450	0.662	0.312
United Kingdom	0.170	0.088	0.143	0.200	0.229

Goods Imports

Germany

$$BMA = \underset{(2.370)}{(-1.671} + \underset{(0.025)}{0.736}\ BSMA)/4.0$$

$\bar{R}^2 = 0.989$
DW = 1.41

Belgium

$$BMB = \underset{(5.496)}{(25.621} + \underset{(0.016)}{0.695}\ BSMB)/50$$

$\bar{R}^2 = 0.995$
DW = 1.73

Denmark

$$BMD = \underset{(0.279)}{(2.571} + \underset{(0.012)}{0.680}\ BSMD)/6.90714$$

$\bar{R}^2 = 0.997$
DW = 2.03

France

$$BMF = \underset{(2.284)}{(4.637} + \underset{(0.030)}{0.669}\ BSMF)/4.93706$$

$\bar{R}^2 = 0.982$
DW = 1.56

Ireland

$$BME = \underset{(15.290)}{(11.680} + \underset{(0.034)}{0.797}\ BSME)/357.143$$

$\bar{R}^2 = 0.983$
DW = 2.19

Italy

$$BMI = \underset{(0.108)}{0.508} + \underset{(0.016)}{0.712}\ BSMI)/0.625$$

$\bar{R}^2 = 0.995$
DW = 1.76

Luxemburg

$$BML = (6.259 + 0.654\ BSML)/50$$
$$(0.875)\ (0.032)$$

$\bar{R}^2 = 0.972$
DW = 1.43

The Netherlands

$$BMN = (1.529 + 0.819\ BSMN)/3.62$$
$$(0.693)\ (0.019)$$

$\bar{R}^2 = 0.995$
DW = 1.79

United Kingdom

$$BMU = (-0.492 + 0.756\ BSMU)/0.357143$$
$$(0.254)\ (0.021)$$

$\bar{R}^2 = 0.993$
DW = 1.43

BLEU (Belgium and Luxemburg)

$$BMBL = (BMB + BML)/TUEBL$$

Bilateral Trade Flows

$$(XBij - \overset{\circ}{aij}\ BMj) = -1.584\ \overset{\circ}{XBij}\ (PXCi - PMCj)$$
$$(0.176)$$
$$+ 1.011\ \overset{\circ}{XBij}\ (YPOTi - YPOTMj)$$
$$(0.080)$$
$$- 0.945\ \overset{\circ}{XBij}\ (TENSi - TENSMj)$$
$$(0.322)$$
$$+ 0.082\ \overset{\circ}{XBij}\ .\ BCEEI_{ij}$$
$$(0.020)$$
$$- 0.037\ \overset{\circ}{XBij}\ \cdot\ BAELEI_{ij} + 0.006\ \overset{\circ}{XBij}.BCEEX_{ij}$$
$$(0.023) \qquad (0.009)$$
$$- 0.050\ \overset{\circ}{XBij}.BAELEX_{ij}$$
$$(0.011)$$

$\bar{R}^2 = 0.406$

Exports of Services

Germany

$$XSA = 6.532 + 0.138\ (4.0\ XBTA)$$
$$(0.973)\ (0.010)$$

$\bar{R}^2 = 0.742$
DW = 2.50

Belgium

$$XSB = -1.500 + 0.192\ (.50\ XBTB)$$
$$(4.301)\ (0.012)$$

$\bar{R}^2 = 0.984$
DW = 1.41

Denmark

$$XSD = -0.516 + 0.354\ (.691\ XBTD)$$
$$(0.381)\ (0.023)$$

$\bar{R}^2 = 0.969$
DW = 1.73

France

$$XSF = -12.788 + 0.245\ (4.94\ XBTF)$$
$$(2.570)\ (0.045)$$

$\bar{R}^2 = 0.959$
DW = 1.29

Ireland

$$XSE = 76.034 + 0.389\ (357.1\ XBTE)$$
$$(11.672)\ (0.047)$$

$\bar{R}^2 = 0.924$
DW = 1.47

Italy

$$XSI = 0.356 + 0.387\ (.625\ XBTI)$$
$$(0.104)\ (0.020)$$

$\bar{R}^2 = 0.978$
DW = 1.79

The Netherlands

$$XSN = 4.318 + 0.184\ (3.62\ XBTN)$$
$$(0.195)\ \ (0.016)$$

$\bar{R}^2 = 0.989$
$DW = 2.19$

United Kingdom

$$XSU = -0.075 + 0.401\ (.357\ XBTU)$$
$$(0.352)\ \ (0.068)$$

$\bar{R}^2 = 0.880$
$DW = 1.68$

Averages and World Variables

$$PMCj = \sum_i \overset{\circ}{a}ij\ PXCi$$

$$YPOTMj = \sum_i \overset{\circ}{a}ij\ YPOTi$$

$$TENSMj = \sum_i \overset{\circ}{a}ij\ TENSi$$

$$XBTR = \sum_j XBRj + CIRM$$

$$BMR = \sum_i XBiR + CIRM$$

$$WT = \sum_i XBTi$$

World Prices, Terms of Trade, Current Price Balances on Goods and Services

$$PWT = (\Sigma PXCi \cdot XBTi + PXCR \cdot XBTR)/WT \qquad (i \in EEC)$$

$$TECHi = PXi/PMi$$

$$BGSVi = (PXi/100) \cdot XBSi - (PMi/100) \cdot BSMi$$

Appendix II

Notation

The variable names listed below are the Fortran names used in the solution program. The suffix i = A, I, N, F, B, U, D, L represent countries where

A = Germany (Allemagne)
I = Italy
N = The Netherlands
F = France
B = Belgium
U = United Kingdom
E = Ireland (Eire)
L = Luxemburg
T = Total EEC
R = Rest of world.

The base year for constant price flows and for indices is 1963. The main data source is the OECD National Accounts Statistics and Labour Force Statistics except for wages (UN Monthly Bulletin of Statistics) and for interest rates and rates of exchange (IMF International Financial Statistics). The trade matrices and the "dollar" export price indices were communicated by G. Taplin, IMF, and are the same as those used in Project Link. All monetary data are expressed in billions of national currency except Italy (thousands billion lira) and Ireland (millions of pounds).

Endogenous Variables

Factor Demand Block

CAPi : capital stock at constant prices
Vi : gross fixed capital formation, constant prices
EMPi : total employment (thousands)
CHi : unemployment (thousands)
YPOTi : potential output
TENSi : pressure of demand

Income Expenditure Block

Ci : private consumption, constant prices
DSTi : changes in stocks, constant prices
PNBi : Gross National Product, constant prices
PNBVi : Gross National Product, current prices
PIBVi : Gross Domestic Product, current prices
PIBCFi : Gross Domestic Product at factor cost, constant prices
YDi : Disposable Income, constant prices
YDVi : Disposable Income, current prices

Wage Price Block

Wi : index of hourly earnings in manufacturing (1963 = 100)
PCi : price index of private consumption (1963 = 100)
PVi : price index of Gross Domestic Asset Formation (1963 = 100)
PGi : price index of Government Current Expenditures (1963 = 100)
PXi : price index of Total Exports (1963 = 100) in national currency
PMi : price index of Total Imports (1963 = 100) in national currency
PXCi : dollar price index of Exports (1963 = 100)
PMCi : dollar price index of Imports (1963 = 100)
Pi : deflator of Gross National Product (1963 = 100)
PDIi : deflator of Internal Demand (1963 = 100)
CCAPi : implicit price of capital

Trade Linkage Block

XBij : exports of goods from country i to country j, constant prices i, j = A, I, N, F, B, U, D, E and R (rest of the world)
XBTi : total exports of goods, constant prices
BMi : total imports of goods, constant prices
XSi : exports of services, constant prices
SMi : imports of services, constant prices
XBSi : exports of goods and services, constant prices
BSMi : imports of goods and services, constant prices
BMBL : BLEU imports of goods
DMi : import content of final expenditures
YPOTMi: average production capacity of competitors of country i
TENSMi: average pressure of demand of competitors of country i
BGSVi : balance on goods and services, current account
TECHi : terms of trade
PWT : world prices

Policy Instruments

Gi : government current expenditure, constant prices
TINDVi : indirect taxes, current prices
SUBVi : subsidies, current prices
REVALi : index of rates of exchange, expressed in units of national currency per US dollar
POPACi : available labor force
RLi : long-term rate of interest
YDEXi : exogenous change in taxes
VEXi : exogenous change in investment

Other Exogenous Variables

PXRW : export price of countries other than the EEC (1963 = 1.0)
TEMPS : time (1953 = 0)
AJPXi : adjustment converting export prices for goods to export prices for goods and services
AJPMi : adjustment converting import prices for goods to import prices for goods and services
PXCGR : export prices of goods, rest of world
PXCR : export prices of goods and services, rest of world
CIRM : intratrade, rest of world
YPOTR : production capacity, rest of world
TENSR : pressure of demand, rest of world
UEBL : share of Belgium in goods exports of the BLEU
TUEBL : adjustment of goods imports of BLEU to goods imports of Belgium
VAEXVi : net factor income paid to rest of world, current prices
BCEEI : dummy variable intra EEC trade
BAELE : dummy variable intra EFTA trade
BCEEX : dummy variable EEC-non-EEC trade
BAELEX: dummy variable EFTA-non-EFTA trade

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Discussion

Keith N. Johnson

In this paper, Waelbroeck and Dramais report on yet another internationally linked empirical system, in this case a series of models of economies which make up the European Economic Community. We have heard this morning from the LINK project and will hear next from RDX/MPS. It is apparent that these linked macro-model systems differ in both structure and orientation in comparison to the theoretical papers presented earlier. Only recently has large-scale economic modelling been intensively applied to the international system. The resulting models still tend to rely heavily on fundamental linkages among trade flows and trade prices (as well as the relationships between these and domestic sectors) while the theoretical focus has moved on to other considerations such as monetary and investment linkages. Similarly, nowhere among the empirically oriented studies is there truly a discussion of coordinated policy, that is of linkages among policy instruments or between transmitted economic impulses and policy responses. Instead these models are mainly used to carry out ceteris paribus simulation studies, however complicated they might be. In particular, despite the evident efforts of the authors, the use of "coordination" in the title of this paper represents more their plans than accomplishments. I return to this point later.

Nevertheless, even in the rather restricted context of current international modelling experience, DESMOS is clearly distinguishable. Waelbroeck and Dramais have quite effectively developed a set of small-scale, medium-term models by carefully insuring the integrity of the underlying production relationships. These basic equations are then extended into complete models, but extended only enough to incorporate relevant policy channels, and kept simple otherwise. Finally, the country models are interrelated by means of a new form of linkage equation, where the novel feature is the introduction of capacity effects in export determination.

What is obtained is a set of nine rather modest-scale models which are specified as nearly the same across countries as possible. The self-imposed constraints of moderate size and common specification do not

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appear to be unduly restrictive, judging by the DESMOS experience. However, one feels a certain trepidation in voicing criticism. If the commonality of specification is to be maintained, then each new equation must be implemented for each of the nine countries. If the feasibility of maintaining the system in a single center is to protected, then each data series must be easily available.

Yet, certain scattered criticisms are appropriate. In the estimation of DESMOS, the Coen-Hickman technique is used to insure mutual consistency among the production, labor demand, and investment equations. In the long run, therefore, they are guaranteed that these three variables move sensibly along the frontier of a single production technology. However, in the short run this restriction may be a liability; it is not then reasonable to expect the economy to be at the technological frontier and a more varied pattern of responses is possible. By introducing some adjustment lags, Waelbroeck and Dramais attempt to reflect this fact, but imperfectly to be sure. The mean adjustment lags in Table 2 are often implausibly long. For example, half of the capital response to a change in output consumes over 15 years for Germany and the Netherlands and over 20 years for France. The labor demand mean lags are also too long for Germany (eight years) and for Denmark (six years). As the authors note, this result may follow from a too close tie between the adjustment speeds to a change in factor prices compared to a change in output. They also plan apparently to tie prices directly to unit production costs. In fact, a careful review of the equations for the various price deflators indicates that, for many of the countries, one cannot distinguish statistically between the expenditure prices when the specifications are the same. For example, the Ireland consumption price is determined from wages with an estimated elasticity of 0.44 (standard error of 0.11) and from import prices with an elasticity of 0.32 (0.16). The investment deflator equation has corresponding elasticities of 0.36 (0.14) and 0.26 (0.17). Export prices have elasticities of 0.47 (0.14) and 0.49 (0.20). We do not know the sampling covariances, but based on the sampling errors alone, it is possible these three equations are the same. A similar result appears for Belgium, France, and somewhat for the Netherlands and Denmark. Italy, Germany, and the United Kingdom have more distinctive patterns however. If divergent price movements are important in determining dynamic simulation responses, whether these differences are significant could be crucial.

The extension of the production sectors into compact, sensible models, regardless of the price equations, is nicely accomplished, but the introduction of policy channels seems to be less complete. For example, the only monetary instrument is the long-term interest rate which enters in the definition of the cost of capital. If consumption were disaggregated into durables and non-durables, it might be possible to introduce the term-structure of interest rates to reflect credit rationing in the determination of durable consumption. This would of course require new variables and extra equations. More disturbing is the absence of any income-side relationships or tax rates explicitly considered. The equation determining

disposable income linearly from total income then must be interpreted as reflecting not only tax and transfer policies, but also as implicitly reflecting the distribution of incomes, say, as between wages and profits. It is doubtful whether alternative policies (or particularly policy response functions) may be adequately studied without such distributional information. This qualification would seem to hold particularly where the capital stock is treated in a putty-putty framework. For example, a fairly common feature of certain of the LINK models is that increased wage demands, ceteris paribus, may lead, for a year or two, to increased output despite falling exports and increasing imports because of short-run transfers of income from profits to wages.[1]

In the linkages among real trade flows, Waelbroeck and Dramais have introduced a most interesting new result. Following Hickman-Lau, they explain market shares as a function of relative export prices, but also employ relative capacity utilization and relative production capacity as additional explanatory variables. This extension is a particularly good example of how a set of small models may be useful. The role of and need for a capacity utilization effect in export determination has been recognized in LINK meetings for two years or more (not infrequently by Prof. Waelbroeck), but the present model has accommodated to the need much more quickly. The basic problem in this respect is to develop internationally comparable indices of capacity utilization, a difficulty which is neatly circumvented when, as here, the underlying models are specified identically. The bilateral flow equation which is used, it should be emphasized, is very restrictive. The underlying functions given in the discussion of the Linkage Block are linearized around the base year shares a^0_{ij} and simplified substantially to give the linear functions in the Appendix. Notice that even the underlying functions assume that the elasticity of substitution is constant within each import market. The same assumption applies to elasticities with respect to relative capacity output and with respect to relative capacity utilization. In the pooled time-series and cross-section estimated equation, each of these elasticities is further assumed to be the same across markets. In the Klein-van Peeterssen and Moriguchi versions of the LINK equations, these parameters are assumed to vary across markets but not across exporters to any market.[2] Furthermore, some unpublished calculations made by Moriguchi and myself suggest that even this weaker constraint is not tenable statistically; without some restriction, however, there are serious degrees of freedom problems in estimating all of the parameters. Similarly, the import expenditure elasticities in the DESMOS

[1]See the chapter by Johnson and Klein, this volume.

[2]See L.R. Klein and A. van Peeterssen, "Forecasting World Trade within Project LINK" in J. Ball (ed.), *The International Linkage of National Economic Models*, North-Holland, 1973. Also Moriguchi and K. Johnson, "The Estimation of Import Market Shares, A New Approach," Kyoto Discussion Paper No. 58 presented to the annual LINK world meeting, Vienna 1972.

equation are assumed to be constant across markets and exporters. Numerous published studies have verified the existence of differential effects here.

The preceding comments refer to the traditional parts of the DESMOS import allocation model, but in addition to relative prices, market shares depend on the product of the variables:

$$\left(\frac{Y_i}{Y_j^*}\right)^{\gamma} \cdot \left(\frac{T_i}{T_j^*}\right)^{\delta}$$

where Y_i is capacity output and T_i is the ratio of actual output to capacity output (say Q_i/Y_i) in country i. Assuming adequate equilibration in the models, in the long run, we have $Q_i = Y_i$ so the second term tends to unity. Furthermore, since the estimate of γ and of $-\delta$ are both near unity, market shares will eventually vary with the ratio Q_i/Q_j^*, essentially a gravity model specification. In the short run, capacity should be fairly constant. In this case, market shares can easily be seen to vary with $k(Q_i/Q_j^*)^{-1}$ where k is the constant $(Y_i/Y_j^*)^2$. In a sense, therefore, the model behaves initially *opposite* to that of a gravity model.

The appropriateness of the capacity measure is somewhat questionable however. The traditional justification for defining capacity output by evaluating the production function at full employment is that capital is fixed in the short run. In DESMOS, however, excepting the United Kingdom and Germany, capital is variable as well as malleable within a period of a year. Also, it is not clear that capacity *to export* is being measured. If one believes in the dichotomy of the "Scandanavian" model, and if tradeables were produced mainly from capital and non-tradeables mostly from labor, then a measure which ultimately depends on the unemployment rate might be a poor indicator of under-utilization of export capacity. For short-run forecasting , these considerations are probably not especially important. However, because of the specification of the production sector and simplifications on the demand side, I believe that DESMOS is more reliable for medium-run structural analysis so that the creativity demonstrated in this export specification may not be as useful to DESMOS as to others. Waelbroeck and Dramais have here broken new ground empirically, and, hopefully their efforts will enhance what may be a fruitful path of inquiry.

As it was not possible for Waelbroeck and Dramais to completely report all of their policy simulations, it is not possible for me to pursue detailed comment on all they describe. Nor is it necessary. A few isolated remarks will suffice.

The overall pattern of the dynamic multipliers which appear in this section of the paper are quite sensible and provide testimony to the usefulness of such small models. The impact of direct inducements to investment seems to be notably strong and those operating via interest rates

notably weak in comparison. Also, it is not clear exactly how the immigration of labor calculations are undertaken. If there is an assumed increase, for example, in German "guest workers," is there also a partially countervailing decrease in the active population assumed, say in Italy? The most interesting result would seem to be the price responses to exchange fluctuation in Table 8, which may be approximately interpreted as an analysis of a "typical" E.E.C. economy. Following a 10 percent revaluation, export prices in local currency units fall by almost 4 percent and continue to decline. By the fifth year, more than half of the change in the exchange rate has been absorbed, and, as a consequence, the effect on the balance of payments is temporary and small. The authors note, correctly, that one reason for this effect is the decline in wages which accompanies reduced activity, but this is not the most important reason. The typical export price equation depends on wages, but also on import prices, and the elasticity with respect to the latter is generally equal to or greater than that with respect to wages. In fact, nearly 90 percent of the initial year absorption is attributable to the same source. To a certain extent, where imported materials are used in the production process, this result stems from declining unit costs, but it must largely represent competitive behavior on the part of exporters.

I do not want to comment on the DESMOS multiplier and cross-multiplier calculations in comparison to those of Hickman and the LINK model. It is essential to point out, however, that the most important difference between the two sets of calculations is not the difference in structure or size, but rather the period. The DESMOS multipliers cover the period 1970 — 1975 while Hickman's multipliers are evaluated over the period 1973 — 1975. The initial conditions may substantially influence dynamic multipliers where the models are non-linear, and this accounts for the large differences, for example, in the case of the Netherlands.

The section on "controllability" of the E.E.C. model can be misleading. Where we might agree that policy makers, indeed all of us, are not concerned with precise values of policy multipliers since, after all, they are statistical estimates and subject to sampling error (of generally unspecified magnitudes), the extensive use of only the signs of the multipliers in this section will not even reflect orders of magnitude unless much care is taken.

One assumption which must underly such "qualitative" analysis is that it is possible to determine a set of policy experiments which are, in some sense, comparable, perhaps in terms of political feasibility. Using Table 8, it is possible to construct a new Table 9′ which contains not only the signs but also typical orders of magnitudes of policy responses. Referring to their Table 9, and disregarding the unemployment target, Waelbroeck and Dramais now argue that there must be some combination of demand contraction and revaluation which has no impact on the balance of payments. Unless the system is extremely non-linear, this combination will exist with the (dynamic) weights assigned to each instrument depending on the (dynamic) multipliers in Table 9′. In Table 8, it is seen that the impact on the

balance of payments of a unit increase in public consumption is -0.33 while the impact of a unit revaluation is -0.36. If the units are small enough to assume approximate linearity, then a unit policy variation composed of approximately 1/2 unit fiscal contraction and 1/2 unit revaluation will be close to neutral regarding the balance of payments. By the fifth year, the weights in the policy mix must be approximately 0.22 fiscal contraction and 0.78 revaluation. These calculations then lead Waelbroeck and Dramais to their Table 10 and me to my Table 10′ which gives, in addition to the signs, the unit policy mixes and resulting impacts. The point, of course, is that the numerical entries in Table 10′ and particularly the weights form a significantly different pattern than the signs alone in Table 10. For example, fiscal policy seems to be very unimportant, whatever the target. Importing foreign labor is the most important element in the policy mix to control prices as well as in the policy mix to stimulate real output. Increases in the long-term interest rate are most heavily weighted in a policy mix to improve the balance of payments. These results are not entirely plausible, but do effectively demonstrate the care required in the interpretation of such qualitative analysis.

Table 9′

Sign and Magnitude of Typical Policy Multipliers

Impact on:	Public Consumption	Rate of Exchange	Long-term Interest Rate	Labor Immigration
GNP	+1.9	-2.4	-1.6	+0.4
Unemployment	-1.2	+1.6	+0.2	+0.8
Consumer Prices	+1.9	-1.6	+0.1	-1.2
Balance of Payments	-0.7	-0.2	+0.4	+0.2

Source: Waelbroeck and Dramais, Table 8, five-year multipliers.

Note: Public consumption = increase equal to 1 percent of GNP
Rate of exchange = 10 percent revaluation
Long-term Interest Rate = 100 basis point increase
Labor Immigration = 1 percent increase in active population

Table 10′

Impacts of Combinations of Instruments

	-ΔEXP (0.22) +ΔEXCH (0.78)	-ΔRL (0.33) +ΔIMMIG (0.67)	+ΔEXCH (0.40) -ΔRL (0.60)	+ΔEXP (0.22) -ΔIMMIG (0.78)
	(a)	(b)	(c)	(d)
Impact on:				
GNP	-2.3	+0.8	0.0	0.0
Consumer Prices	-1.5	-0.8	-0.7	+1.4
Balance of Payments	0.0	0.0	+0.3	-0.3

	-ΔEXP (0.07) +ΔEXCH (0.20) -ΔRL (0.24) +ΔIMMIG (0.49)	-ΔEXP (0.07) -ΔEXCH (0.27) +ΔRL (0.40) +ΔIMMIG (0.26)	+EXP (0.08) -ΔEXCH (0.25) -ΔRL (0.22) +ΔIMMIG (0.44)
	(a+b)	(-c — d)	(-a+b)
Impact on:			
GNP	0.0	0.0	+1.3
Consumer Prices	-1.0	0.0	0.0
Balance of Payments	0.0	+0.3	0.0

Source: Table 9′.

Note: +ΔEXP = increase of public consumption equal to 1 percent of GNP
+ΔEXCH = 10 percent revaluation
+ΔRL = 100 basis point increase in long-term interest rate
+ΔIMMIG = 1 percent increase in active population, labor immigration

The paper returns at the end to the question of policy coordination, and so do I. In so doing, I wish to emphasize the importance of this (or some other) econometric model in policy analysis. The premise that it is quite unlikely for a policy maker to fully comprehend the myriad of interactions and dependencies in the economy will lead almost directly to the recommendation that an econometric model will supplement his effectiveness in this respect. Still, as the present authors are careful to point out, the model is just a tool in this process.

Other tools are equally necessary in the E.E.C. coordination exercise they hypothesize. The negotiating forum, that is the ability to communicate policy targets and preferences simultaneously, is one such requirement. The *desire* on the part of E.E.C. member governments to coordinate policy is another. The capability of these governments to then implement faithfully the agreed-upon policies is a third. All are integral parts of the analysis of coordinated policy. A structural econometric model like DESMOS does not, for example, indicate to what extent policy making "should" be decentralized either across countries or within a single economy. A very useful result would be the identification of those policies which can be effectively set by means of response functions as opposed to requiring a negotiated consensus. Suppose, on the other hand, that equally acceptable impacts in the hypothetical E.E.C. negotiation example could be obtained from quite different instrument variations. If the required policies are not unique, what determines the result? Finally, no consideration is given to bargaining power; the participation and compliance of, say, the United Kingdom must be presupposed in the present example when it may be to the British advantage to do neither.

In fact, what DESMOS represents in terms of coordination of economic policy is simply a method by which a diverse but interrelated set of interests may attempt to understand one another. It could equally be used as a policy tool by the administration of some "United States of Europe." However, it is not as easily adapted to the analysis where national identities and goals are quite segregated and distinct, the case which seems to me to reflect the important aspect of coordination.

Patterns of Instability in Socialist Countries: Do They Call for Internationally Coordinated Stabilization Measures?

Aleksander Bajt

When I settled on the above title, I was certainly overoptimistic. The answer to the question whether an internationally coordinated stabilization policy is needed in socialist countries presupposes the knowledge of (1) what kind of instabilities there exist in socialist countries, (2) how they are generated, (3) whether, and if so, how their mechanisms are linked internationally.

In fact, there is not very much known on these issues. It would therefore be too ambitious to tackle the title question. Even discussion on (3) seems premature. Answers to (1) and (2) have to be provided first. If for nothing else, they will give us an opportunity to see whether and how internal instabilities are reflected in the existing transmission models. Only very tentative suggestions will be made in other directions.

In Section I, an analysis of medium-term cycles, mainly due to fluctuations of agricultural and investment activities, is presented. Section II deals with short-run instability caused by aggregate demand in socialist countries. Finally, Section III examines price instability, more specifically interindustry movements of wage rates, in Yugoslavia.

I. Agricultural and Investment Cycles

The main sources of instability in socialist countries are agricultural and investment cycles. While agricultural fluctuations (including their international transmission) have been taken for granted as wholly exogenous (changing weather conditions), investment cycles have attracted some attention of economists.

The Czech economist J. Goldman (1964) can be credited for introducing investment cycles to the academic audience. Several other economists,

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Czech, Polish, and Yugoslav particularly, contributed to their understanding. The author of this paper published a review article on these efforts in the *Journal of Economic Literature* (1971). Thus this discussion can be brief.

For purposes of this conference research on investment cycles in Eastern (E) European socialist economies (ESE) has been extended to 1950-70. Since the degree of instability does not tell anything about the type of instability, frequencies have been estimated in addition. Results appear in Tables I and II.

Table I gives standard deviations of the yearly rates of growth for investment, construction, industrial production, agriculture and gross social product (GSP) all for 1950-70, 1950-60 and 1960-70. They measure instability of growth in ESE. I do not see sufficient reasons for accepting coefficients of variation as the measure of instability. On *a priori* grounds agricultural fluctuations are independent of growth. This also holds for GSP (high share of agriculture). Cross country rank correlations between average rates of growth and standard deviations are virtually zero (investment 0.095, and construction — 0.097) or negative (manufacturing — 0.607) for the 1950-70 and results for the two subperiods are still worse.

During the whole 20-year period instability is highest in agriculture. It is particularly high in the four south-east (SE) ESE, two to four times as high as in the north-east (NE) ESE. The difference has to do with periodic droughts in SE Europe that have not been adequately counteracted by technological and/or institutional measures. This, however, applies only to the first subperiod. In the second subperiod agricultural fluctuations weakened. Since in NE ESE they increased slightly, differences between the two groups of countries almost vanished. Yugoslavia and Romania are the only exceptions.

Investment is the second main destabilizor in socialist countries. This is surprising as one would expect that planning would try to achieve sustained growth exactly through stably growing investment. Instability of investment is the highest in SE ESE and Czechoslavakia (CSSR). The Soviet Union and Poland display the lowest amplitudes. In Germany and Yugoslavia amplitudes are about two times, and in all other countries three to four times as large as in Soviet Union and Poland. Since Soviet, Polish and German figures are for total investment, they might be biased downward.

Amplitudes of investment cycles were approximately halved in all countries from the first to the second 10-year period, the only exception being Yugoslavia where they retained the same order of magnitude. Since the amplitudes of agricultural fluctuations were further reduced, investment has become the main factor of instability in SE ESE and CSSR. Only in Soviet Union and Poland agriculture is still leading.

Construction comes third. Its fluctuations display similar amplitudes as investment, which is understandable. The main difference is that amplitudes in construction of the three NE ESE are as a rule larger and in the remaining countries substantially smaller than in investment. With CSSR

Table I

Standard deviations of the yearly rates of growth
1950-1970 (a), 1950-1960 (b), 1960-1970 (c)

	Investment			Construction			Manufacturing			Agriculture			Social Product		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Soviet Union	4.17	3.53	2.39	4.74	4.09	2.87	2.16	1.80	0.89	5.83	5.55	5.60	2.46[3]	2.05	1.74
Poland	5.34	6.63	2.63	6.09[3]	7.93	2.69	3.66	4.17	1.25	4.69	4.09	5.22	2.21[3]	2.21	1.97
Germany	8.18	8.71	4.13	9.88	12.98	3.57	4.22	4.61	0.73	n.a.	n.a.	n.a.	4.86	5.37	1.21
Czechoslavakia	10.16[1]	11.24	7.71	5.65	4.52	5.21	3.86	3.22	2.67	4.56	4.04	5.03	3.19	2.03	3.38
Romania	16.15[1]	21.41	7.03	13.04	17.13	3.82	3.70	5.05	1.40	20.60[2]	27.43	7.57	7.81[3]	10.71	2.01
Hungary	20.78[1]	26.80	11.85	9.41	12.76	3.70	6.60	8.72	2.04	10.63	14.25	4.77	6.98[3]	9.60	2.20
Yugoslavia	9.74[1]	10.10	9.28	12.30[2]	15.33	7.15	5.86	6.72	4.67	21.18[2]	28.36	7.93	7.51	10.01	3.53
Bulgaria	12.56[1]	16.67	6.05	7.21	8.49	5.04	3.19	3.45	1.55	12.50	16.45	5.87	9.24[3]	12.55	2.39

Notes: [1]Industrial fixed investment (instead of total)
[2]Gross social product — upward biased amplitude
[3]Net social product

as the only exception, amplitudes are more than halved from the first to the second subperiod.

Fluctuations in GSP are higher than in manufacturing and much lower than in other aggregates. GSP of the three NE countries grows more stably than elsewhere. In the four SE ESE with a large share of agriculture in the GSP, agricultural cycles are a major determinant of instability in the growth of GSP. In the second subperiod the leading role is left to investment, and in Soviet Union and Poland to agriculture.

Although there is no need to define investment cycles as upcross cycles, we adopted this view for two reasons: First, one needs a measure of the frequency of investment cycles. They might be just year-to-year fluctuations. Second, as with Kuznets' cycles (Howrey, 1968; Klotz, 1973), the existence of investment cycles has been questioned. B. Klotz, 1971, points out that investment cycles might be a statistical artifact, produced by three-year moving averages used in our graphical description (Bajt, 1971). He has found that even with zero first-order autocorrelation of residuals of a regression of logs of a certain macro-aggregate on a linear time trend three-year moving averages produce 7.5 year "upcross" cycles, and that data for western countries favor his point. It will be shown that Klotz' fear has not been justified. Autocorrelation is rather high. The only exception is agriculture (and because of it GSP) in the four SE ESE.

Our results are presented in Table II. First order autocorrelation coefficients (with t-values in parentheses) appear as the first two figures, and the corresponding upcross periods in years are added as the third figure for each country. While in SE ESE the length of upcross cycles in agriculture is much below the critical value (7.5 years), including NE ESE agriculture, the length of upcross cycles in investment is (arithmetic mean) 14.29, in construction 11.05, and in manufacturing 14.34 years (GSP cycles are shorter because of agriculture). This corroborates our earlier conclusion that investment cycles are about 8 years in length. Namely, in a sample of 20 the true cycles are about 55 percent of upcross cycles.

Several economists proposed their explanation of investment cycles. J. Goldman explains them by periodically launched "investment drives" in central five-year plans. Socialist development strategy is industrialization of the "predominant role of the producer goods production" type, that is a strategy of rapidly growing producer goods industries and lagging consumer goods production. Designated to catch up with western economies, the extremely high investment, particularly in iron and steel, mining, power generation and heavy chemistry (all these branches are included in "manufacturing" in our tables) produced in a few years all kinds of bottlenecks like raw materials, foreign exchange, labor force, consumption and food production (Goldman and Fleck, 1967). In my view the last two bottlenecks that generated popular discontent (1956 events in Poland and Hungary) should be regarded as the decisive ones. As a result planners periodically had to revise their plans by giving temporary priority to consumer goods production (Lange, 1964). Thus, exaggerated investments, followed by a negative response of the population, seem to be the main

Table II

Upcross period (P) of yearly rates of growth (in years)
(with first order auto-correlation (C) of residuals
from the regression of the yearly rates of growth on a linear time trend

	Investment			Construction			Manufacturing			Agriculture			Social Product		
	C	(t)	P	C	(t)	P	C	(t)	P	C	(t)	P	C	(t)	P
Soviet Union	0.878	(9.4)	22.3	0.473	(2.4)	10.7	0.822	(9.7)	18.3	0.624	(3.5)	12.3	0.819[3]	(8.8)	18.2
Poland	0.762	(9.6)	15.2	0.371[3]	(2.6)	9.8	0.673	(7.5)	13.5	0.413	(4.2)	10.1	0.775[3]	(6.4)	16.3
Germany	0.677	(5.8)	13.6	0.267	(1.4)	9.0	0.660	(7.2)	13.3	n.a.	n.a.	n.a.	0.638	(7.2)	12.9
Czechoslavakia	0.717[1]	(4.4)	14.6	0.735	(5.6)	15.1	0.791	(7.2)	16.9	0.437	(2.1)	10.4	0.756	(6.3)	15.7
Romania	0.455[1]	(2.9)	10.5	0.198	(1.1)	8.6	0.748	(4.3)	15.4	-0.500[2]	(2.8)	4.8	-0.287[3]	(1.7)	5.9
Hungary	0.534[1]	(2.8)	11.4	0.589	(3.1)	12.2	0.395	(2.3)	10.0	-0.336	(1.5)	5.7	0.097[3]	(0.4)	8.0
Yugoslavia	0.642[1]	(3.9)	13.1	0.581[2]	(4.1)	12.0	0.531	(3.9)	11.4	-0.458[2]	(2.4)	4.2	0.161	(0.8)	8.4
Bulgaria	0.676[1]	(4.0)	13.6	0.499	(2.6)	11.0	0.763	(4.9)	15.9	-0.250	(1.2)	6.1	-0.091[3]	(0.5)	7.1

Notes: [1]Industrial fixed investment (instead of total)
[2]Gross social product
[3]Net social product

forces that generated what is labeled investment cycles. Factors like farmers' reluctance to accept collectivization and forced deliveries, misfortunes with weather conditions, unexpected political implications of lagging consumption, might have helped. The facts that outside of agriculture investment cycles are most violent in investment which is the main tool of planners, that they are synchronized among countries (medium-term plans roughly coincide), that investment peaks mainly fall in the odd numbered while investment troughs in the even numbered five-year periods (counted from the first non-Soviet plans on), that fluctuations are the mildest in the Soviet Union (with largest planning experience), that they decreased from the first to the second decade (increased experience of planners) seem to favor our interpretation.

The purpose of what follows is to look for some quantitative arguments in favor of our interpretation. The capacity effect of investment will be studied by looking at the growth of industrial production and construction, GSP may not prove useful because of its agricultural component. Depressing effects on consumption will be studied by looking at the growth of agriculture. Consumer goods production could be another possibility. Yet, there are no reliable data at hand. Moreover, at the prevailing levels of living, particularly in the first postwar period, consumer reactivity to agricultural supply must have been particularly high. Table III summarizes our results. Simple correlation coefficients between rates of growth of investment and rates of growth of construction, industrial production, agriculture, and GSP, lagged as indicated in the first row, appear in the second row of the first column for each aggregate and country. Lags are the highest correlation lags. Since all these aggregates may, and with yearly data as a rule do, accelerate and decelerate simultaneously with investment, their simultaneity being a result of the accelerating and decelerating general activity, zero lag correlations do not tell very much. Simultaneous correlation is therefore eliminated and residuals of the rates of growth of construction, industrial production, agriculture, and GSP, lagged up to three years in each direction, with residuals of the rate of growth of investment correlated instead. The obtained coefficients $r_{Y_t X_{t-i} \,.\, X_t}$ are labeled partial lag-correlation coefficients. They are given for the best-fit lag in each direction (indicated in the first row) in the second row of the second and third column of each aggregate. Low coefficients are omitted. Parentheses show some supplementary, and brackets some substitutional, results of correlation with lagged investment residuals $r_{X_t Y_{t-i} \,.\, Y_t}$ — resulting in slightly different samples).

[Editors' note: Professor Portes in his comment below describes the author's procedure in more detail. The author first regresses the rate of growth of construction, $CONSTR_t$, for example, on the rate of growth of investment, INV_t, and obtains a series of residuals, $(e^C{}_t)$. He then regresses $INV_{t+\tau}$ on INV_t separately for $\tau = -3,\ldots, +3$, and obtains a series of residuals, $(e^I{}_{t+\tau}), \tau = -3,\ldots, +3$. Finally, he regresses $(e^C{}_t)$ on $(e^I{}_{t+\tau})$ for each value of τ and looks for the best fit. The end result of Professor Bajt's

Table III

Highest simple and partial correlation coefficients of the rate of growth of fixed investment with rates of growth of construction, industrial production, agriculture and GSP

	Construction			Industrial Production			Agriculture			GSP			
	-1	-1	1	-1	-3		0	3	-1	0	3	-3	
Soviet Union	0.87	0.69	0.40	0.73	0.71		0.52	0.36	-0.42	0.76	0.60	0.38	
	0	(-3)	3	1	-2		1	1	-3	0	(2)	-3	
Poland	0.68	(0.30)	0.64	0.24	0.25		0.36	0.47	-0.40	-0.38	(0.65)	-0.37	
	0	-3		0	-3	(3)				0	[1]	3	(-3)
Germany	0.64	0.55		0.57	0.64	(0.72)		n.a.		0.66	[0.73]	0.73	0.27
	0	(-1)	(2)	0	-1		3	3	-3	0		1	-1 [-1]
Czechoslovakia	0.81	(0.17)	(0.19)	0.63	0.61		0.31	0.24	-0.55	0.45	0.23	0.19	[0.36]
	0	(-1)	3	0	-2	(1)	1	1	-2	1	1	-1	
Romania	0.15	(0.33)	0.39	0.81	0.53	(0.54)	0.51	0.67	-0.43	0.52	0.54	0.22	
	-1	-1	1	-2	-2	(1)	1	1	-2	1	1	-1	
Hungary	0.24	0.57	0.40	(0.61)	(0.60)	(0.50)	0.57	0.62	-0.42	0.61	0.61	0.34	
	0	-3		0	-3		0	(1)	1	0	3	-3	
Yugoslavia	0.69	0.66		0.54	0.33		0.31	(0.21)	-0.36	0.54	0.18	0.17	
	0	-1	(3)	1	2		0	2	-1	0	2	(-2)	
Bulgaria	0.82	0.48	(0.36)	0.44	0.55		0.44	0.43	-0.48	0.72	0.44	(-0.71)	

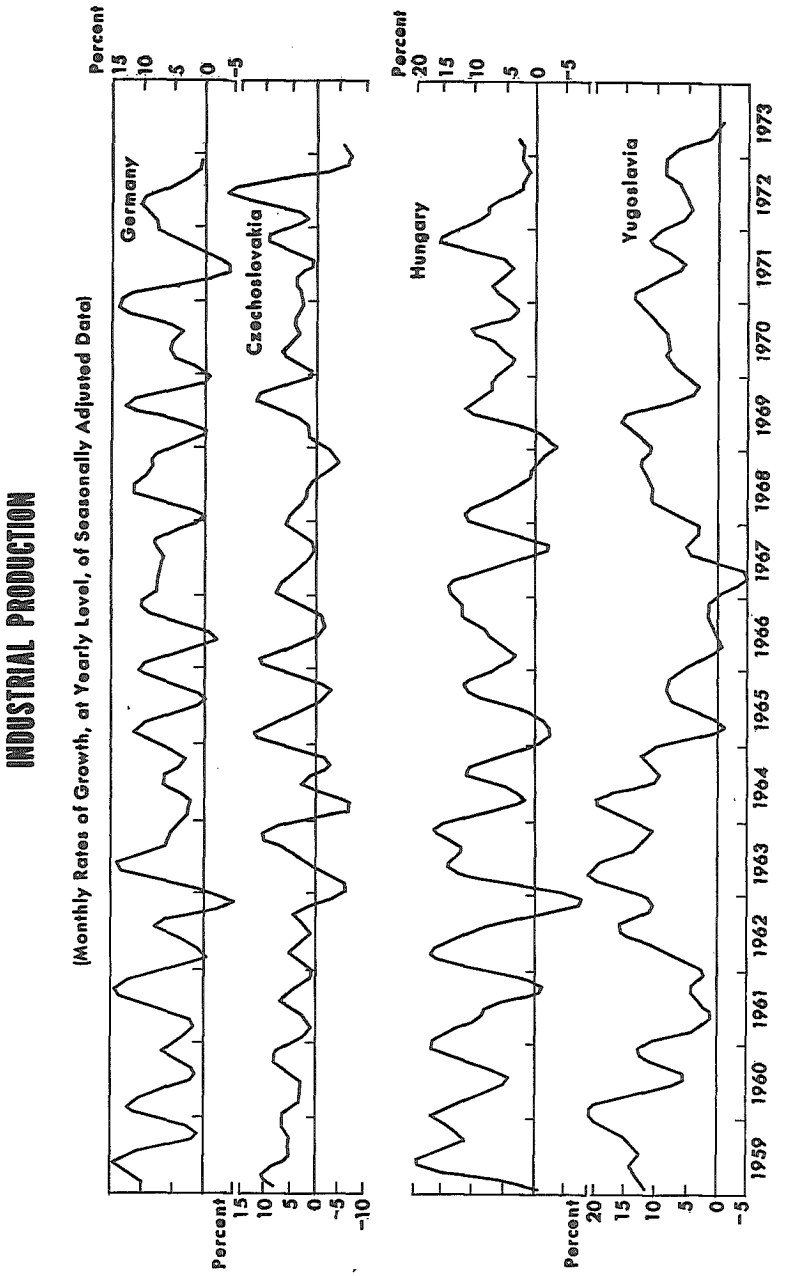
calculations is an approximation to the partial correlation coefficient $r_{Y_t X_{t-i} \cdot X_t}$ (where $Y_t = CONSTR_t$, $X_t = INV_t$) referred to in the text.]

Partial lag-correlations (also simple lag-correlation) indicate the direction of impulses between the corresponding variables, together with their strength and time distance. Impulses in either of the two directions usually exist within any zero simple lag-correlation. Partial lag-correlation allows a rudimentary splitting of statistical variables into individual impulses and contributes to the correct specification.

Results for construction and industrial production had to be expected. The main reason is that investment is mainly exogenous, determined by plans. Pulsation from investment to industrial production is most pronounced in the Soviet Union and Hungary. Partial impulses in the same direction exist in all countries but Bulgaria. The lag between one and three years roughly agrees with the empirically known gestation periods. Impulses in the opposite direction, from production to investment, are detected only in four instances. If impulse from investment to production is identified as capacity effect and the one in the opposite direction as accelerator effect, then it is possible to state that the capacity effect of investment is much stronger than the accelerator effect of production. This is consistent with the planned character of socialist economies. Moreover, it substantiates our belief that investment is mainly exogenous.

It is plausible to assume that a large part of pulsation from investment to construction is covered by zero lag simple correlation. As expected, correlation coefficients are as a rule higher than for industrial production and not a single one is for positive lags (these would indicate impulses from construction to investment). Soviet Union and Hungary manifest particularly strong capacity effects. Partial impulses also are mainly of the capacity type. The Polish and Rumanian exceptions are weakened by the alternative correlations of lagged investment residuals. From the remaining four cases the accelerator effect comes from the same alternative correlation in two of them.

Results for agriculture are the most relevant for our interpretation of investment cycles. Pulsation from investment to industrial production and construction merely describes the transmission of cycles from investment to other aggregates. In view of these results agriculture may not be as exogenous as it is generally believed, even not in short periods of time. Simple correlation coefficients, indicating positive pulsation from agriculture to investment in no less than four instances, might be dismissed on *a priori* grounds. It is difficult to believe that such impulses could exist in centrally planned economies. However, partial lag-correlations are too much in unison. In all countries but Yugoslavia positive impulses from agriculture to investment are at work. That is, an acceleration of agricultural growth favors acceleration of investment and vice versa. We may recall that it has been argued that with a different agricultural policy in ESE a large part of industrialization could have been financed by exporting agricultural produce. Balance-of-payments difficulties usually stem from agricultural failures.



However, the really important result is the uniformly negative partial lag-correlation coefficients for negative lags. In other words, a negative pulsation runs from investment to agriculture in all ESE. Not only does investment not foster, it actually hurts agricultural production. It is not possible to trace the chain of causation from investment to agriculture with the data at hand. Reallocation of population from agriculture to industry, forced deliveries, increased taxes, the general political attitude towards farmers, forced collectivization, impaired farmers' expectations and similar factors may be links in it.

Welcome as the above results may be, a large number of questions remain. For yearly data, not always for the same aggregates, not checked for any possible kind of errors, exposed to spurious correlation, they are too good a performance. The method itself needs careful examination, particularly in its application to yearly data. Nonetheless, the results reinforce the belief that by pushing investment beyond its optimum rate planners have been the main generator of cycles.

Simple and partial lag-correlation method was also used to see whether investment cycles were transmitted internationally (within ESE). No evidence has been found to confirm this hypothesis. The established coincidence of investment cycles most likely comes from roughly coincident medium-term plans and from coincident agricultural setbacks.

II. Demand-generated Instability in Planned Economies?

We now part with yearly data. We are left with Germany, Czechoslavakia, Hungary and Yugoslavia, and with industrial production only.

Figure 1 reproduces monthly rates of growth of industrial production (yearly level), seasonally adjusted (with random and trading day disturbances eliminated), for the four socialist economies, 1959-1973. Graphs display considerable degree of instability (industrial production can be taken as being representative of general economic activity). While average rates of growth 1960 through 1970 are 5.71, 6.43, 6.59 and 8.04 percent (yearly level) for Germany, Czeckoslavakia, Hungary and Yugoslavia, respectively, their standard deviations are 3.79, 9.10, 5.74 and 5.54. Since standard deviations in yearly rates amount to 0.73, 2.67, 2.04 and 4.67 (Table I, period 1960-70), respectively, we have an indication that fluctuations in the first three ESE may be of a predominantly seasonal character.

This appears to be confirmed by our graphs. Almost regular yearly subcycles occur in all of the four series of data despite seasonal adjustment (Method II, X-11, Bureau of the Census). These might be partly the result of a Slutskyan process. Only Yugoslav manufacturing displays undisputable cyclical behavior.

Spectral analysis (data detrended by taking rates of growth from seasonally unadjusted absolute data) confirms this. In the seasonal band of frequencies 10-month cycles persist in Yugoslavia and Germany, and 15-month cycles in the two remaining ESE. The existence of the Yugoslav

10-month cycles is supported by weak remnants of their 3.3-month harmonic. German data display some remnants of 15-month, and Czechoslavakian and Hungarian data of about 6 and 9-month cycles, respectively. All three, however, may be multiples of three-month cycles, found in seasonally unadjusted data. As shown by Nerlove, 1964, these might come from trading-day composition.

Spectral analysis of seasonally adjusted data shows significant (Howrey's criterion, 1968) 90-month cycles in Yugoslavia. I dismiss this possibility on ground of too short time series (Granger and Hatanaka, 1964). The graph indicates that short cycles are shorter. Upcross cycles for seasonally adjusted monthly rates of growth are 45 months long (autocorrelation of residuals 0.972) and upcross cycles for monthly rates of growth of seasonally adjusted indices 21.3 months long (autocorrelation 0.869). While the latter are seasonal, the frequency of the former is cyclical. Spectral analysis of seasonally adjusted data does not reveal any of these cycles. For the other three ESE spectral analysis does not reveal any cycles in the cyclical band of frequencies either for adjusted or for unadjusted data, and visual inspection of graphs does not reveal them either. Upcross cycles for monthly rates of growth of seasonally adjusted data are of about 12 months long in all three ESE. In any case, if short cycles exist, they must be rather weak.

Since our time series are too short for short cycles to be ascertained by spectral analysis, we must rely on visual inspection and on 45-month upcross cycles. We thus believe that short cycles exist in Yugoslavia but that there is no evidence of their existence in the other three ESE.

If this is so, short cycles may have to do with the structure of the decision-making process, the Yugoslav being highly decentralized. Central planning seems able to cope successfully with problems of stable growth. In a rather short time it not only weakened investment cycles (in fact, in manufacturing it decreased them below the capitalist average) but prevented short cycles from turning up. Unless ESE embark on decentralization, their nonagricultural oscillations are likely to become very mild.

The fact that Yugoslav economic growth was highly unstable has been known for quite some time. The two decelerations in 1961 and 1965-67 produced severe political problems (unemployment, insolvency, lagging wages). They both were aggravated by economic reforms that introduced tight money policy.

To show exactly how decentralization leads to instability, a forecasting model based on autonomous expenditures is presented. Induced consumption is usually regarded as a function of disposable income, and induced investment as a function of the increase in consumption. They may, therefore, be estimated from adequate consumption and investment functions. Total consumption and investment being known, autonomous consumption and investment are obtained as the difference between total and induced consumption and investment. This difference equals residuals which are (seasonally adjusted monthly data) highly serially correlated. Of

course, these residuals do not say anything as to the absolute level of autonomous consumption and investment. Fortunately this is not really needed. What is needed is autonomous consumption and investment impulses, and positively correlated residuals seem to serve this purpose quite well.

Government expenditure is treated similarly. With a tax system that rests heavily on personal incomes and with about 6,000 independent federal, republican, and local budgets, government revenues are approximated by personal disposable incomes and their autonomous part estimated within a consumption function.

The model, estimated for 1960-73 (OLS), is as follows:

$$\underset{(-5.1)\quad(214.8)}{CPD_t = -119.85 + 0.879\ Y_t} \tag{1}$$

$$\bar{R}^2 = 0.996, \quad T = 49 - 214$$

$$CPA = CP/CPD - 1 \tag{2}$$

$$\underset{(18.1)\quad(33.1)}{ID_t = 900.67 + 1.610(CP_{t-1} - CP_{t-13})} \tag{3}$$

$$\bar{R}^2 = 0.87, \quad T = 49 - 210$$

$$IA = ID/I - 1 \tag{4}$$

$$\underset{(7.4)\quad(47)}{GD_t = 146.4 + 0.171\ Y_t} \tag{5}$$

$$\bar{R}^2 = 0.93, \quad T = 49 - 210$$

$$GA = GD/G - 1 \tag{6}$$

$$\underset{(8.3)\ (9.7)\qquad(5.8)\qquad(6.3)\qquad(2.5)}{rQA = 10.9 + 55.9\ CPA_{t-9} + 11.1\ IA_{t-7} + 10.1\ GA_{t-5} - 0.023\ T} \tag{7}$$

$$\bar{R}^2 = 0.57, \quad T = 58 - 214$$

All nominal variables (CP = expenditures of the population on goods, I = investment expenditures for fixed and circulating capital, G = government expenditures — federal, republican, and local, D = derived — induced, A = autonomous, Y = disposable personal incomes, QA = economic activity measured by the index of industrial production, 100 = ∅ 1972, and using autonomous expenditures as independent variables, T = linear time trend with T = 1 = January 1956 — 49 = January 1960, r = monthly rate of growth at the annual level) are in millions of current dinars. The period from 1960 onwards was chosen as 1960 is a benchmark in

the development of selfmanagement type of the decision-making decentralization. Equation (7) shows a very good fit (consumption function (1), estimated for monthly rates of growth, has R^2 equal to 0.37). The variable CPA, lagged for nine months, is the decisive one. It determines the general course of the rate of growth of economic activity.

Lags in (7) seem to be acceptable. The differences, particularly between lags of CPA and GA, embrace unknown transmission mechanisms from retail trade to raw materials and capital equipment production. Wholesale trade, consumer goods production, inventories of finished goods both in retail and wholesale trade, and in industry, different calendar lengths of Marshall's short and long-period reacting of production to demand impulses may be links in it. All lags, if looked at as distributed (e.g., Almon polynomial lags), are unimodal with the highest and most significant coefficient estimates as specified and with virtually zero simultaneous correlation.

Forecasting records of the model and its variable CPA in particular are very good. For instance, ex post forecasts produce negative rates of growth in 1967, exactly when they occurred in fact. Ex ante unconditional forecasts have been published since 1968, with great success. Thus the model is considered as a proof that medium-term instability is really demand originated and that demand of the population is the prime mover in the process.

For stabilization purposes the "autonomy" of expenditures, consumer expenditures in the first place, though irrelevant for forecasting, is of greatest interest. If these expenditures were autonomous, counteracting policy would be necessary; if dependent on some other variable, especially an economic policy variable, stabilization efforts could also act through influencing that particular variable.

The answer was tried in two directions. Dependence on various monetary variables was tried first — without success. In particular, consumer credits turned out to be counteracted by population by savings account deposits. On the average, consumer credit expansions are followed by expansions of savings account deposits. Their main influence is on the structure of expenditures.

Dependence on the structure of the economy, that is the interplay of behavior parameters within a structural macroeconomic model, was tried next. Suppose that the basic structure of the economic mechanism is represented by a three-equation structural recursive model à la Samuelson's accelerator-multiplier model of 1939 (Samuelson, 1939) of the following form:

$$\underset{(-19)\quad(88.8)\qquad(7.2)}{GPSGD_t = -0.627 + 0.681\ GSP_{t-1} + 0.331\ (CPSG_{t-1} - CPSG_{t-13})}$$

(1)

$$\bar{R}^2 = 0.998, \quad T = 74 \text{ to } 212, \quad D.W. = 0.10$$

$$ID_t = 1208.63 + 0.799\ (GSP_{t-1} - GSP_{t-13}) \quad (2)$$
$$(30.3)\quad (43.3)$$
$$\bar{R}^2 = 0.937, \quad T = 86 \text{ to } 212, \quad D.W. = 0.07$$

$$GSP_t = CPSGD_t + ID_t + A_t \quad (3)$$

(CPSG = expenditures of population and government on goods and services, GSP = domestic gross social product, I = total investment, A = total autonomous expenditures, D.W. = Durbin-Watson statistic).

All variables are in millions of current dinars. The variable $CPSG_{t-1} - CPSG_{t-13}$ is added to the consumption function in order to account for the empirical fact that CPSG develops ahead of GSP in the predominant part of the estimation period (the best-fit consumption function being thus a function that regresses consumer expenditures on future income). Inclusion of a consumption accelerator is understandable since the economy does not spend CPSG only on non-durables but on durables as well (there are no adequate data on these categories of goods separately). This agrees with Hamburger's finding that expenditures for consumer durables should be treated as investment (1967). CPSG is included instead of disposable personal income only to keep the number of variables low. Cycles in GSP are very similar to those in industrial production forecast by our first model.

For purposes of simulation total autonomous expenditures were defined similarly as in our forecasting model, more specifically as the difference between GSP and induced consumption and investment expenditure,

$$A = (GSP - CPSGD - ID)$$

but included in the system with their linear time trend values (after a slight *ad hoc* correction of the direction of the trend):

$$A_t = (GSP_t - CPSGD_t - ID_t) = -1372 + 16.119T \quad (4)$$
$$(-10.5)\ (18.9)$$
$$\bar{R}^2 = 0.74, \quad T = 86 \text{ to } 212, \quad D.W. = 0.06$$

Simulation experiments with only A exogenous and T = 86 to 98 as the initial values of endogenous variables (with GSP adjusted to stable growth within T = 86 to 98) lead to the following set of conclusions:[1]

1. The consumption function (1) produces with its accelerator term oscillations of consumption ahead of income. It therefore explains the fact observed in the Yugoslav economy (and elsewhere) that the best-fit consumption function is the one that regresses current consumption on future income. The performance of (1) is particularly satisfactory since without

[1]Characteristic roots of the implied difference equations were not computed. The particular part of the solution seems to be particularly cumbersome.

$(CPSG_{t-1} - CPSG_{t-13})$ values of CPSGD, estimated on GSP_{t-1} alone, would systematically lag behind GSP for two or more months. However, $(CPSG_{t-1} - CPSG_{t-13})$ does not explain all oscillations of consumption that are independent of GSP_{t-1}, as clearly shown by the low D.W. of (1).

2. The model produces cycles in GSP, CPSG and I of a period of about 11 to 12 months. Cycles of a similar period really exist in Yugoslav economic activity. However, simulated amplitudes are much milder than in reality. Even without this evidence it is hard to believe that simulated cycles correspond to reality. The reason for our distrust is that even extremely small departures of GSP or A from the determined paths cause the model to explode in a few months. Since obviously only divine forces could keep real initial values of GSP and real course of A on the determined paths, our model suggests that the structure is highly explosive. Moreover, simulation relies on stable point estimates and disregards both other values within confidence intervals and the possibility of changing structural parameters — all rather restrictive and unrealistic assumptions (Wishwakarma, 1974).

3. We were able to simulate the course of GSP, CPSG and I by linear increases in A only for about 30 months. Simulation over a longer period calls for (repeated) adjustments of the increase in A. Since this breaks linearity, thus possibly introducing cycles, we did not pursue this course. Towards the end of the 30-month period simulation seriously underestimates real GSP values. Any attempts to approach them apparently puts GSP in the acceleration part of the cycle (in the sense of short cycles) and leads to explosion. Very likely, short cycles are not implied in the estimated parameters.

Summarizing, partly at least "autonomous" expenditures are not autonomous. Stabilization policy most likely should not confine itself to direct interventions (investment and government expenditures) but try to control incomes of the economy as well.

III. Price Instability Generation

In discussing inflation western scholars usually point at phenomena like queues in front of stores, poor retail trade assortment, deficient quality of goods, high farm prices and second-hand market prices, and similar factors. These, in my view, are rather marginal phenomena. Much more relevant is the fact that retail prices are stable over long periods and that not infrequently they are decreased. The mechanism of the economy allows the central planner to set prices at any level he wishes. Spillovers of demand to free markets are explained by deficiencies in planning. So are unsold surpluses, frequent in foreign trade sectors. Compared with western economies, EESE may be regarded as essentially inflation-proof.

The only real exception is Yugoslavia. From the last economic reform (1968) on, Hungarian prices also have been slipping from their planned course (the case of Czechoslovakia was similar in 1967 and thereafter — Janda, 1970) but it is far too early to contend that they escaped the control of planners, (Zala, 1973). In 1973 the rate of inflation reached slightly

over 3 percent. Only in Yugoslavia inflation (20 percent in 1973) has grown into an unmanageable process that continuously presses the government into a trade-off between stability and growth thus decreasing growth below its potential.

In what follows I shall concentrate on a specific mechanism of inflation, that is wage inflation. This is justified on two grounds. First, wage inflation has been a major gear in price instability in all modern market economies which are characterized by their inability to use monetary and fiscal policy both ways. Second, being essentially a redistribution process, wage inflation mechanism is a prototype of many modern inflation processes, international crude-oil inflation included.

We shall first hypothesize the wage inflation mechanism (1) and subsequently try to test it by investigating the behavior of the interindustry wage structure.

(1) Yugoslav enterprises are independent in their wage policy. Their incomes set the upper limit to wages paid, and minimum wages set the lower limit. Because of differences in capital per worker, productivity, natural resources (skills and intensity of labor are assumed equal) and state intervention, incomes per worker are different in different enterprises. Political power may be added for services (administration, health, instruction, research etc.). Though high-income enterprises invest more per worker, their wages also are higher. This results in inequality of wages between enterprises.

While workers cannot be fired under selfmanagement, they have the right to quit their jobs any time. Since getting a new job is not always easy, pressures for wage increases are more commonly and effectively exerted by decreasing labor efforts or by using political influence. Anyhow, low-wage enterprises usually find ways and means by which to adjust their wages either without changing prices (lower investment per worker, decreased taxes) or by increasing prices (administratively increased price ceilings, increased prices in imperfect markets).

The wage inflation proceeds therefore as follows. High incomes that flow out of strong market (production) or political (services) monopoly power result in high wages. Low-wage enterprises, trying to catch up, necessarily exert an upward pressure on prices that are much less flexible than prices of high-income enterprises (price ceilings, stronger competition). Thus wage inflation is hypothesized as a process starting with a run ahead (demand pull) and finishing with a catch up (cost push) phase.

Despite this process wages never get equalized. The ranking of production processes according to their relative wages remains fairly stable over long periods of time, no matter how they are grouped (two- or three-digit industries, regionally, according to capital intensity, monopoly power). The explanation seems obvious. Increased wages of low-wage industries (together with deficit financing of other categories of final demand) allow, via increased aggregate demand, incessant price and wage increases of high-income enterprises thus making the run ahead (demand pull) a permanent process.

For this reason testing of the described process is likely a difficult task. Whereas it would be easy to trace it by studying a limited number of carefully selected, some low- and some high-income enterprises, wage increases in low- and high-income enterprises of the whole economy are most likely hopelessly intermingled. Cyclical growth may serve as an uncommissioned help. Changing business conditions have discriminatory effects on high- and low-income enterprises. In periods of slow growth business conditions deteriorate for all enterprises but, because of more perfect competition, they deteriorate more for low-income enterprises. For this reason, and as their price-wage margin is narrow anyhow, their wages grow at lower rates (if at all) than wages of high-income enterprises. Conversely, in periods of fast growth, business conditions improve for all, but relatively more for low-income enterprises. Thus they have an opportunity of catching up with high-income enterprises. This time, wages of low-income enterprises grow at higher rates than wages of high-income enterprises.

Three testable hypotheses are implied in the above dynamized run ahead (demand pull) — catch up (cost push) mechanism:

a) Interenterprise wage differentials are neither constant nor do they develop smoothly over time. Rather, they oscillate;
b) Wage differentials oscillate together with business conditions;
c) The correlation is negative between the two, that is, wages in low-income enterprises grow faster in improved, and slower in impaired, business conditions.

(2) Although every industry comprises enterprises with both low- and high-incomes per worker, some are predominantly high-income and some predominantly low-income industries. With monthly data published for three-digit industries, both in production and services, interenterprise structure will be approached through interindustry structure. Any other criterion of grouping, more promising in principle, would require data on individual enterprises.

Our sample period will be January 1964 to April 1970, the period from the beginning of the published time series to the introduction of state interventions in wage formation that transformed (rather than crippled) the predominantly interindustry mechanism into an interregional one. In that period, 1964 to 1965 and 1968 to 1969 were years of fast, and 1966 to 1967, with the end of 1969, years of slow growth. The longest and most pronounced growth cycle is included. That is most important. It is very likely that with short and mild oscillation of growth the proposed test would not have yielded significant estimates.

In order to test (a), coefficients of variance of average industrial wages were computed for each month of the period according to the formula:

$$KV_w = \frac{\Sigma_1^N (w_i - W)^2}{NW}$$

where KV_w = coefficient of variance of average industrial wages, w_i = monthly average wage in the i-th industry, W = monthly average wage of the whole economy, and N = number of industries (54). Yearly rates of change of five-month moving averages (used to decrease the erratic movement of KV_w) of these KV_w are given in Table IV. Cyclical behavior is beyond doubt. Regressed on a linear time trend the yearly rates of change of KV_w give a D.W. value of 0.12, confirming cyclicality. Yearly rates of change of KV_w are used to minimize the risk of introducing seasonal cycles.

Table IV

Yearly rates of change of KV_w

(five-months moving averages)

Month \ Year	1965	1966	1967	1968	1969	1970
I	-4.7	-2.5	8.1	4.2	-3.9	-0.1
II	-2.7	-3.6	8.6	3.5	-2.7	-1.4
III	-1.2	-3.8	9.7	0.8	-1.6	
IV	-1.3	-6.4	10.9	1.3	1.0	
V	-0.4	-7.1	10.4	0.5	0.9	
VI	3.0	-7.5	10.1	-0.9	1.8	
VII	0.0	-6.5	12.1	-0.3	-0.5	
VIII	-0.7	-3.2	10.2	0.5	0.3	
IX	-0.7	-0.6	8.1	-1.8	-0.7	
X	-2.4	0.4	8.5	-1.8	-1.7	
XI	-3.9	3.8	7.0	-2.3	-1.6	
XII	-2.2	6.7	3.2	-1.8	1.6	

In order to test (b), we will regress yearly coefficients of growth of KV_w on yearly rates of growth of three growth variables (plus a time trend): industrial production and unemployment (output and input proxies for real growth — unemployment is used instead of employment to avoid collinearity with industrial production), and retail prices (proxy for nominal growth). Results confirm (b), that is, interindustry wage differentials are really correlated with growth. The best-fit equation is for lags that are indicated (in months) behind variables:

$$kKV_w = \underset{(30)}{123.4} - \underset{(18.8)}{103.3}\, sQ_{t+3} - \underset{(11.7)}{42.7}\, sP_{t-5} + \underset{(5.4)}{32}\, sU_{t-9} - \underset{(3.1)}{0.9}\, T$$

$$\bar{R}^2 = 0.89, \quad F = 124, \quad D.W. = 0.90$$

where Q = index of industrial production, P = retail price index, U = unemployed workers, t = linear time trend, k = yearly coefficient, and s = yearly rate of growth. The lag +3 of sQ together with the lag -5 of sP probably indicate (with their mean lag of about -1) that kKV_w are dependent on business conditions rather than real growth as such. The difference between their mean and the lag of sU (together with their t-values) shows that reactions of kKV_w to product markets are prompter than to labor markets.

Signs of regression coefficients in the kKV_w equation also corroborate (c). This essentially is Wachter's test, (Wachter, 1970.) A new test, intended to show the time path of the wage inflation mechanism, has been designed as follows. In an exponential function, regression coefficients measure the elasticity of the dependent variable with respect to independent ones. Therefore, if interindustry wage structure in the month t is regressed on the wage structure in the month t-12 (yearly rates are chosen to smooth out increases) according to the formula

$$w_t = a\, w_{t-12}^{b},$$

which is linearized to

$$\ln w_t = \ln a + b \ln w_{t-12}$$

where w is a cross-section series of average wages of all industries, b coefficient should have a value greater than 1 in periods of stretching and a value smaller than 1 in periods of shrinking interindustry wage differentials. That is, during periods of impaired business conditions, b should be higher, and during periods of improved conditions lower than 1.

Two qualifications are needed. First, errors of measurement in the independent variable w_{t-12} bias b coefficient towards 0 (Johnston, 1963, p. 148 ss). Second, variable w_{t-12} that gradually shifts along different phases of the cycle thus intermingling slow and fast growth of low- and high-wage industries, biases b coefficient towards 1 and decreases its oscillations over time. It is difficult to say what might be the joint result of these two biases. A rough solution is to take instead of 1 the average value of b over the whole period as the criterion; as for amplitudes, no such simple rule can be applied.

Result of regressing average industrial wages w_t on w_{t-12} according to the above formula, for all successive months from January 1965 to April 1970, appear in Table V. All symbols are known from before. Constant terms that are not significant at 99 percent level are marked with asterisks.

In my view, the results are remarkably good, even if one forgets that the critical value of b coefficient is around 0.9427. If time series of b is regressed on monthly rates of growth of economic activity (which is a poor substitute for business conditions) and on a time trend (that indicates linear shifts of b value over the whole period) the result is:

$$b = \underset{(12)}{0.82} - \underset{(4.2)}{9.06}\, rQ_{t-3} + \underset{(2.3)}{0.001}\, T$$

$$\bar{R}^2 = 0.23, \quad D.W. = 1.71$$

This is not exactly excellent but still satisfactory in view of the many factors that influence wage increases of individual industries and particularly of the fact that data for industries are obtained by quite arbitrary aggregation of those for individual processes.

Table V

Regressions of ln w_t on ln w_{t-12}

Year and month	ln a(t)	b(t)	R^2	D.W.
1965/I	0.62(3.0)	0.94(27)	0.93	1.37
II	1.0 (3.7)	0.88(18)	0.86	2.12
III	0.91(3.5)	0.90(21)	0.89	1.48
IV	0.43(1.4)x	0.98(19)	0.88	2.09
V	0.72(2.4)x	0.93(19)	0.87	1.38
VI	0.48(1.8)x	0.97(21)	0.90	1.74
VII	0.7 (2.2)x	0.93(18)	0.86	1.24
VIII	0.73(3.6)	0.93(28)	0.93	2.28
IX	1.0 (4.0)	0.89(21)	0.90	1.87
X	1.1 (3.7)	0.87(18)	0.85	1.90
XI	0.9 (3.8)	0.91(23)	0.91	1.69
XII	2.2 (6.6)	0.70(13)	0.76	2.09
1966/I	0.32(1.6)x	1.0 (30)	0.95	1.79
II	0.63(1.7)x	0.96(16)	0.83	1.89
III	1.1 (5.2)	0.87(25)	0.92	1.92
IV	1.6 (3.4)	0.81(11)	0.70	2.08
V	1.7 (5.6)	0.79(16)	0.83	1.79
VI	1.6 (5.5)	0.8 (17)	0.85	1.73
VII	0.68(1.9)x	0.95(17)	0.85	1.34
VIII	0.9 (2.7)	0.9 (17)	0.85	1.62
IX	0.53(1.5)x	0.96(17)	0.85	1.57
X	-0.3 (0.1)x	1.05(15)	0.81	2.15
XI	0.1 (.27)x	1.02(16)	0.83	2.10
XII	0.06(.16)x	1.02(18)	0.86	1.70

Table V (cont.)

Year and month	ln a(t)	b(t)	R^2	D.W.
1967/I	0.22(.75)x	1.00(22)	0.90	2.13
II	0.34(.88)x	0.98(17)	0.84	1.62
III	-0.2 (0.5)x	1.06(18)	0.86	1.93
IV	1.1 (2.6)	0.85(13)	0.77	1.68
V	-0.16(.4)x	1.05(19)	0.97	2.04
VI	-0.4 (1.1)x	1.09(19)	0.88	2.05
VII	-0.33(1.0)x	1.07(21)	0.90	1.92
VIII	-0.31(0.8)x	1.07(19)	0.87	2.27
IX	-0.3 (0.8)x	1.06(19)	0.88	1.46
X	-0.07(0.2)x	1.03(19)	0.88	1.32
XI	0.37(0.1)x	0.96(18)	0.86	2.03
XII	-0.4 (1.6)x	1.07(26)	0.93	1.16
1968/I	0.4 (1.1)x	0.96(19)	0.87	1.71
II	0.95(2.7)	0.87(17)	0.84	1.55
III	0.61(1.6)x	0.92(16)	0.83	1.84
IV	0.07(0.2)x	1.0 (22)	0.90	1.52
V	0.22(0.9)x	0.98(27)	0.93	1.45
VI	0.06(0.2)x	1.0 (26)	0.93	1.78
VII	1.3 (5.0)	0.82(22)	0.90	1.98
VIII	0.55(2.5)x	0.93(28)	0.94	1.51
IX	0.59(2.2)x	0.92(23)	0.91	1.99
X	0.94(4.3)	0.88(27)	0.94	1.86
XI	1.1 (3.5)	0.85(19)	0.87	2.30
XII	1.4 (5.)	0.82(21)	0.89	2.09
1969/I	0.75(2.6)	0.90(21)	0.89	1.64
II	-0.17(0.5)x	1.04(23)	0.91	2.15
III	1.1 (2.7)	0.86(15)	0.82	1.70
IV	0.41(1.6)x	0.96(25)	0.93	1.74
V	0.72(28.)	0.91(24)	0.92	2.31
VI	0.96(3.2)	0.88(20)	0.88	1.71
VII	0.05(.17)x	1.02(22)	0.91	1.58
VIII	0.64(.22)x	0.92(22)	0.90	1.47
IX	0.6 (3.0)	0.94(33)	0.95	2.21
X	0.37(1.2)x	0.97(22)	0.91	1.70
XI	0.77(1.5)x	0.91(12)	0.75	2.28
XII	0.09(0.5)x	1.01(39)	0.97	2.05
1970/I	0.76(2.6)	0.91(22)	0.90	2.22
II	0.96(3.8)	0.88(24)	0.92	1.74
III	-0.11(0.4)x	1.04(30)	0.94	2.25
IV	0.67(2.1)x	0.93	0.89	2.00

IV. Stabilization Policy Implications

The most reliable information we have on instability in ESE is the one on investment cycles. There may be differing views on how they are generated. The fact, however, that investment cycles considerably decreased their amplitudes from the first to the second postwar decade and that planning was apparently the only stabilization policy pursued (Yugoslavia excluded), warrants the conclusion that, even if they had not been generated by plans, as my interpretation suggests, central planning of the ESE type is capable of achieving stable growth. Moreover, in the degree to which investment cycles were responsible for agricultural cycles, planning is likely to mitigate these as well. In other words, there seems to be no need for a specific stabilization policy in regard to investment cycles. As they are supply-generated, the supply-type central planning seems to be an adequate stabilization policy.

In Yugoslavia business cycles are most likely demand-generated. The fact that we could not detect them in any of the three examined ESE does not guarantee that they do not exist either in these three or in any other ESE. However, if business cycles exist in the three investigated ESE, they are likely very mild, that is, of small and irregular amplititudes. Moreover, changes in the general price level are small, infrequent and irregular in their direction. Since no stabilization policy beyond central planning is in use, we may conjecture that central planning is capable of insulating the course of the economy from the disturbing effects of "autonomous" forces. For, while a stable growth of government and investment expenditures, both in the long and in the short run, is imaginable, it is difficult to believe that no unplanned impulses were transmitted to production from population.

Quite different is the Yugoslav case. The independence of Yugoslav enterprises together with an inefficient central plan and a multitude of independent, largely uncoordinated budgets has made her economy operate similarly to classical market economies. Moreover, international instabilities, particularly those working through raw material prices, are transmitted most directly. Any measure leading to greater international stability would contribute to internal stability. However, as instability is predominantly her domestic product, two internal-policy recommendations are appropriate:

First, an incomes (wage) policy that would link wages to labor markets and free them from the impact of product markets, and make labor markets perfect, could possibly contribute to a decrease in the rate of inflation. While I do not make any proposal of this sort for capitalist economies (any incomes policy confined to wages would worsen the economic conditions of workers; if extended to profits, it would perpetuate the existing social system) it is strongly recommendable for a country like Yugoslavia. With socialist ownership of the means of production, linking of wages to labor markets simply amounts to "equal pay for equal work."

In a socialist economy this should be an economic-policy objective even if departures from it did not result in generating inflation.

Second, an adequate incomes policy may also contribute to securing stable growth. While our short-cycle analysis calls for an active budgetary policy, both on its revenue and expenditures side, it suggests that business investment has been overemphasized and expenditures of the population underestimated as sources of instability of growth.

Let me conclude by observing that the above was a discussion of stability and not efficiency problems.

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Discussion

Richard Portes*

Despite his modest disclaimer in the face of a difficult title, Professor Bajt has in fact given us three papers. The first considers patterns of instability in "East European Socialist Economies,"[1] with particular attention to medium-term investment cycles, and some evidence against the existence of short cycles in the CPEs. The second deals with Yugoslav short cycles, a forecasting equation, and a small structural model. The third tests a theory of Yugoslav wage structure.

The total product is substantial and contains much interesting material which deserves detailed comments. Given the subject of the Conference, however, the proportions of my consumption differ somewhat from those of Professor Bajt's production. Moreover, if only because of the supposed importance of the "great grain raid" by the U.S.S.R. as a prime mover in recent U.S. and world instability, I think it worth speculating (in a stabilizing way, I hope) on potential linkages between the socialist economies and the rest of the world.

Bajt dismisses the possibility that such linkages might propagate instability, because he believes investment cycles are disappearing from socialist economies and short cycles have never existed in the CPEs. He may in practice be correct here, even for the medium-term future. I should nevertheless have preferred a more explicit discussion of the international economic relations of the socialist countries, especially the role of the foreign sector in generating and transmitting instability among socialist countries themselves and between them and the rest of the world.

Bajt's basic premise (perhaps tautologous) is that if we find instabilities in an economy directed by central planning, we should expect them to arise out of imperfections in the planning system. He goes on to argue that investment (and to some extent agricultural) cycles *have* been

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*I have had helpful discussions with my colleagues Hugh Davies and John Muellbauer on some of the points discussed below.

[1]We shall distinguish in his sample between the centrally planned economies (CPEs) and Yugoslavia. In many respects, post 1967- Hungary lies in between.

generated by specific characteristics of planning and the planners; that the planners' performance clearly improved from the 1950s to the 1960s; and that this just demonstrates that these cycles have been supply-determined phenomena, which properly run supply planning will eliminate. Short cycles and inflation, on the other hand, he simply finds non-existent in the CPEs. He therefore concludes that central planning insulates the economy from autonomous shocks (and prevents it from transmitting them?), so that internationally coordinated stabilization policies between CPEs and the rest of the world — and within CMEA — are unnecessary.

To discuss investment cycles, Bajt extends the data from Bajt (1971a) to cover 1950-1970 and considers the two decades separately. He defines instability in effect as deviations from trend growth. The Conference did not standardize definitions. Bajt's here is purely descriptive of the data. He then goes to a *cyclical* concept, and later, discussing his model of Yugoslavia, he also considers the sensitivity of the economy to shocks. In any event, instability as first defined diminished significantly for all aggregates studied in the second decade.[2] In the 1950s agriculture was the least stable variable, while in the 1960s this was investment (except in the USSR and Poland). Construction, gross social product, and industrial output follow in increasing degree of stability. Thus investment is now "the main factor of instability." But even to put the point this way implies a model in which investment is exogenous. Although he argues this case later, maintaining that investment was determined "by the planners," the data alone — without testing any structure — cannot tell us this.

Bajt then considers a cyclical interpretation of the observed instability. He first denies that the cyclical behavior apparently shown by the data in Bajt (1971a) is spurious, deriving only from the serial correlation introduced by the use of moving averages. In fact, he finds substantial first-order autocorrelation in each of his 20-year series, unaveraged.

He therefore postulates a mechanism of the cycle in CPEs, incorporating elements of Goldmann's (1964) explanation of the upswing and Olivera's (1960) explanation of the downswing. This extends the views in Bajt (1971a, 1971b) by making agriculture at least partly endogenous. The distinctive feature is the stress on the effect of "excessive" growth of investment in drawing resources away from consumption, and the consequent (lagged) response of the population, generating political pressure on the planners to cut back investment. By contrast, Goldmann would emphasize here the balance of trade and raw material supply constraints, while Olivera gives less weight than Bajt to the negative effects of investment on food supplies. I find that Bajt's process has much in common

[2]His statistical measure, however, is the *standard deviation* of annual rates of growth rather than their coefficient of variation. As Seton and I maintained in Bronfenbrenner (1969), the latter is preferable here. It would slightly soften the contrast between the 1950s and 1960s, because average growth rates fell somewhat (these should at least be included in the Table).

with Hicks's (1967) reinterpretation of the Hayekian cycle in contemporary terms. The shift of resources into investment must reduce the supply of consumption goods, and if a *further* increase in the savings ratio is not forthcoming, there will be a "crisis," and real wages must fall. Of course, the Hayek story requires that the rise in investment, its bias towards the producer goods sector, and its gestation period should together be sufficiently great that the supply of consumption goods will not recover and expand quickly enough to avert the crisis.

Bajt seeks empirical support for his hypothesis in correlations between rates of growth of fixed investment and those of construction, industrial production and agricultural output (denoted here by INV, CONSTR, etc.). No model is proposed. Instead, in his "partial lag correlations," he first regresses (say) $CONSTR_t$ on INV_t and gets a series of residuals, $[e^C_t]$. He then regresses $INV_{t+\tau}$ on INV_t, separately for $\tau = -3, \ldots, +3$, and gets a set of series of residuals, $[e^I_{t+\tau}]$, $\tau = -3, \ldots, +3$, Finally, he regresses $[e^C_t]$ on $[e^I_{t+\tau}]$ for each value of τ and looks at the best fit. Table III gives values of τ and r for the best-fit lags. Generalizing across countries, he finds that investment leads construction and industrial production positively ($\tau < 0$, $r > 0$), investment leads agriculture negatively ($\tau < 0$, $r < 0$), and agriculture leads investment positively ($\tau > 0$, $r > 0$).

Bajt makes the following main points in interpreting these results: (i) "investment is mainly exogenous, determined by plans," and there is a "capacity effect" of investment on construction and industrial production which is "much stronger than the accelerator effect"; (ii) "agriculture may not be as exogenous as generally believed," although "it is not possible to trace the chain of causation from investment to agriculture"; (iii) accelerations in agriculture allow subsequent accelerations in investment.

I can see no justification for inferring causality from this work. One cannot expect Bajt to produce fully specified structural models of these economies — but in the absence of *any* specification of structure and appropriate tests, I remain unconvinced. Nor can I take it as evidence for the pervasive and cumulative qualities connoted by "cyclical" behavior. We are given no data on employment, foreign trade, inventories, consumption, real wages, etc; and there are no reasons to suppose that any multiplier or accelerator mechanisms operate in these economies.

Moreover, even taken at face value, his results offer little support for his view of cycles in CPEs. The "capacity effect" of investment is hardly surprising, but it is irrelevant to Bajt's hypothesis about the relation between investment and consumption. Indeed, I should think he would have to show precisely that the capacity effect is too little and too late to relieve that pressure on consumption which forces the cutback in investment. Here the negative effect of investment on agriculture is more interesting, but how is it supposed to operate? I am skeptical of the effect of investment in drawing labor out of agriculture; Hamermesh and Portes (1972) show that in the Hungarian case, the outflow of labor from agriculture is best explained by the vicissitudes of collectivization policy. In

any event, should he not seek evidence of this effect on real wages and total consumption?

Similarly, the point about agricultural surpluses financing investment booms is plausible enough, but if Bajt believes this operates through foreign trade, surely he should be looking at the links between the trade balance in agricultural products and imports of machinery. I have discussed the relation between Hungarian investment fluctuations and the balance of trade in Portes (1971); in a highly open economy holding small reserves, one expects that after a good year in trade, the planners will push up investment in the following year. And they do. In this respect, investment certainly is not exogenous. Nor is his main argument for the "exogeneity" of investment very strong. Until 1966-70, the coincidence of Five Year Plan periods across countries was very rough indeed (Kaser, 1967, p. 66), and FYPs were frequently abandoned in mid-course. Thus to attribute the synchronization of investment cycles across countries to the synchronication of plans, and then to infer that the planners "autonomously" determine investment, seems unwarranted. Again, why not look for synchronization in intra-CMEA trade?

I therefore should have liked to see the results of Bajt's attempts "to see whether investment cycles have been transmitted internationally (within ESE)." This work is particularly germane to the Conference theme, and even inconclusive results might be very informative.

Investigating short cycles, Bajt is constrained by lack of quarterly or monthly data on anything but industrial production, which is available only for three CPEs and Yugoslavia. These monthly data for the CPEs show much greater variance than the yearly data, but I fully agree with his conclusion that these fluctuations have "a predominantly seasonal character." I should think this is simply the effect of the quarterly "plan cycle" ("storming"). Both spectral analysis and looking at serial correlation in residuals suggest that there are short cycles in Yugoslavia, but not in the CPEs.

Bajt therefore concludes that "central planning seems to be able to successfully cope with problems of stable growth . . . it weakened investment cycles from 1950-60 to 1960-70 and prevented short cycles . . . Non-agricultural oscillations are likely to become very mild." I accept this view, but I think Bajt has neglected some of the most important and interesting questions. In what ways has planning improved over the period? Is it just that the planners are more "realistic" and better judges of how tightly they can limit consumption, or are planning techniques and plan implementation better? What are the functional and behavioral mechanisms, the policy instruments, the institutions which have moderated investment cycles and eliminated short cycles and inflation in the CPEs? Are they all inseparable from physical allocation ("supply planning"), or might some offer lessons to mixed economies?[3] Central planning cannot

[3]Kotowitz and Portes (1974) discuss one such device, the "tax on wage increases," which is related to a plan-implementation technique originally introduced in Hungary in 1957.

in practice control *all* economic variables — there are unplanned phenomena generated by the system itself, by unregulated relationships between variables, and by exogenous shocks (foreign trade, shifts in behavioral functions). How do the planners deal with them, and what kinds of stabilizers can they rely on? How do the planners themselves *react* to changes in economic variables, i.e., can we estimate "planners' behavioral equations"?[4] Other problems, more closely related to the subject of this Conference, are perhaps less amenable to quantitative or theoretical analysis, but some observations on them might have been in order all the same. I shall return to them below.

In the remainder of his paper, Bajt deals only with Yugoslavia. I shall be briefer here, in part because I am less confident than he of the relevance of the Yugoslav case to predicting what might happen if other socialist economies decentralize. Yugoslavia is still less developed than most CPEs, and none will adopt its workers' control nor suffer such sharp regional conflicts.

The main purposes of the section on Yugoslav short cycles is to support the conjecture in Bajt (1971b) that "it is the consumer sector which seems to be responsible for the short cycles in Yugoslavia (p. 68)." There is as yet no structural model for the Yugoslav economy, so he discusses his forecasting equation, which he believes reveals the important role of "autonomous" consumption expenditures in propelling the cycles.

The construction of the forecasting equation is straightforward. To get proxies for the impulses transmitted by "autonomous expenditures," he takes residuals (which are highly autocorrelated) from estimated consumption, investment, and government expenditure functions. That is, using monthly data, he estimates $C_t(Y_t)$, $I_t(C_{t-1} - C_{t-13})$, and $G_t(Y_t)$, where Y is disposable income and government spending is taken as a function of revenues, proxied by Y. Note that there are no lags (with monthly data) in C(.) and G(.), and only a one-month lag in the accelerator. He then uses the three series of residuals and a trend to explain economic activity as measured by the index of industrial production. On the residuals, he searches for the best-fit single lags ($\tau = -9$ on the consumption residual variable, -7 on investment, and -5 on government expenditure). The consumption residual is the "decisive" variable (by what criterion?).

As I understand this technique, its main advantage over a more conventional approach is to cut down the work of finding an acceptable lag structure. The corresponding approach would be to estimate C, I, and G as functions of their own lagged values and lagged values of Y, putting a lot of effort into getting the right lag structure in each equation. One would then forecast Y with $\hat{C}$, $\hat{I}$, $\hat{G}$ (estimated from the structural equations, adjusting constants with moving averages of recent residuals). Now the explanatory variables (the consumption, investment, and government residual series) in Bajt's equation are of course also functions of lagged

[4]For a planner's labor demand function (wage-setting equation), see Hamermesh and Portes (1972).

values of C, I, G and Y, and by assuming simple lag structures in the original equations yielding the residual variables he reduces the work of finding acceptable lags to looking at three Almon lag distributions.

Bajt says that "for stabilization purposes, the 'autonomy' of . . . consumer expenditures . . . is of greater interest." Perhaps, but I suspect he is more concerned to back up his interpretation of the Yugoslav short cycles. In either case, I cannot see how his three-equation accelerator-multiplier model and its behavior under simulation have any bearing whatsoever on this structural question. This model, he finds, "suggests the structure [of the economy] is highly explosive." One would of course expect the *model* to be explosive with Durbin-Watson statistics implying first-order autoregressive parameters almost equal to unity, but surely this tells us nothing about the Yugoslav economy.

Quite rightly, Bajt dismisses the conventional view that there is significant inflation in the CPEs, which in view of their negligible open inflation he therefore calls "essentially inflation proof." Current work of my own in this area finds no sign of the two main effects which theory (e.g., Barro and Grossman, 1974) predicts from repressed inflation: forced saving, and reduction in labor supply.

The Yugoslav case is of course quite different. Bajt postulates a mechanism of wage inflation in Yugoslavia which adds to models such as Wachter's (1970) the particular forces generated by worker's control and socialist job security. The basic hypothesis is that the spread of inter*enterprise* wage differentials will be negatively correlated with the state of business conditions. In any case, he has three separate tests (using monthly wage data on 54 *industries* over 1964-1970), all of which confirm the proposition.

I have myself recently used an equation similar to Bajt's (and Wachter's) to explain intertemporal movements in the coefficient of variation of the inter-industry wage structure in several countries, and my results are consistent with his. I am somewhat dubious, however, about concluding from the lag structure of his equation that "reactions of the KV to product markets are prompter than to labor markets," and basing on this his recommendation about incomes policy in Yugoslavia.

Turning finally to some broader issues, while I agree with Bajt that the CPEs are unlikely to become significantly less stable than in the recent past, I think we must bear in mind some arguments to the contrary. The first, mentioned by Bajt (but not with the same emphasis here as in Bajt 1971a, 1971b), is that decentralization and greater scope for market relations and demand influences in the CPEs would introduce more instability. But I myself do not believe that "economic reforms" in Eastern Europe will go very far in this direction. Nor will the rise in standards of living and consequent increasing importance of discretionary consumer expenditure have a significant destabilizing effect (as was suggested by Seton in Bronfenbrenner, 1969). The planners are capable of adjusting the structure of consumer supplies tolerably well and maintaining aggregate

equilibrium. This is shown by the absence of repressed inflation and of any evidence that private savings are "excessive" or especially volatile.

On the external side, I would judge convertibility within CMEA to be about as likely as "economic and monetary union" in the EEC — not very, and certainly not soon. A fortiori, no CPE currency will become convertible in the West. Any form of convertibility is fundamentally inconsistent with physical planning and fixed domestic prices. This will of course set limits to the expansion of East-West commodity trade (though not necessarily to the increasingly popular "cooperation agreements"). CPE trade dependence will continue to rise gradually, and the share of trade with the West will increase somewhat, but we should not expect anything dramatic, if only because of the limited capacity of the CPEs to supply exports acceptable in the West.[5]

The socialist countries are therefore unlikely to become a significant destabilizing influence on the rest of the world. But Soviet purchases of grain do highlight the continuing instability and generally poor performance of agriculture in the USSR. Presumably the United States has learned enough not to be "schnookered" (Nixon, 1973) again, but two general points emerge. First, the socialist countries will play a more important role on world markets for primary commodities than for industrial goods. As buyers, they will no doubt show as much hostility towards incipient LDC cartels as the advanced capitalist countries, but we may expect their influence on world prices to grow. The major potential seller is of course the USSR, but I would regard the immense development projects which would be necessary as a very uncertain and long-run prospect. Second, although we can disregard most of the conventional transmission mechanisms between CPEs and the rest of the world, we should not forget Soviet gold, which does enable the USSR to transmit short but sharp impulses to the world economy.

[5]Even the Chinese, whose trade with the United States this year is projected to rise from $500 mill. in 1973 to $1.25 bill. (and thus to exceed Soviet-American trade), cannot keep it up unless American generosity becomes unbounded (the projected 1974 volumes breaks down to $1.15 bill. Chinese imports, $100 mill. exports). But it does seem unlikely that we shall again witness another eastwards rush of New York bankers, competing to offer the most favorable terms for large long-term loans. Socialist countries may of course borrow more on the Eurodollar market, as the Hungarians have done.

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Reply to Professor Portes' Discussion

A. J. Bajt

My basic reaction to Professor Portes is that of a general agreement with his discussion.

In the first place, I also should like to study ESE international relations, including the transmission of instabilities. Yet, unless one goes in for transmission mechanisms as such, in which case transmission of an occasional shock à la great grain deal is as good as any other, then structural instabilities, regularly reproduced by economic mechanisms of the individual countries, are the first step. After having attended this conference for two days I can add a new reason to those given in the paper. With transmission models that have been developed in the West and which also comprise socialist countries, a direct concentration on transmission problems would be an unnecessary duplication of efforts, amounting almost to suicide in view of their powerfulness.

I also agree with Portes that "speculating on potential linkages between the socialist economies and the rest of the world," judging the likelihood of convertibility and predicting the future course of economic reforms in CPE (to take a few examples) is an appealing approach. But I find this kind of work either obsolete (models not only specify but estimate linkages) or too difficult (econometric forecasters have problems with quarters) and beyond the scope of our profession (how can an economist tell that workers' control will not be adopted in any of CPE?), and in any case placing too much relevance on assumptions rather than facts. Many predictions are just guesses, no matter how right they may prove. For instance, CPE and Yugoslavia did not "show as much hostility towards" the recent Arab oil supply and price handling "as the advanced capitalist countries." Although they had to adapt their economies to a painful change, there was no hostility in their reactions. Moreover, they welcomed the new policy on *a priori* grounds, and they would have had to welcome it even if there were no capitalist economies.

I am by no means surprised if Portes remains unconvinced by my interpretation of investment cycles. In the sense of being 100 percent sure, I am not convinced either. If for nothing else, they must differ from cycle to cycle, and from country to country. The postulated interpretation is

just the one that best and most generally fits into facts — economic, social, political etc. — established statistically and in many other ways. But I am surprised when he accepts my eight-year cycles without any comment, in fact without mentioning them, including Howrey's and Klotz' method of measurement. For planners' one-year lagged reactions to foreign-exchange-reserve fluctuations, which in turn depend on agricultural production and exports, advanced by Portes, should have produced year-to-year investment cycles (see upcross periods in Table II of my paper), which obviously fall outside the range of cyclical fluctuations.

I also share Portes' preference for "fully specified structural models," although he seems to be quite a bit too optimistic about them. First, I do not believe that structural models, and econometric models in general, are the only road to truth: economics existed centuries before such models were invented. There is considerable ESE literature on investment cycles and their interpretation but without econometrics. Even Lange, 1964, does not use econometrics when he discusses them. Second, I would be very reluctant to build any structural investment-cycle model with yearly data. Excercises on international links of investment cycles convinced me that diametrically opposed theories could be "appropriately tested" with equally good results. Highly aggregated data, both across sectors and in time, allow wonderful things. In the best case they yield "great economic ratios" and rather inconclusively describe the actual working of the economy. To approach the right specification including lag structure, V. Bole has proposed the "partial lag-correlation" and used it to study investment cycles. I fully agree that lag-correlation does not stand for cause-effect relationships. But cause-effect relationships do go on in time and sometimes can be traced by appropriate techniques. One may be partial lag-correlation, particularly with yearly data. However, simple lag-correlograms, that is distributed lag structures, can be misleading because real interaction of economic agents takes place in shorter time periods than years.

Finally, in principle I have nothing against introducing real wages and total consumption. But I find the approximation of consumption by agricultural production quite satisfactory. For improvement I would prefer including food exports and imports rather than indices of real wages. Those data may not be reliable and require settlement of several utility and price questions.

There are a few minor technical points on which I would like to add comments.

(l) I wonder about Portes' insistence on endogenous investment. By what mechanism do investment rates endogenously approach the 40 percent (of GSP) mark?

(2) When he said that I should have "to show precisely that the capacity effect is too little," Portes appears to mistake correlation coefficients for regression coefficients. The established correlation coefficients may stand for any value of capacity or accelerator effects. More

important, the "too little capacity effect" is shown by the negative correlation between investment and lagged agriculture. Steel is irrelevant anyhow.

(3) I cannot accept Portes' belief that CPE fluctuations (monthly data) are predominantly seasonal, because data are seasonally adjusted. Quarterly plan "storming," suggested as an explanation, is clearly a seasonal phenomenon and should not have shown up in adjusted data. If quarterly plan storming were the reason for the persistence of seasonal oscillations, one would have to show that they are seasonally irregular and account for the reason. I would retain this possibility as an emergency exit. Since 1960 there has been no plan storming, quarterly or otherwise, in Yugoslavia but an irregular season exists just as in other ESE. It seems more likely that seasonal adjustment of data includes some hidden Slutskian processes which come to the fore when data are transformed into monthly rates of growth. Harmonics of trading day cyclicallity is another possibility.

(4) The coincidence of medium-term plans was certainly not perfect. But the first medium-term plans, most relevant for initiating the process, were launched in the same year (1947) in five countries (Yugoslavia, Czechoslovakia, Hungary, Poland, and GDR), with no country deviating for more than one year.

(5) Portes' argument that the Yugoslav case is irrelevant for what might happen if other ESE decentralize ("Yugoslavia is still less developed than most CPEs, and none will adopt its workers' control nor suffer sharp regional conflicts") is a *non sequitur,* since decentralization with its economic consequences is neither confined to LDC nor necessarily assumes the form of workers' management nor is dependent on regional conflicts. Later on Portes himself argues that decentralization increases demand-generated instability. Post-1967 Hungary, if lying between CPE and Yugoslavia, must have been moving yugowards, despite being better developed and suffering no regional conflicts. How far such processes will go is obviously not an economic question.

(6) Portes' belief that "the main advantage /of the forecasting equation/ ... is to cut down the work of finding an acceptable lag structure" is not warranted. First, it is rather easy to estimate any lag structure with available computer techniques. It can be inferred from our paper that we did estimate Almon lags. Although I like them, I somehow dislike the recent Almon-lag fashion. The simple and partial lag-correlograms give a very exact picture of unconstrained lag structures. The specified lags come from this technique. Portes' proposal of estimating Y as a sum of estimated C, I and G, is equivalent to my three-equation model which he finds of no interest. The proposal "to estimate C, I and G as functions of their own lagged values and lagged values of Y" implies a very restrictive (Koyck's) lag structure, highly unrealistic in the case of our inverted-V-shaped lag structure. The real advantage of our model is that it identifies impulses which lead economic activity for quite a number of months thus

allowing efficient forecasting, particularly of the turning points. Portes' proposal limits the forecasting horizon to one month, at least at a first glance. However, by generating a systematic delay in forecast timing, which is up to three months in the case of Yugoslavia, he is able only to forecast the past. Adjustments of constant terms could help, but not if handled the way Portes proposes and it would be rather queer to rely in real forecasting on adjustment of constant terms anyhow.

(7) Portes "suspects that in the three-equation structural model" I am "more concerned to back" my "interpretation of the Yugoslav short cycles." But its main result is precisely to oppose my "autonomous expenditures" interpretation since oscillations are partly explained endogenously. To grasp the meaning of this and similar results one should look at Hickman, 1972.

(8) As for explosiveness of the model, it entirely depends on the estimated parameters (Samuelson, 1939) and on exogenous data. The Durbin-Watson statistic has no bearing on simulation whatever. Since high positive serial correlation is necessarily present in models with seasonally adjusted monthly data, one is tempted to ask whether building annual models (with no autocorrelation) is the way to increase economic stability.

In our case simulation was performed, in order to avoid transmission of cycles from outside, on an extremely restrictive assumption of linearly increasing government expenditures as the only exogenous variable. The really surprising fact is that explosion occurs only after 30 months.

(9) Portes implies that models and their structures (values of parameters) do not tell anything about the respective economies. It is true that nobody has ever seen an economy explode. But have explosive models really nothing to tell about the stability of an economy? What, then, are they built for?

Let me finally agree with Portes that some of the "most important questions ... bearing on investment cycles" which I neglected to discuss are really highly attractive. Would he agree that they represent a very small sample of the whole population of interesting questions about investment cycles? (All references apply to the bibliography given at the end of my paper.)

Stabilization Policy In Japan And Its Relations to Economic Instability in the World

Masahiro Tatemoto

When small Alice in Wonderland began to grow larger again, the Dormouse who was sitting next to her said, "I wish you wouldn't squeeze so." Alice said, "I can't help it. *I am growing.*" "You've no right to grow here," said the Dormouse. "Don't talk nonsense," said Alice, "You know you're growing too." "Yes, but *I grow at a reasonable pace,*" said the Dormouse, "*not in that ridiculous fashion.*"

The topic I was given in this session reminded me of the above story because it seemed to me that the title itself implied (1) that Japan had a stabilization policy with instruments aimed at realizing the economy's potential rate of growth under the constraint of price stability and the balance-of-payment equilibrium; (2) that the Japanese high rate of growth in real GNP (See Figure 1) was the result of this stabilization policy; (3) and that this "ridiculous fashion" of Japanese economic growth in comparison with other countries "reasonable pace" was one of the causes of world economic instability ("squeeze").

The purpose of this paper is to examine whether these three propositions are true. In section 1, we will discuss whether there was a stabilization policy in the economy. Section 2 discusses some causes of rapid growth with special attention to the relationship between domestic investment in plant and equipment and export performance. Section 3 will examine how this export performance and import-saving technology, together with the timid "do-nothing" attitude of our government, led to a large surplus in the balance of payments in 1971, which was a destabilizing element in the international monetary system.

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1. A Stabilization Policy?

The Japanese economy since 1961, the first year of the "Income Doubling Plan," has witnessed a rapid growth in real GNP with full employment, although the rate of growth has fluctuated within a range of 5-15 percent, as shown in Figure 2. Figure 2 also shows the increase in the consumer price index (average annual rate of increase of 6 percent) and a sharp increase in international reserves after 1967.

For those who pay attention only to the average annual rate of growth, setting aside the inflation and external balance problems, the Japanese performance may be called a "success story." On the other hand, for those who are concerned with inflation and external balance, it is not. Moreover, as already mentioned, year-to-year change in the rate of growth could never be called stable. Table 1 represents the gap between potential and realized GNP.

Table 1
Potential and Realized GNP (Billion Yen)

Fiscal Year	Potential (V*)	Realized (V)	Gap (V*—V)	Gap ratio
1961	23,321	23,275	46	0.2
1962	26,002	24,610	1,392	5.4
1963	28,895	27,764	1,131	3.9
1964	31,946	30,771	1,175	3.7
1965	35,003	32,484	2,518	7.2
1966	38,495	36,239	2,256	5.9
1967	42,717	41,120	1,597	3.7
1968	47,825	46,750	1,075	2.2
1969	53,550	52,498	1,053	2.0
1970	60,365	57,493	2,872	4.8

Source: Economic Deliberation Council, 1973, *The 4th Report of the Committee on Econometric Methods.*

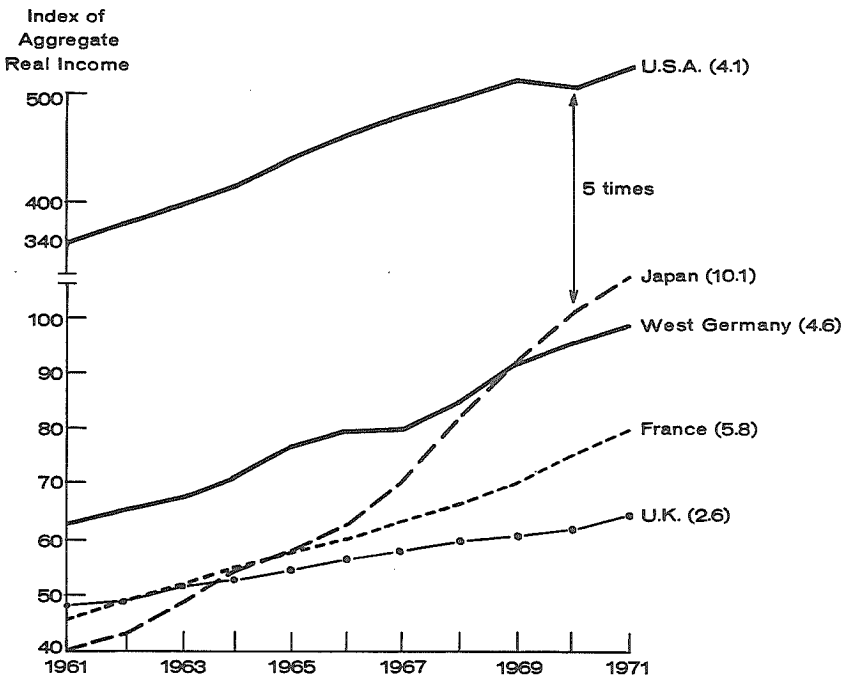
The potential GNP(V*) in the table was computed by using a production function,

$$\ln V^* = -3.9916 + 0.5495 \ln (K_p + K_{g1}) + 0.56721 \ln (h^* Q_L N_L) + 0.1737 \ln K_{g2} + 0.01t + 0.0017Z$$

Figure 1

GROWTH RATE IN REAL GNP

(1970 Japan = 100)



Note: Figures in parentheses indicate average per annum rates of growth.

Source: The Bank of Japan, Japan and the World: A Comparison by Economic and Financial Statistics, 1972

Figure 2.1

GROWTH RATE

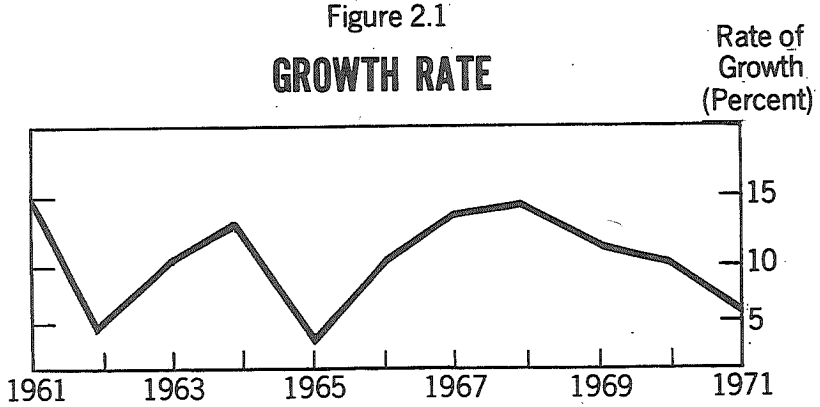


Figure 2.2

EXCHANGE RESERVE

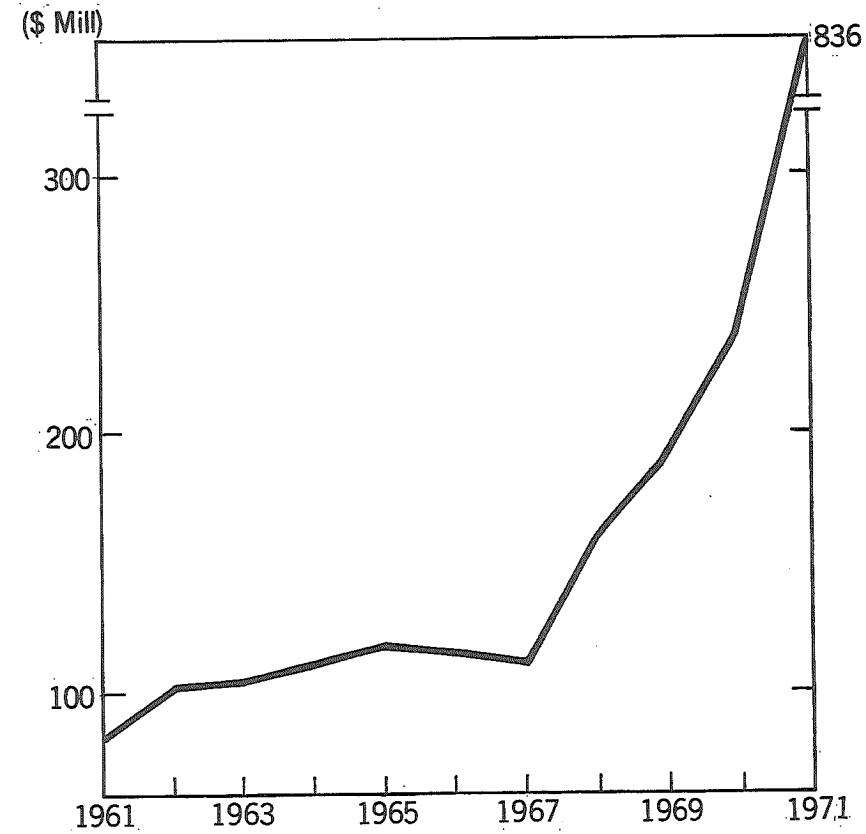


Figure 2.3

PRICES

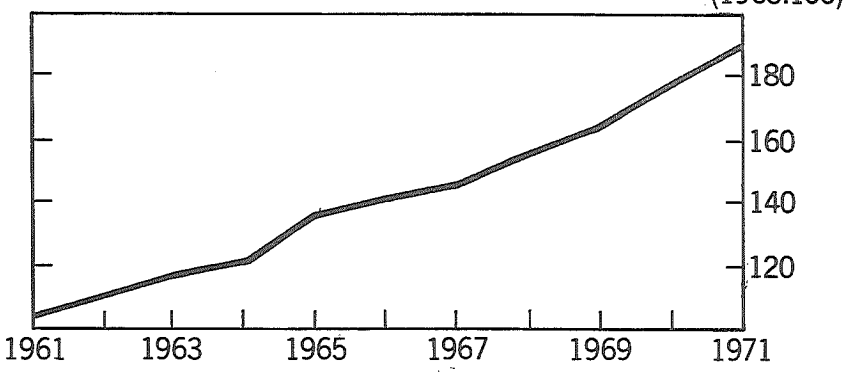
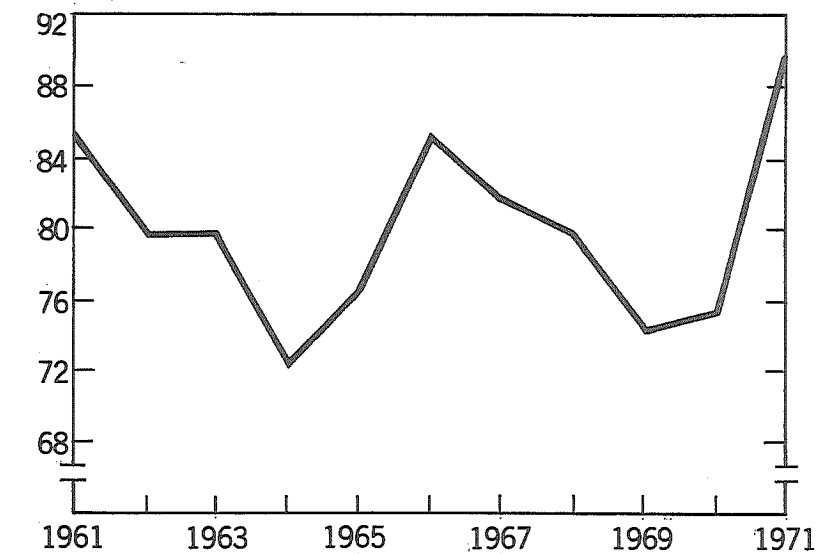


Figure 2.4

UNEMPLOYMENT



K_p = private capital stock, K_{g1} = capital stock in National Railway and Telegram and Telephone Corporation, K_{g2} = capital stock in other government enterprises, h* = standard working hour x 1.12, Q_L = quality of labor index, N_L = labor force, t = time, Z = biannual dummy.

According to Table 1, there was always underutilization of supply potentials in the Japanese economy in the period of 1961-70. In Figure 3, realized annual rates of growth in real GNP are shown in contrast with planned rates of growth and the annual GNP gap ratio,

$$\frac{(V^* - V)}{V^*} \times 100.$$

Planned rates of growth were taken from three economic plans revised successively in the period, and they are to be interpreted as the *ex ante* targets which government economic policy authorities pursued for stabilization purposes. It is of some interest to note that the target rates of growth were much lower than actual ones except for two "recession" years, 1962 and 1965. This means that the economy performed much better than the authorities expected. The same kind of underestimation of the economy's potential can be observed in our government's short-term outlook that is published at the beginning of each fiscal year to be used as a basis of "economic management." Should this be called a "success story" for stabilization policy?

The persistent underestimation in the plans and annual outlook has an important implication in considering the role of budgetary surplus for promoting economic growth. "Balanced budgets" were prepared on the basis of underestimated revenues corresponding to biased projections, which whether intentional or not, produced persistent current surpluses *ex post*, even after the Ministry of Finance had used a sizable portion to reduce income taxes in the next fiscal years. [Watanabe (1970)].

Table 2 represents the percentage distribution of gross saving and capital formation since 1961 fiscal year. Note that the shares of both government saving (government current surplus roughly corresponds to tax revenues *minus* current purchase of goods and services in our case) and its investment is notably large. By using the notations in Table 2 and neglecting the statistical discrepancy, we can write:

$$\underset{\text{(saving)}}{D + Sp + Sc + Sg} = \underset{\text{(investment)}}{Ip + Ig + J + If},$$

and Table 2 shows that on both side of the equation, the contribution of government is substantial.

In addition to the above fiscal system to produce a sizable "surplus budget," an "easy money" policy has been continuously adopted to encourage private fixed investment, predominantly investment in plant and equipment embodying new technology. This is referred by Tachi (1966) as the Japanese version of "easy money with a surplus budget" policy for

Figure 3

PLANNED AND REALIZED GROWTH

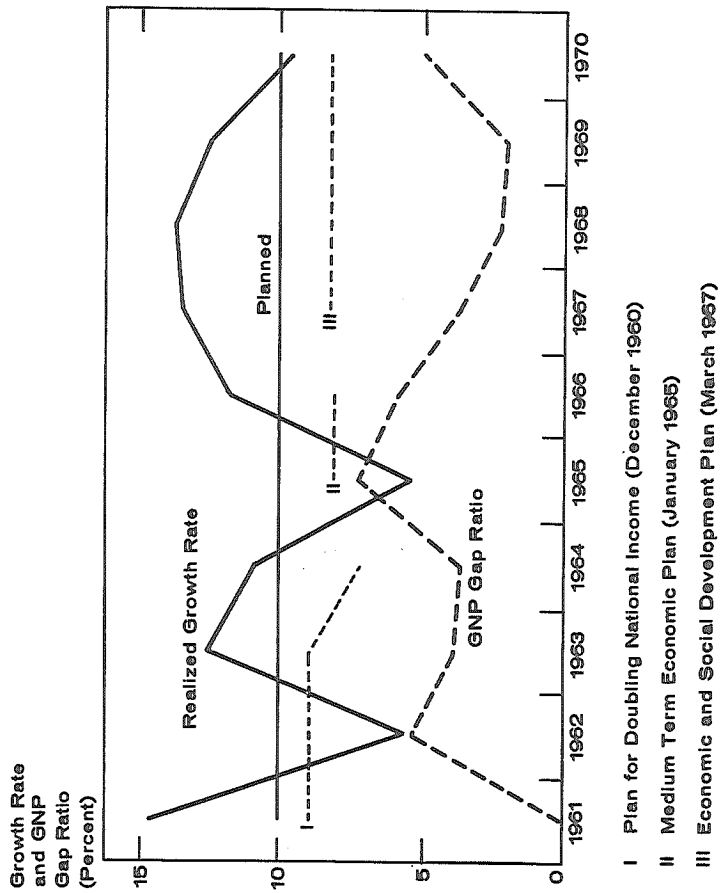


Table 2
Gross Saving and Investment
(percentage distribution)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Provisions for the consumption of fixed capital (D)	28	33	33	35	37	35	34	33	33	34	36
Personal saving (Sp)	31	35	33	32	34	33	34	33	31	33	34
Corporate saving (Sc)	15	12	12	10	9	13	14	17	16	16	15
Saving of general government (Sg)	22	23	22	19	18	16	17	18	19	20	18
Statistical discrepancy (E)	4	- 3	0	4	3	4	2	0	2	- 2	- 2
Private gross fixed capital formation (Ip)	66	68	66	67	62	62	65	64	67	66	64
Government gross fixed capital formation (Ig)	21	28	26	25	27	24	23	22	20	21	25
Inventory investment (J)	18	4	12	8	7	10	13	11	10	10	4
Surplus of the nation on current account (If)	- 5	0	- 4	0	3	3	0	3	3	3	7

Source: Economic Planning Agency, *Revised Report on National Income Statistics,* 1951-1967; and *Annual Report on National Income Statistics* 1973.

economic growth with some qualifications. But before entering into a discussion on the monetary policy to increase Ip on the right-hand side of the above equation, we will add one fact. The government attempted to increase all other elements except Sg on the left-hand side of the equation through a tax policy measure, such as allowing fast depreciation practices (for higher D), tax reduction on retained profits (for higher Sc), and discouraging personal consumption by maintaining an almost constant real tax rate in spite of the fact that the nominal income tax was reduced every year by raising the minimum taxable income in accordance with the growth in personal incomes (for higher Sp). The "easy money" policy has been called a "low-interest rate" policy and it has been coupled with credit rationing, i.e., direct quantitative credit control which is called "regulation at the window" by the Bank of Japan. Without any theoretical justifications, policy makers, such as the Ministry of Finance and the (notorious) Ministry of International Trade and Industry believed the "low-interest rate" policy would enhance the "international competitive strength of Japanese industries" by reducing the costs of "capital" which was considered to be a "scarce resource," in comparison with "abundant labor." If this presumption were true, a low interest rate might be considered as a privilege or as a subsidy to a category of "important industries" (as a matter of fact, mostly heavy and chemical industries) which were qualified to borrow funds from commercial banks under the "loan rules" of the government at artificially fixed lower interest rates than that would have been determined under the free market mechanism. This Japanese version of the "easy money" policy has *not* been carried out by increasing the supply of money in order to lower the interest rate in a free financial market. On the contrary, it meant the rationing of credit at an artificially fixed low interest rate i_1, as represented in Figure 4, not at i_0 which would equate the demand and supply of loanable funds for investment. Thus, in this scheme, the unsatisfied excess demand AB has to be suppressed to OA by credit rationing. It should be noted that the predominant portion of the investment funds of private corporations has been financed (directly) by commercial bank loans rather than by issuing (directly) new stocks or bonds in the capital market. As a result, commercial banks, especially big city banks, which financed the investment of large scale corporations in the field of heavy and chemical industries, experienced persistent "overloans" in excess of the deposit to these banks. The banks, in turn, depended heavily on borrowings from the Bank of Japan. This means that the Bank of Japan has supplied additional money ("growth money") making the low interest rate policy effective. Is it then the "easy money with a surplus budget" policy that has succeeded in making the economy grow rapidly?

Figure 5 shows when tight money policies were adopted since 1961. It also shows the changes in exchange reserves, the implicit GNP deflator and the growth rate of real GNP (seasonally adjusted), which were considered major objectives of a stabilization policy. Note that the changes in

Figure 4

CREDIT RATIONING

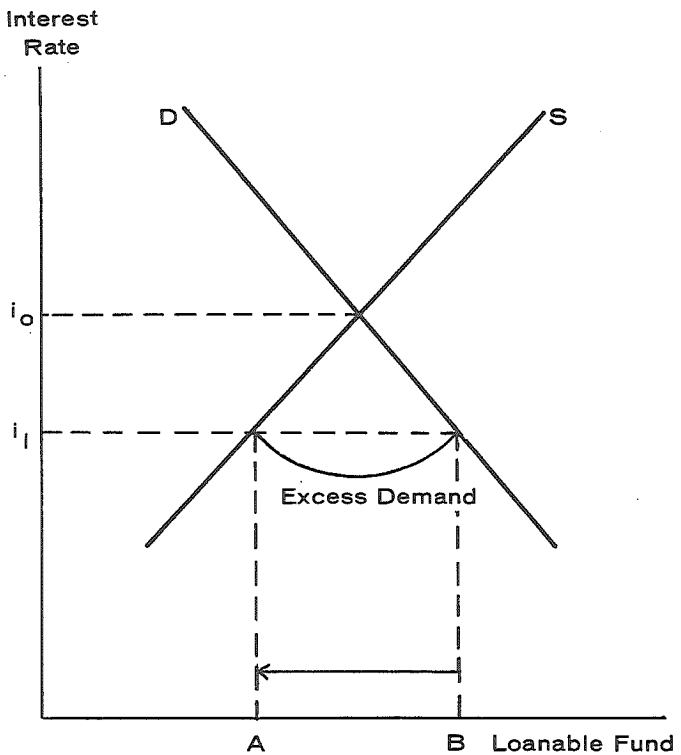
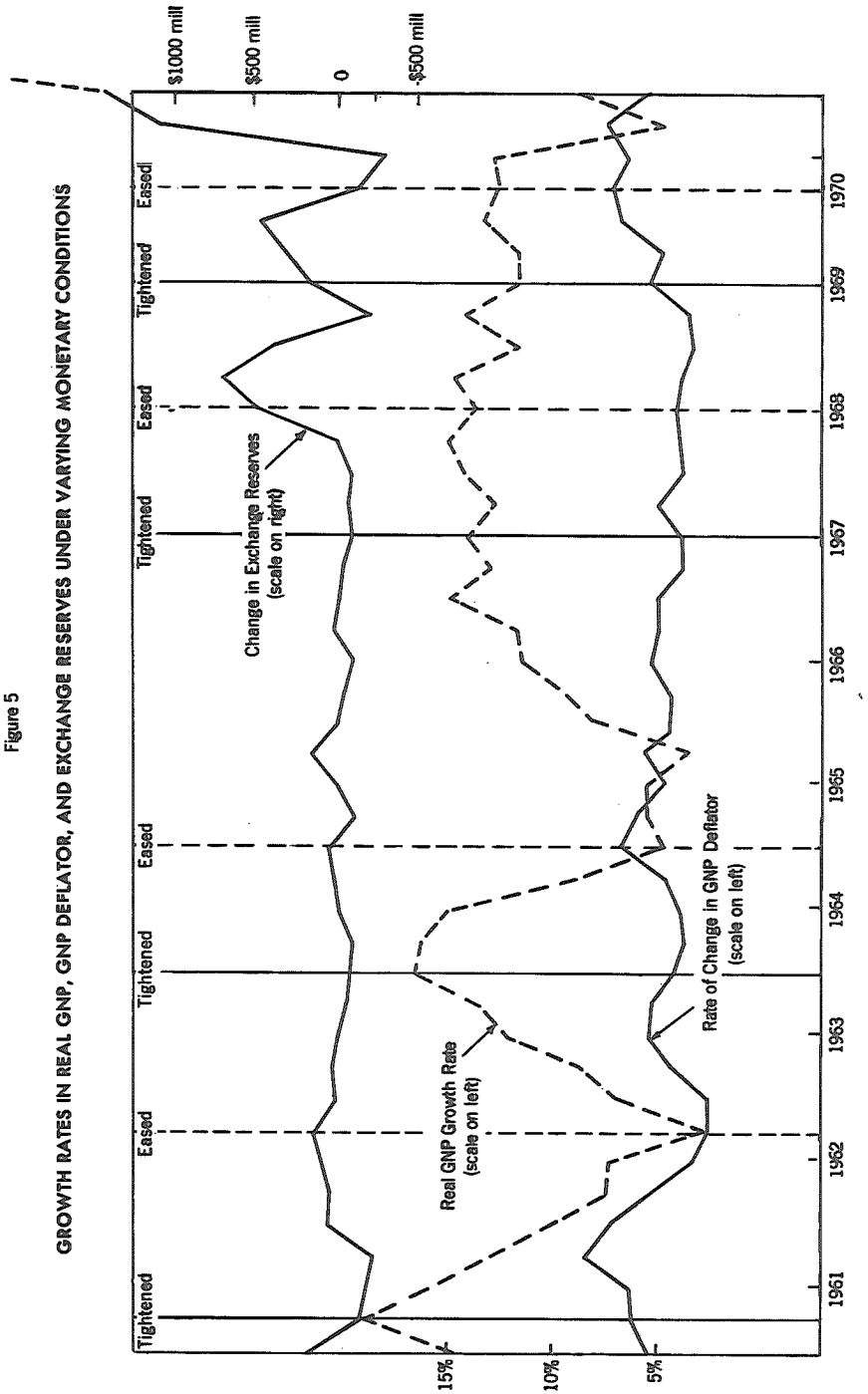


Figure 5

GROWTH RATES IN REAL GNP, GNP DEFLATOR, AND EXCHANGE RESERVES UNDER VARYING MONETARY CONDITIONS



monetary policy (which are reflected in the changes in rediscount rates) were sensitive to the balance-of-payments positions at least until 1967. Kaizuka (1967) carried out careful studies on the objectives of Japanese monetary policy along the line of Dewald and Johnson (1963) and Rueber (1964), and he found that the Bank of Japan always attempted to achieve a single policy target, i.e., balance-of-payments equilibrium. The achievement of other objectives, such as price stability and economic growth with full employment, was incidental to that of the balance-of-payments target. This implies that the economy's trends of rapid growth originating from the above mentioned "easy money with surplus budget" mechanism were checked from time to time by the balance-of-payments constraint, and the monetary policy in Japan for stabilization purpose was of a "stop-and-go" type. Since fiscal expenditures were not suitable measures for short-term stabilization because the Ministry of Finance maintained an inflexible "single year balancing principle," the Bank of Japan had to maneuver its strong weapon of direct controls in order to cope with the balance-of-payments difficulties. The Bank had to wait until the summer of 1969 to use it for the purpose of internal price stabilization when the external balance was favorable. We will come back to this controversial matter in Section 3.

2. Invesment-Led Growth

In the last section our major finding was: (1) that there was a growth-oriented policy of "easy money with a surplus budget," which was designed to stimulate business fixed investment; and (2) that the resulting high rate of economic growth, when excessive, had to be checked with reins of a tight money policy for balance-of-payments reasons. Table 3 represents the increase in real GNE and its components in the decade of 1961-70.

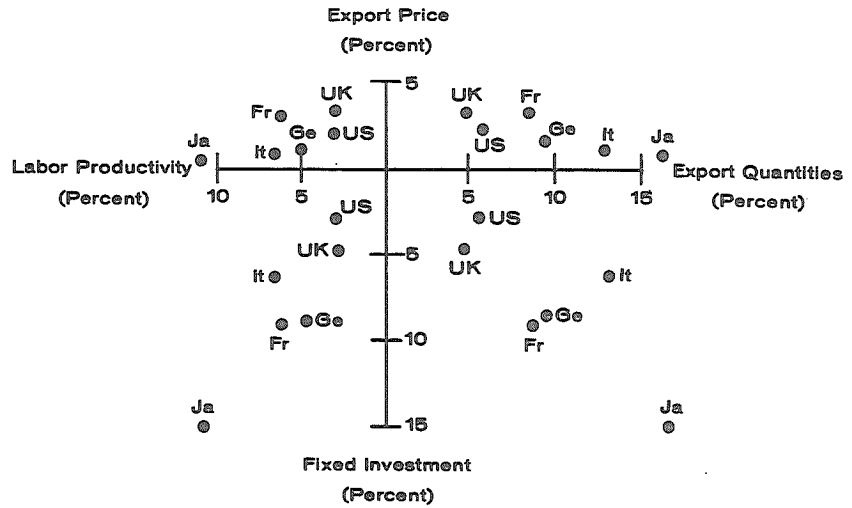
A glance at Table 3 reveals that the increase in business investment in plant and equipment (which accounts for about one-fourth of the total increase in real GNP in a decade) and exports of goods and services (which account for 17 percent of the total increase) played a predominant role in economic growth, while consumption, both private and governmental, grew slower than GNP. There is a question whether the growth of the economy has been "investment-led" or "export-led." Since the contribution of gross domestic capital formation accounts for 47 percent of the total increase, most economists believe growth was "investment-led." Others argue that exports have grown faster than investment as is seen in Table 3. However, exports and investment are interrelated and it is naturally impossible to evaluate the relative contribution of each to growth.

Figure 6 shows such interrelationships between fixed investment, labor productivity, export price and export quantum in the 1960s for six industrial countries. All variables are expressed in terms of the average annual percentage change.

Figure 6

AVERAGE ANNUAL RATE OF INCREASE FOR 1960-1969

Export Prices, Labor Productivity, Export Quantities and Fixed Investment



Source: Bank of Japan, Monthly Report of Research Department, August 1973.

Table 3
GNE in 1965 Prices (Billion Yen)

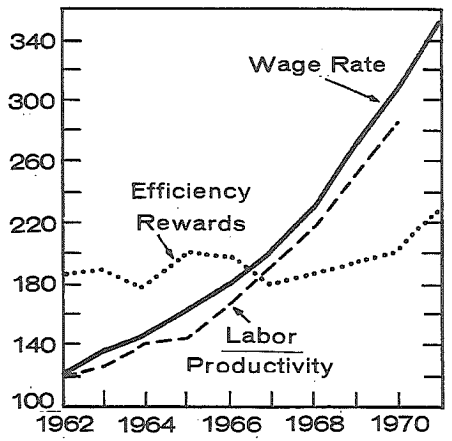
	1961	1970	Increment 1961-1970	Percentage Contribution	Growth Rate per Annum
Consumption					
Private	13,027	28,504	15,477	45.3	8.1
Government	2,260	4,025	1,765	5.2	5.9
Fixed Investment					
Business	4,262	12,977	8,715	25.5	11.8
Government	1,766	5,062	3,286	9.6	11.0
Housing	913	3,417	2,504	7.3	14.1
Stockpile	1,315	2,712	1,397	4.1	7.5
Export	1,981	7,768	5,787	16.9	14.7
(Minus) Import	-2,260	-7,024	4,764	-13.9	12.0
GNE	23,275	57,441	34,160	100.0	9.5

Source: Economic Planning Agency, *Annual Report on National Income Statistics*, 1973.

We observe in the figure: (1) the larger the fixed investment, the larger was the increase in labor productivity, (2) the larger the improvement in labor productivity, the larger was the reduction in export price, and (3) the larger the increase in price competitiveness of exports, the larger was the export quantum, (4) the larger the export performance, the larger was investment. Japan's case is in the extreme in the above interrelationship. A substantial portion of gross domestic capital formation was directed to plant and equipment, both private and governmental, which directly increased productive capacity. These new plants and equipment were not for the mere expansion of traditional types which used old technology. Instead, they embodied technological progress of both foreign and domestic origin. For example, the construction of a new steel mill was not necessarily a mere addition to the existing productive capacity of a mill of the same type as before, but often embodied a completely new technology, such as an oxygen converter, an electronic control system, a larger capacity blast furnace, etc. The investment engine which was ignited by technological progress increased labor productivity, and in spite of the sharp increase in wage rates, the former exceeded the latter enabling export prices to fall. This is shown in Figure 7. In other words, the productivity increase which resulted from technical progress embodied in new plant and equipment influenced Japan's comparative advantage favorably, permitting infant industries to grow. In the first stage of development, an infant industry's disadvantage disappeared so that home production of

Figure 7

WAGE RATE, LABOR PRODUCTIVITY AND EFFICIENCY REWARDS*



*Wage Rate and Labor Productivity are Indexes (1962 = 100).

such industry substituted for imports. In the final stage, the industry succeeded in having a comparative advantage (under the fixed exchange rate of 360 yen a dollar) and exporting its products. This kind of product cycle (innovation → investment → import substitution → export) can be observed in the postwar development of (present) export industries, such as iron and steel, automobile, synthetic fibers, petrochemicals, electronics and so on. However, as already mentioned, it is not appropriate to conclude that the spectacular success in export performance is the result of the "animal spirit" of investor-entrepreneurship in Japan, because investments were partly induced by the increase in effective demand including export. To illustrate the mutual interdependence between investment and export, let me present some numerical relationships in the *Denken* model on which we are working. In the model, the elasticities of private fixed investment are as follows:

With respect to	Elasticity Value
(1) Rate of profit/rate of interest	0.87
(2) Increase in commercial bank loans	0.30
(3) Real wage rate (substitution for labor)	
before 1963 F. Y.	0.71
after 1964 F. Y.	0.86

Since profit depends on national income and other variables, as our model showed, and national income is defined as GNE which includes export minus adjustment items, it is clear that part of investment was induced by exports. Thus, it is impossible to isolate the investment-led growth in GNP from the export-led growth. In connection with the above mentioned "easy money" policy, it is important to note that monetary variables and bank loans are included in the above investment function. Then, it might be reasonable to conclude that the rapid growth of the economy was, at least until 1970, a success story of the "low interest with credit rationing" policy. That policy served to maintain the interest rate low enough relative to the profit rate, and the excess demand for investment funds resulting from this policy was successfully adjusted by direct control of commercial bank loans.

3. External Surplus

As represented in Table 4, the nation's external balance prior to 1968 was almost in equilibrium under the fixed exchange rate ¥360 per dollar, and foreign exchange reserves were maintained at the almost constant level of 2 billion dollars. After 1968, exchange reserves began to increase sharply due to widening gaps between exports and imports. A rough but useful account of this widening gap is the difference between the *total* elasticity of Japanese exports (in dollar terms) with respect to world imports (in dollar terms), an elasticity which has been 2 and the elasticity of imports (in dollar or yen terms as both coincide under the fixed exchange

Table 4
External Balance
(billion dollars)

Year	Export	Import	Trade Balance	Balance on Current Account	Overall Balance	Exchange Reserve
1961	4.1	4.7	-0.6	-1.0	-1.0	1.5
1962	4.9	4.5	0.4	—	0.2	1.8
1963	5.4	5.5	—	-0.8	-0.2	1.9
1964	6.7	6.3	0.4	-0.5	-0.1	2.0
1965	8.3	6.4	1.9	0.9	0.4	2.1
1966	9.6	7.4	0.3	1.3	0.3	2.1
1967	10.2	9.1	1.2	-0.2	0.6	2.0
1968	12.8	10.2	2.6	1.1	1.1	2.9
1969	15.7	12.0	3.7	2.1	2.3	3.5
1970	19.0	15.2	4.0	2.0	1.4	4.4
1971	23.6	15.8	7.8	7.9	7.7	15.2
1972	28.0	19.1	9.0	6.7	4.7	18.3
1973	36.2	32.5	3.7	-0.3	-10.1	12.2

Source: The Bank of Japan.

rate) with respect to GNP (in yen terms) an elasticity which has been unity. In order to balance exports and imports, Japanese GNP must grow twice as fast as world imports (starting from equilibrium), and this was the case before 1964. After 1965, however, the growth rate in the world imports increased by 10 percent, while that of Japanese GNP remained at 15 percent as before. This is a simple and intuitive explanation of the widening gap between exports and imports after 1965.

In this phase of the accelerated increase in exchange reserves, the Bank of Japan dared to adopt a strong tight money policy for fear of the development of inflation. It was in the summer of 1969 as we have mentioned at the end of Section I. In fact, the wholesale price index which had been stable for a decade (1 percent per annum increase) increased for 15 consecutive months of the 1969-70 period by 5 percent. Academic economists like Yasuba (1970) criticized the policy for being inappropriate in the case of "inflation and external surplus" because the tight money policy could be a remedy for inflation but would increase the external surplus at the same time. In addition, he identified the inflation as "imported" under the fixed exchange rate. This is one reason why many academic economists, including the present author [Tatemoto and Uchida (1971)], proposed a revaluation of the yen as an appropriate measure. In view of the tendency of a widening gap in the trade balance, it was necessary in this phase to maintain a sufficiently *higher growth rate* in comparison with that in world imports in order to compensate for the one-half lower total elasticity of imports relative to that of exports. Thus, the consequence of tight money policy at that time was the further widening of a payment gap without a price decline and the accelerated accumulation of reserves. Where a higher domestic rate of growth was not feasible, for one reason or another, an appropriate policy for restoring equilibrium was exchange rate adjustment. However, this policy could not be adopted due to the strong political pressures opposing revaluation. Thus, instead of adjusting the fixed exchange rate, a "monetary and fiscal policy mix to *defend* the yen" was adopted in the 1970-71 period. This policy of domestic expansion (and import liberalization) was continued until the summer of 1971 and the NEP (New Economic Policy), introduced not by Lenin but by Nixon. Then the politicians said that Japan "was forced by foreign pressures to float the yen" after two weeks of mysterious effort by the Bank of Japan to maintain the old fixed exchange rate of ¥360 per dollar at the cost of an additional purchase of 4.5 billion paper dollars.

Political pressures backed by special interests disguised as the nation's interests often took the place of reason in the history of economic policy in modern Japan. For example, towards the end of the 1920s when the country was preparing to come back to the gold standard, political pressures attempted to maintain the *low* price of yen in terms of shillings for reasons of national prestige, while towards the end of 1970s, there were political pressures to maintain the *low* price of yen in terms of cents. Both of these unreasonable political efforts made a muddle of the economy.

At the end of this brief note on Japanese economic policy, we have reached a somewhat ironical, although not paradoxical, conclusion that it was the failure, not the success, of Japanese stabilization policy that caused instability in the international monetary system. That is to say, the failure to maintain a sufficiently *higher* domestic rate of growth (by a stabilization policy) than those abroad, was the main cause of a large external payments surplus during 1971-72, which was one of the destabilizing elements in the world monetary system.

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Discussion

Lawrence B. Krause

Professor Tatemoto has done an excellent job of capturing the essence of Japanese stabilization policy in a very few pages and has also managed to be quite provocative. He has examined the following three questions: (1) Did Japan have a stabilization policy in the sense of using policy instruments to promote the realization of its growth potential subject to the constraints of the balance of payments and price stability? (2) Was the rapid growth of Japan during the 1960s a result of stabilization policy? and (3) Was rapid Japanese growth a cause of world economic instability? Professor Tatemoto established that Japan *did* have a stabilization policy; that Japanese growth was substantially, possibly critically, affected by that policy; and that rapid Japanese growth was *not* a cause of world economic instability, but to the contrary world instability might have been avoided if Japan had only grown even faster (or world imports had grown more slowly). I would like to elaborate and interpret his three answers. The Existence and Nature of Japanese Stabilization Policy

There is little doubt but that Japan had a macroeconomic goal and policies addressed to it, but it differed considerably from the stabilization objectives of other advanced countries, and certainly from those of the United States. Japan sought to achieve maximum economic growth for the purpose of catching up with advanced Western countries — essentially the same goal that existed since the Meiji Restoration in 1868. In order to maximize growth, the government was prepared to suffer a large amount of *instability* in economic activity which in some years meant a change in growth rates of close to 10 percent. It was only during a few years in the late 1960s that Japan achieved both a high and stable rate of growth. Thus the government might be criticized — as some Japanese economists have done — for sacrificing too much stability to achieve growth. The

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social cost of instability is sometimes not appreciated by foreign observers because they only look at the unemployment rate which did not change very much from boom to recession years. Rather the cost of a recession was borne by workers who happened to complete their education during a weak employment year and were forced into sub-optimal career paths or by workers who were unable to upgrade their employment into the modern sectors of the economy, and also by small businessmen who lost both capital and employment through bankruptcy of their businesses. As is implied by the above, Japanese policy by concentrating on growth was prevented from focusing on other social goals like the distribution of income (or wealth) and the quality of life which may also be subject to criticism.

Some special interest also attaches to the instruments of stabilization policy — in Professor Tatemoto's apt phrase, "the easy money with surplus budget" policy. Tatemoto indicated how this policy was used to encourage savings at all levels in the economy and to channel those savings into private industrial investment and in particular the heavy and chemical industries targeted by the Ministry of International Trade and Industry for special consideration. Tatemoto somewhat questioned the success of this policy pointing out that realized growth fell short of its potential throughout the 1960s, even though it systematically exceeded the rate indicated in the various economic plans and in the official annual forecasts that were used as a basis for economic management.

But would it have been possible for Japan to have grown at a faster rate during the 1960s? It would hardly seem possible. Aside from 1962 and 1965 when the economy was restrained by tight money, the rate of expansion might well have been limited by labor market constraints of a kind not reflected in the production function used by Tatemoto. One can easily envision a speed limit at which labor can be withdrawn from low productivity pursuits such as agriculture and small business which if exceeded will lead to social and economic disorganization and loss of output. There were signs that such a constraint was operative during the later 1960s despite the calculated GNP gap of 2.0 percent to 4.8 percent per year.

It is rather interesting that the government consistently underestimated Japanese growth. One cannot attribute the poor forecasting record to a string of unexpected developments since the Japan Economic Research Center was in fact able to forecast much better and without a biased error. A more logical explanation suggests that the government intentionally underestimated the growth rate as an instrument for achieving rapid growth. Within the government, the official forecast was used to estimate tax revenues and in combination with the balanced budget ideology, was an effective means of limiting the growth of government expenditures below the growth of tax receipts. Since the elasticity of Japanese tax receipts to money growth is quite high — close to 2.0 — the government had a large melon at the end of each fiscal year to distribute in tax reductions and it gave generous amounts to business which encouraged industrial investment. Thus the underestimation of economic

growth by the government became an instrument to channel more resources into private industrial investment which in turn helped to promote economic growth.

Investment-led Growth vs. Export-led Growth

Tatemoto answered his second question in the affirmative; that is, rapid Japanese growth could be attributed to the success of the "easy money with surplus budget" policy. He showed in Table 3 that business plant and equipment expenditure was the major force driving the economy and resulted from (or was encouraged by) government policy. The only conceivable competing hypothesis is that Japanese growth was export-led since exports also grew faster than gross national expenditures. Tatemoto argues that it is impossible to separate the growth stimulus coming from exports as distinct from investment since they are interrelated; e.g., profits are a major factor determining investments (as measured in the Denken model) and export sales are a major determinant of business profits.

While I do not necessarily disagree with Tatemoto, I have investigated the export-led growth hypothesis from a different point of view. The concept of export-led growth has been used in the literature in three different ways: first as a descriptive concept, second as a positive or analytical concept, and third as a normative concept and policy prescription. In purely descriptive terms, Japanese growth has been export-led in that exports grew faster than GNP as shown in Table 3. When measured in 1965 prices, Japanese exports of goods and services were 8.4 percent of GNP in 1961, rose to 13.2 percent in 1970 and 14.4 percent in 1972. Similarly Japanese exports of manufactures relative to manufacturing production measured on a 1970 base was only 67.2 in 1961, 100 in 1970 and 117.4 in 1972. But in the same descriptive sense that Japanese growth was export-led, it has also been led by business fixed investment, government investment, housing investment and even imports. Clearly the concept has little interest in just its descriptive form.

Export-led growth as a positive or analytical concept is of much greater interest, for instance, as used by Caves.[1] The concept in this sense relates to the economic growth consequence that comes from an exogenous disturbance in the export sector such as that which occurred as a result of the wheat boom of Canada in 1901-1911 or the oil boom of Ecuador today. Such a disturbance would lead to a rise in economic rent and in real income and is quite distinct from the rise in income that comes from higher productivity in domestic production as a result of larger investments in human or physical capital. In order for this concept to have any explanatory power, there must be a source of external disturbance and a response mechanism to turn the disturbance into domestic growth. There is little question that Japan had the response mechanism, but the external disturbance is another matter. Caves suggests a simple

test to distinguish an external from a domestic disturbance. If the disturbance arises predominantly from external demand, then export price and quantity changes should be positively correlated; and if the disturbance arises from shifts in domestic supply, the correlation would be negative. By this test Japanese growth was clearly *not* export-led for most of the 1960s since the price index for Japanese exports was 92.0 in 1961 (1970=100) and remained virtually unchanged through 1968 when it was 92.9 despite the massive increase in export volume of 232 percent. From 1968 through 1971, there was a distinct change. Not only did Japanese export volume and prices rise, but a balance-of-payments surplus developed. This was the period of Vietnam-induced price inflation in the United States and Japanese growth might well be described as export-led in this short period — exports primarily to the United States.

The normative sense of export-led growth has recently been endorsed again by Nicholas Kaldor as a prescription for British policy.[2] According to the prescription a country like Britain can best raise its growth rate by stimulating exports through subsidizing them or simply undervaluing the exchange rate. Japanese experience might be instructive in this regard. While Japan had many policies which in one way or another promoted exports or inhibited imports, these policies were operative throughout the entire postwar period and were if anything being moderated when the period of export-led growth started in 1969. The closest that Japan came to a policy stance in favor of export-led growth resulted from a negative policy, i.e., a refusal to revalue the yen when it became undervalued. As a result of this refusal, Japanese economic and political relations with its economic partners suffered and in general this was a very unhappy time for Japanese foreign relations. This refusal was criticized by Tatemoto, Amano and many other Japanese economists. What this suggests is that a large industrial country like Japan or Britain cannot promote export-led growth without destabilizing the international system of which they are a part, although the same judgment might not apply to a less developed country.

Rapid Japanese Growth and World Economic Instability

In the last section of his paper, Tatemoto rejected the notion that rapid Japanese growth was a cause of world economic instability. He points out that the total elasticity of Japanese exports (in dollar terms) with respect to world imports (in dollar terms) was 2.0 or exactly twice the elasticity of Japanese imports with respect to Japanese GNP. Thus in order to maintain a balanced expansion, Japanese GNP must growth twice as fast as world imports, which generally means more than twice the growth rate of other industrial countries. The instability that occurred in the world after 1968 when Japan developed a large balance-of-payments surplus was not due to too rapid Japanese growth, but because world trade volume increased without a corresponding rise of Japanese GNP growth (which was

already at 15 percent) and thus a gap developed. According to Tatemoto, Japan can be criticized for not revaluing the yen, but not for growing too quickly.

Again, I do not think I disagree with Tatemoto, but I would like to put two reservations on his interpretation. First, as shown by Komiya,[3] it appears that Japan could grow faster than other countries without having either a surplus or deficit in the balance of payments. But in my view, a large country like Japan can cause severe adjustment problems for other countries through unusually rapid growth even if it had a balanced expansion of exports and imports. The adjustment problem can arise either through an escalation of raw material prices if world supply does not keep pace with Japanese import demands or if world industrial markets do not grow fast enough to absorb needed Japanese exports without an increase in Japanese shares of trade. While these are problems of adjustment rather than instability, they are serious nonetheless.

Second, I cannot accept the elasticity of Japanese exports with respect to world imports as a fixed parameter, but rather view it as endogenously determined and principally by the structure of Japanese growth. As noted previously, Japanese policy promoted private investment-led growth and it was the expansion of industrial capacity resulting therefrom that yielded such high elasticities. It was not the rate of Japanese growth that caused world instability, but rather the fact that it was weighted so heavily by industrial expansion. I have concluded this from a particularly insightful earlier work by Professor Tatemoto.[4] In a long-run simulation of the Denken model, Tatemoto showed that if government goods and services plus government investment were the driving force in the economy, Japanese growth could continue at a high rate without a tendency toward balance-of-payments surpluses, but surpluses would occur with private plant and equipment-led growth. Since many observers suggest that Japan really requires a larger share of public goods in the society, the policy option is open to them. Thus rapid Japanese growth may not have been the cause of world instability, but an imbalanced structure of Japanese growth might have been.

Let me conclude by expressing my sincere appreciation of Professor Tatemoto's work — not only this paper, but his other work as well. This conference is in his debt.

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Discussion

Akihiro Amano

Dr. Krause has given superb comments on Professor Tatemoto's paper as an expert on the Japanese economy. Unfortunately Professor Tatemoto was unable to attend this seminar, and I hope it will not be inappropriate for me to give some remarks on Dr. Krause's comments.

First of all, it seems important to make clear the meaning of "stabilization policies." A natural interpretation of the term would be that it means a set of policies which are directed toward stabilizing the fluctuations of certain target variables around their long-run growth paths. It would not cover policies which are intended to affect the long-run growth paths themselves. I think the first point of Tatemoto's paper is to negate the existence of stabilization policies in this sense. The policy combination of the selective low-interest-rate policy with the de facto surplus budget policy had better be called a growth policy rather than a stabilization policy. And in most of the 1960s other policy tools, especially the monetary policies and to a lesser extent some part of the fiscal policies, were by and large mobilized to adjust the balance-of-payments deficits under the fixed exchange rate system. Monetary policies were indeed quite effective in curing the balance-of-payments deficits, but at the same time they played the role of accentuating cyclical movements of the economic activities. This outcome was not inevitable, however, because the cyclical movements of economic activities would have been mitigated if the exchange rates had been managed with more flexibility. Professor Tatemoto attempts, I think, to emphasize that the balance-of-payments policies actually destabilized the economic activities around the long-run growth path in order to supplement the growth policy. I quite agree with Dr. Krause in his observation that the Japanese government intentionally underestimated the growth rate and hence tax revenues at the stage of forming the budget plan. This is particularly true for the official short-term forecast made at the beginning of the fiscal year. But this again is a part of the growth policy.

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There seems to be no difference of views between Professor Tatemoto and Dr. Krause concerning the assessment of the growth policy. There exists a slight difference of emphasis, however, as to whether the growth was led by exports or by investments. I would support Professor Tatemoto's view that it is theoretically not very meaningful to distinguish the two types, as exports and investments are both jointly dependent variables. Unless there exists a certain exogenous change of a considerable scale whose effect falls upon either one of the variables, it will not be possible to identify the causal relationships. Indeed, in selecting the strategic industries to which low-interest-rate policy was applied, those industries having highest growth rates in world demand and those having highest potentialities in raising productivity were given a high priority. Thus, both ex ante and ex post investments were closely geared to the development and the structure of world markets. I would call such a growth pattern the "export-capturing growth" instead of using the somewhat passive word "export-led."

Another aspect which I should like to emphasize is the role of the balance-of-payments adjustment under the fixed exchange rate system in the income-multiplier process. Assume, for example, that either exports or investments experience an autonomous increase of the same magnitude. If we neglect the balance-of-payments constraint, the two changes would produce similar time paths of dynamic multipliers. If there is the balance-of-payments adjustment working through the multiplier process, which keeps the balance of payments intact, then the export multipliers must be larger than the investment multipliers. A classical example of showing this in a macro-economic framework may be found in Rhomberg [3]. Macro-econometric models of the Japanese economy possessing the balance-of-payments adjustment mechanism are presented in [1] and [2], both of which have shown that the long-run export multiplier is several times larger than the investment multiplier. This seems to suggest the importance of exports in the process of development for an economy with relatively unutilized resources and a vulnerable balance-of-payments structure.

Finally, I do not have much to argue about the question of unreasonably rapid growth as a source of world instability. Theoretically speaking, a rapidly growing economy will benefit others by transmitting the benefits of growth, provided that the pattern of growth is not "anti-trade biased," i.e., biased towards import-competing industries. This statement presupposes, of course, that there is no problem of adjustments. There are two kinds of adjustments in the present context, however, that must be taken into account. One is the balance-of-payments adjustment, and the other is the adjustment of resource allocation. Even when the multilateral balance-of-payments adjustment mechanism is working smoothly, a sudden and big increase in exports of one country may put the rest of the world in hardship. Similarly, the necessity of rapidly changing the resource allocation will cause a temporary loss of welfare in individual

Modeling Stabilization Policy for the LDCs in an International Setting

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The major concern of both empirical and theoretical macroeconomic analysis of the LDCs has *not* been the question of stabilization within the framework of national income determination models. In a recent survey of the state of the art regarding the use of economy-wide models for LDCs, for example, Blitzer et al (1974) do not even include a chapter on macroeconomic income-determination models. The focus, instead, has been on growth, with the analytical framework provided by supply-oriented models characterized by very limited or no substitution possibilities and by binding capital and/or foreign exchange constraints.

Such an emphasis reflects two widely held views. 1) Growth is relatively a far more important economic objective (and stabilization less important) in the LDCs than in the DCs. 2) Keynesian income-determination models are inappropriate or of very limited appropriateness for LDCs.[1]

Some exceptions to the predominant view have long existed. Often these exceptions, moreover, have included considerable concern about the role of the foreign sector in stabilization. The participants in the "structuralist-monetarist" controversy in Latin America, for example, have accorded a significant role to stabilization policies, with special emphasis on the foreign sector.[2]

These exceptions, moreover, have been growing recently. The recognition of the existence of considerable underutilized capacity has increased

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[1] Rao (1952) presents an early statement of this view. Ranis (1974) gives a recent summary.

[2] For a summary of the "structuralist-monetarist" debate, see Campos (1964).

interest in the use of national-income-determination models for stabilization purposes.[3] A large number of Keynesian-based national-income-determination models for LDCs have been constructed and utilized.[4] Even the strongest advocates of supply-oriented capital-and-foreign-exchange-constrained analysis of the LDCs seem to be having second thoughts about the importance of short-run factors and stabilization problems. Throughout the above-cited survey by Blitzer et al (1974), for example, references to the need to treat short-run features (e.g., price responses, capacity-utilization determination, aggregate-demand-related policies) are frequent.

At the same time that interest in and use of stabilization models for the LDCs has been growing, controversies have emerged over the specification of income-determination models for the DCs. In the past decade, critics have claimed that deficiencies in the theoretical structure make any analysis of stabilization policies based on such models suspect. Recently, however, some convergence seems to have occurred at least in regard to the nature of the issues. Ando (1974), Blinder and Solow (1973), Hansen (1973a) and others have attempted to adjust the IS-LM model to explore these controversies.

Given some convergence on the nature of stabilization issues in the DCs and given the increasing preoccupation with stabilization problems in the LDCs, the time seems ripe to re-examine the applicability of modern stabilization analysis to the special situations of open LDCs. This paper begins such an attempt. The strategy is to examine, in turn, each of the components of recent models for stabilization in DCs and to consider how they need to be altered for analysis of stabilization issues in LDCs.

The prototype model for the DCs used as a starting point (Table 1) combines the features of the closed economy model of Ando (1974) and the analysis of international capital movements of Branson (1974).[5] This model is somewhat complex in order to incorporate a number of features discussed in recent controversies. Solution by differentiation does not lead to simple elegant expressions. For understanding beyond that provided below, the reader is referred to the papers by Ando and Branson.

Before proceeding to consider how the components of such a model must be modified in order to capture the features of LDCs, a caveat is in order. The LDCs are far from homogeneous. In terms of almost any relevant feature the range across countries is enormous. In what follows, therefore, the suggested modifications reflect characteristics not necessarily common to all LDCs, but at least to a significant number of them.

[3]For an illustration, see Schydlowsky (1971, 1974).

[4]For an example and some references to others, see Behrman (1974, 1975).

[5]These models are equilibrium models. In recent years Barro and Grossman (1971), Clower (1965), and Leijonhufvud (1968), among others, have focused on disequilibrium features of national income determination. Their criticism of equilibrium models is provocative, but the disequilibrium mechanisms proposed to date are quite arbitrary and *ad hoc.*

1. Labor Market and Determination of Price

Equations (1) through (4) are the relations for the labor market and for the determination of prices and wages in a recent model for DCs.

Equation (1) depicts the short-run relationship between output and the required manhours for production. Producers' durable equipment is assumed to be in the form of putty-clay. At any point in time the economy has a collection of machines whose labor-output ratio was determined by the technology and the expected relative prices at the time each machine was manufactured. Given the relative prices of the current period, machines (and the labor associated with them) are used in production in order of their efficiency until the desired output is produced.

Equation (2) gives the unemployment rate as a function of manhours and population characteristics. It incorporates into one expression the determination of hours worked per person and the response of the size of the labor force to employment conditions and demographic features of the population.

Equation (3) is a Phillips-curve relation for the determination of the rate of change of wages as a function of the unemployment rate and price expectations.

Equation (4) determines the price level of output under the hypothesis that the price is determined by a (possibly lagged) mark-up on the minimized average cost. The price level should vary proportionally with the money wage level and reciprocally with long-run productivity. The mark-up factor is μ. Since the mark-up may vary in the short run with the utilization of capacity, the unemployment rate is also included in this function.

For the LDCs modifications are necessary in order to capture two important features.

1) Most of the LDCs are characterized by dualism of their labor and product markets.[6] The modern sector is market-oriented and pays wages approximately proportional to the value of the marginal product of labor. Its technology is fairly recent, and permits but limited substitution between primary factors.[7] In some countries unions are quite powerful in this sector. Since part of this sector is agricultural, an important source of disturbances usually is the weather.

The traditional sector is much less market-oriented. In most countries a major component of this sector is noncommercial agriculture. For this subsector the marketed surplus often is a small part of total production

[6]This dualism is not necessarily between agriculture and industry. Generally, in fact, both of these sectors have modern and traditional components.

[7]The movement towards putty-clay considerations in the macroeconomic literature for DCs lags substantially the emphasis on *ex post* fixed proportions for the modern sector of the LDCs. Eckaus (1955) provides an early statement.

and *may* be an inverse function of price.[8] In this subsector, even more than in the modern sector, climatic variations often cause large disturbances. Factor substitution usually is possible, but the relatively high labor-to-capital ratio often results in disguised unemployment with marginal products substantially below those in the modern sector. Because of family and communal arrangements, however, the share of individual laborers is determined by tradition and is closer to the average than the marginal product.

Equations (1), (2), therefore, may be appropriate for the modern sector (with all the included variables referring only to that sector and with some modification to incorporate the role of weather). The traditional sector, however, is a residual claimant on labor.

Rao (1952) claims that the predominance of disguised unemployment in the traditional sector, instead of open unemployment as in more developed economies, implies a very limited labor supply response to changes in aggregate demand. This is the case, he maintains, because (i) the disguised unemployed labor is not aware of being unemployed and (ii) their share of income in the traditional sector is greater than the market wage (which reflects the low marginal product of labor). The supply of labor for the modern sector, he concludes, is very inelastic and expanded aggregate demand results primarily in price increases.[9]

The dominant view of the impact of dualism on the labor market, however, features the model of Lewis (1954). The average share of labor in the traditional sector, plus a differential for the costs of moving from the traditional to the modern sector, provides a floor for wages in the modern sector.[10] The average share of labor in the traditional sector is assumed to remain approximately constant over a wide range of sizes for the traditional labor force.[11] Over a substantial range, therefore, the supply of labor for the modern sector will be quite elastic.

Prima facie this might seem to lead to a very Keynesian case in the modern sector with an "unlimited supply of labor" at a fixed wage. But

[8]If this response is inverse or positive but small, changes in aggregate demand may cause primarily price and not output changes for basic wage goods. The analysis in Behrman (1968), however, suggests that while these responses may be inverse, they also may be positive and quite large.

[9]That the average labor share in the traditional sector is more than the marginal product of labor in that sector, of course, does not necessarily imply that the supply curve of labor for the modern sector is very inelastic. The Lewis model discussed in the next paragraph, in fact, comes to the opposite conclusion about elasticity with respect to the real wage.

[10]The discrepancy between the marginal products in the two sectors obviously leads to static inefficiencies.

[11]The average share per laborer is generally assumed to be fixed by tradition until enough labor exits from this sector so that the marginal product of labor rises to this level and market prices begin to dominate (Fei and Ranis, 1964).

this wage is fixed in real terms, so the situation is very classical in an important sense. In a one-good model with no money illusion on the part of the laborers in the traditional sector, in fact, Equation (3) could be replaced by an equality between real wages in the modern sector and the exogenously given traditional average labor share. Equilibrium employment and output would be irresponsive to changes in aggregate demand.

A more realistic assumption is that the elasticity of the wage with respect to the price on the labor supply curve for the modern sector is positive, but less than one. It is less than one for at least two reasons. (i) At least in the short run, laborers apparently have some money illusion. Because the laborers in the traditional sector receive much of their income in kind, however, such money illusion may be less for them than for workers in DCs. On the other hand, less effective communications systems may work in the opposite direction. (ii) The overall price index is a weighted average of the price for the modern sector and the price for the traditional sector. One characteristic of dualism is that the former is more responsive to aggregate demand changes than the latter. Moreover, government price ceilings are usually directed largely towards traditional goods because of their importance as basic wage goods for modern sector laborers. Therefore, the real wage in terms of traditional goods can vary much less than the real wage in terms of all goods. As a result some response to changes in aggregate demand is generally possible in the modern sector, although probably not as much as in many DCs.

In some LDCs, however, unions or legal wage rates have substantial effects on the wage level in the modern sector. Where either of these factors are important, the modern-sector labor market may be extremely Keynesian with an exogenous fixed nominal wage. Shifts in aggregate demand should have substantial employment and output impact in those modern sectors. In such cases Harris and Todaro (1970) posit that in equilibrium, nevertheless, some unemployment which can not be eradicated by aggregate demand policies should be expected in the modern urban areas. They claim that rural-urban migration occurs as long as the expected income (taking into account both the higher modern-sector wage and the probability of obtaining employment) exceeds the traditional average labor share. The result will be some open employment as long as the government or unions cause a differential to persist between the traditional average labor share and the modern-sector wage.

2) The foreign sector plays a much more important direct role in labor, production and price relations in most LDCs (and probably in most small open DCs) than is indicated in the model of Table 1. Four modifications of the counterparts of Equations (1) — (4) for the modern sector need to be made to reflect the impact of the foreign sector.

(i) Some imported intermediate inputs and raw materials are critical in the production process. The elasticity of substitution between such imports and domestic factors is very low or zero. Especially in the disequilibrium exchange rate system common for many LDCs, the constraint

on production and employment may not be the putty-clay stock of machinery and equipment, but the availability of these imported inputs. Equation (1) needs to be modified to reflect this possibility.

(ii) The derivation of Equation (1) also needs to be modified due to the fact that technologies used in the modern sector are largely imported from DCs with much different factor endowments. Very little choice may be available (or may be thought to be available) even *ex ante* for the capital-labor ratio of the LDCs. Therefore, the putty-clay response to expected relative prices is constrained to a choice among relatively capital-intensive technologies. What Eckaus (1955) calls the "factor proportions problem" limits the absorption of labor by the modern sector.

(iii) The discussion above suggests that for many LDCs Equation (3) should be replaced or modified by considerations relating to the real labor share in the traditional sector, government minimum wages and union pressures. If some version of Equation (3) remains, however, one further modification needs to be made. In many LDCs an important and generally available index of inflationary expectations is the rate of change of the exchange rate. In addition to the history of past inflation, therefore, this variable (or some function of past values of it) should be included for such countries.

(iv) In light of the widespread importance of intermediate and raw material imports, Equation (4) also should be modified to reflect mark-ups on imports as well as on labor. Changes in the international prices or in import policies, therefore, have direct effects on the domestic price level.

2. Product Market

Equation (5) in Table 1 is the definition of net national product. Equations (6) through (10) describe the demand for real output.

Equation (6) is the consumption function. In a life-cycle hypothesis variant, real consumption depends upon expected real disposable income (approximated by a distributed lag of actual real disposable income) and net worth.

For the LDCs, several hypotheses about private consumption behavior have been suggested. (i) Because of the existence of a large number of individuals at or near a subsistence income level, consumption may not be proportional to income even in the long run. If true, the high marginal propensity to consume at low income levels, *ceteris paribus*, may imply a relatively high multiplier. (ii) Retained business earnings (although not necessarily from corporations) are a relatively important source of savings. Therefore, a division at least between labor and non-labor income might be desirable. (iii) The marginal propensity to consume out of the income generated in some sectors — especially those related to exports — may be higher than elsewhere in the economy. The inclusion of a separate argument in the function for income from exports thus might be desirable. This modification would further increase the impact of the foreign sector on stabilization.

Mikesell and Zinser (1973) review the existing empirical evidence for private consumption behavior in LDCs. Some, although not unquestionable, support has been found for all three propositions.

Equation (7) is the investment function. For the DCs in which capital markets function well so that the cost of capital is well defined, investment decisions are based on a comparison of the present value of the expected stream of income generated by the investment and the cost of investment. Simultaneous variables which enter into the investment decision, therefore, include the capitalization rate applicable to real assets and net national product in real terms. The appropriate tax rates also have a role.

For some of the more advanced LDCs some evidence exists which supports the use of the same basic formulation (*e.g.*, Behrman, 1972). More generally, however, substantial modifications are needed to reflect special aspects of capital markets, social overhead capital, and international considerations.

(i) Domestic capital markets in LDCs often do not function well. Markets are very fragmented, especially between the traditional and modern sectors. In the modern sector legal limits on nominal interest rates frequently are effective so that credit rationing occurs in bank markets. Government planning organizations also often attempt to control the allocation of physical capital by nonmarket means.

The net result is that much of the domestically financed investment does not pass through a capital market (or, at least not through "the" capital market). Instead it originates in retained earnings or in direct flows from the government. Government policy is often directed towards increasing the former source through changing the terms of trade by price ceilings and foreign trade policies in favor of sectors in which investment is desired. Quite commonly industry is so favored over primary production, and import substitution or nontraditional exports are favored relative to traditional exports.

To capture these features, direct financial flows from the government and quantitative allocations mechanisms need to be included in the investment function. To represent the impact of policies which work through altering terms of trade, a multisector model is required.[12]

(ii) The development literature emphasizes repeatedly the role of social overhead capital in the development process. Because of externalities and increasing returns to scale over the relevant range, Rosenstein-Rodan

[12]Hansen (1973b) also argues that substantial disaggregation is necessary because policies which operate on relative prices are pervasive. He therefore works on a commodity level of aggregation in his Afghanistan and Thai models. For LDCs with larger and more complex modern sectors such a level of disaggregation would be unmanageable for empirical work. Nevertheless more disaggregation than is common for models of the DCs is necessary because of the relative price effects, and perhaps some important commodities should be treated individually. Of course aggregate factor constraints need to be maintained no matter what is the degree of disaggregation (although it is not clear how these constraints are maintained in Hansen's commodity supply relations).

(1961) and others maintain that the government must increase substantially such social overhead capital in order to induce private investment. The role of social overhead capital in determining the stream of expected net income from investment therefore should be made explicit.

(iii) International considerations enter into investment decisions in at least two important ways.

First, in the modern sectors of many LDCs a not inconsiderable portion of the capital stock originates from direct foreign investment. One implication of this foreign ownership is that for such investment the relevant cost of capital reflects the opportunity cost in the international capital market (modified by local tax, repatriation and earnings regulations and expected exchange rate movements), not in the domestic market. Another implication is that net factor payments abroad may have a stabilizing influence if they are determined as a residual.

Second, for many of the LDCs much of the machinery and equipment for investment in the modern sector is imported. This relates to the factor proportions problem referred to above because of the concentration on developing relatively capital-intensive technology in the DCs which produce these imports. It also means that exchange-rate policy and other import policies have important roles in the determination of the cost of capital. If the elasticity of substitution between domestic and foreign investment goods is in fact very low and quantitative restrictions are an important component of trade policy as in many LDCs, moreover, the quantity of imported capital goods may constrain real investment and should be included as an argument in the investment function. Particularly in such cases, the availability of foreign capital inflows (both official and private) may directly or indirectly affect investment (e.g., see Areskoug, 1974).

Equation (8) defines total government expenditures as the sum of exogenous central government expenditures and endogenous local government expenditures. The latter respond fairly strongly to cyclical conditions of the economy.

For LDCs current government expenditures often (but not always) are more centralized than in DCs such as the United States. Nevertheless, there remains a large effectively endogenous component. The government is a relatively large employer in comparison to total modern-sector employment, the wage bill makes up a substantial portion of its expenditure, and cuts in this expenditure as part of stabilization policy would be extremely risky politically in most cases.

Government expenditures also generally are directly affected by foreign sector conditions. This is so because there usually is some response to available revenues, and taxes related to the foreign sector are a major source of variance in those revenues (see below). A further effect is through official capital inflows. The available evidence suggests (although not conclusively, see Mikesell and Zinser, 1973) that such flows are diverted partly to current government expenditures.

Equation (9) is the import function for DCs. Imports respond positively to the level of income and the domestic price level and inversely to the exchange rate (defined as the number of units of domestic currency per unit of foreign currency).

For most LDCs, as noted above, imports play a critical role in the provision of noncompetitive raw materials, intermediate inputs, and machinery and equipment capital goods for the modern sector. To capture the differential impact of various types of imports on growth and stabilization, therefore, some disaggregation is necessary.

Because many of these imports are noncompetitive and because import substitution policies often have reduced competitive imports to a low level, the price and exchange rate elasticities usually are low in absolute value. The income elasticities, on the other hand, are quite high. Some disaggregation, however, once again probably is necessary because of differential responses to different components of total income (e.g., the modern versus the traditional sector, investment versus consumption expenditures).

Policies to regulate imports are widely thought to be among the most potent available to the governments of LDCs in their quest towards growth, distribution and stabilization objectives. Among the policies often utilized are multiple exchange rate systems, tariffs, direct government imports, prior import deposits and quantitative restrictions.[13]

Quantitative restrictions frequently are used to maintain a disequilibrium system with overvalued exchange rate(s) and severe foreign exchange constraints. Disequilibrium is allowed to persist because of perceived negative distribution, inflationary and political effects of devaluation and widespread convictions about inadequacies of allocation by prices. The existence of strong vested interests in the disequilibrium system (e.g., owners of factors in import-substitution subsectors, the recipients of import licenses, or the government bureaucracy) also help to perpetuate the continuance of these systems. Due to substantial excess demand, nevertheless, controls generally are relaxed when foreign exchange becomes available from export booms or increased capital inflows. The import functions need to be modified, therefore, not only to include the above-mentioned policy tools, but also the availability of foreign exchange.

Equation (10) is the export function for the DCs. Exports are assumed to respond directly to the exchange rate and inversely to the domestic price level.

For LDCs the structuralists and a large number of other observers (e.g., Heller, 1954 and Higgins, 1968) maintain that a major source of instability is fluctuations in the value of exports. Not only do such variations directly affect total aggregate demand, they also change aggregate demand through the government deficit because of the dependence of government revenues on international trade revenues. Furthermore, they alter

[13]In some LDCs considerable smuggling exists in attempts to avoid these policies.

production in the modern sector because of the tight foreign-exchange constraint and the low elasticity of substitution for critical imported inputs. The holders of this view conclude that general fiscal and monetary policy will not be very effective in stabilization attempts. Instead emphasis must be placed on exchange rate and tax policies directly related to exports. Some observers further conclude that movements towards less dependence on the foreign sector is desirable in order to lessen its destabilizing influence.

The seminal investigation of MacBean (1966) has been followed by a number of studies which suggest that the above-hypothesized strong relationship between export instability and overall instability is exaggerated. Mathieson and McKinnon (1974) even conclude that there is some slight indication that "outward-looking" trade policies may increase stability. MacBean (1966) posits that two factors lie behind the lack of a strong relationship between domestic variables and export fluctuations: i) the low value of the foreign-trade multiplier in part because of repatriation of factor returns to foreign owners and because of leakages into taxes on exports, and ii) the distributed lag nature of reactions to changes in exports.

These studies do bring into question the once-conventional wisdom about the destabilizing influence of international markets. The issue is far from resolved, however, because of the failure of such studies to specify adequately the structure (including the lags in responses, as MacBean's second point reflects) of the LDCs. Even the strongest doubters about the importance of international market fluctuations, moreover, grant that export variations probably are destabilizing in those cases in which exports are very concentrated in a few products.

The correct specification of the export function, therefore, is a critical component of a stabilization model for most LDCs. For many countries exports must be divided into two categories which differ substantially in exchange rate and tax-subsidy treatment: traditional (largely primary products) and non-traditional (often industrial products). The former often are major sources of government revenues. The latter frequently are subsidized in hopes of diversifying sources of foreign exchange and gaining entry into faster-growing markets. For the traditional exports of some LDCs, finally, the existence of some market power (perhaps within the framework of international commodity agreements) also needs to be represented.

3. Financial Markets and Assets

The financial market for the DCs in Table 1 is patterned on the extensions of Tobin's (1969) portfolio equilibrium model by Ando (1974) and Branson (1974). Equations (11) — (14) are demand functions of private-sector asset holders for four imperfectly substitutable assets: equities, bonds, foreign securities and money. Equation (15) is the definition of the net worth of the private sector. The demand for each asset is a function of

the rates of return (with a fixed zero rate of interest for money) and income (with a transactions demand for money). The nominal supplies of money and bonds and the interest rate for foreign securities are assumed to be exogenous.

All assets are gross substitutes. Domestic asset-holders must hold given quantities of equities and bonds, neither of which are traded internationally. Domestic asset-holders face an elastic supply of foreign securities at an interest rate fixed internationally. They are free to trade between money and foreign securities. Any purchase of the latter implicitly reduces domestic foreign exchange by an identical amount.

Equations (16) — (18) are relations between holding and capitalization, real and nominal, and holding and international rates for the three respective non-zero return assets. Equations (19) — (22) are simple hypotheses about the formation of expectations. Equation (23) determines the market value of real assets by capitalizing the expected stream of income from *existing* assets.

Branson (1974) analyzes a similar model for DCs. His main results are two. (i) The inclusion of non-internationally traded assets restores the effectiveness of monetary policy as measured by the possibility of altering rates of return on domestic assets relative to foreign securities. (ii) The relative impact of open-market operations on domestic-asset rates depends on which asset is the instrument of open-market operations.

For the LDCs a number of changes need to be made. As discussed above, asset markets generally are quite fragmented, function very poorly and are relatively unimportant in channeling investible funds. Dualism is a common feature, with changes in the organized market having but limited impact on the unorganized sector. Government-bond markets and private-security markets both generally are quite small.

Monetary policy usually is limited in scope, especially internally. The very small bond market precludes substantial open market operations. The nominal money supply is not exogenous, but is dependent on *de facto* or *de jure* obligations to finance the government deficit or on foreign exchange movements. Monetary instruments include marginal and average reserve requirements, rediscount rates, prior deposits on imports, and exchange rate(s). Also important are interest rate ceilings, and quantitative restrictions on internal credit and on international capital flows. The use of these latter policies requires that relations in the model be modified to reflect rationing due to quantitative variables. Uncertainty about future quantitative policies also may complicate the formation of expectations in Equations (19) — (22).

The foreign sector impinges on the financial markets in a number of important ways. As indicated in the previous paragraph, foreign exchange movements have substantial impact on the domestic money supply and the major discretionary monetary operations are in the foreign sector. Foreign direct ownership of domestic capital in the modern sector often is important, so Equation 22 or 23 must be modified so that only the value

of the domestically owned portion of the capital stock enters into domestic portfolio decisions.

In a few LDCs, such as Mexico (see Ladenson, 1974), moreover, the interest rate in the international market may effectively create a liquidity trap for the organized monetary market. In general, however, the international interest rate does not peg the domestic rate for at least one of two reasons: (i) Quantitative restrictions on capital movements break the link between domestic and international capital markets. (ii) The existence of Bransonian internationally nontraded assets which are not perfect substitutes for internationally traded assets permits some independence in interest rate movements.

4. Identities and Miscellaneous Relations

Equations (24) — (28) define disposable income, private savings, income from capital and the balance-of-payments surplus. For the DCs these definitions are basically self-explanatory. Note that capital gains on existing assets arise because of changes in the capitalization rate or changes in the expected stream of income from these existing assets due to varying economic conditions. They do not, of course, include additions to real assets from current net investment. For the LDCs the major special problem is the evaluation of capital gains because of the virtual absence of markets for internal equities.

Equation (29) is the tax function (net of transfers). For DCs the major complication behind this simple representation often is the treatment of the corporation income tax. Therefore income from capital is included as an argument in this function in addition to total personal income.

In LDCs conditions are much different for tax collections. (i) The traditional sector is not monetized. (ii) Literacy is relatively low. (iii) Systematic accounting systems are not widely used. (iv) The legitimacy of government revenue collection is less widely accepted and the tradition of voluntary compliance is less strong. (v) Lack of resources, low civil service pay, and traditional social relations often make efficient and honest tax collection very difficult.

As a result, the relative significance of alternative sources of tax revenues differ from patterns in DCs. General personal and corporation income taxes are much less important. Instead dependence is greater on import and export taxes, indirect taxes and taxes on income generated by foreign-owned corporations. Taxes related to the foreign sector are much more significant because generally they are relatively simple to administer and difficult to evade. This greater dependence on the foreign sector adds to the difficulties of stabilizing these economies because balance-of-payments considerations may conflict with the use of taxes for stabilization purposes. The more regressive nature of the tax structures with its greater dependence on indirect taxes, moreover, implies less "automatic stabilization" from the tax system than in DCs.

Equation (30) is the government budget constraint which Christ (1968) and others emphasize repeatedly. In a closed economy or in an economy with balance-of-trade equilibrium, this relation need not appear explicitly. The model already contains the private sector accounts and a full recording of transactions between the private and government sectors. If the private sector accounting identities are satisfied, so must be those for the government sector.

5. The Foreign Sector and Stabilization in LDCs

To this point the present paper basically has taken a macro-stabilization model for the DCs and has suggested how it might be modified to fit better the situations of LDCs. Such a procedure, unfortunately, does not lead to a nice neat model whose differentials will tell the story for at least three reasons. (i) The initial model for the DCs is sufficiently complex so that such a process is not very fruitful in that case unless one has considerable empirical evidence about the size of parameters. (ii) The LDCs are not homogeneous. Conditions vary substantially across countries. (iii) Modeling of stabilization in closed LDCs is at a very primitive stage. Many problems — such as how to treat the channeling of investible funds — have not been treated adequately. Therefore, there is not much of a basis on which to add foreign-sector considerations.

Nevertheless, this paper hopefully serves as a beginning. Several interesting points are suggested by the analysis.

(i) The traditional sector is subject to fluctuations originating in natural conditions and in export markets for traditional products. At the same time the traditional sector is fairly independent of fluctuations in aggregate demand originating in the modern sector because of variances in investment in that sector or in the availability of non-competitive imports for that sector. The focus of stabilization questions concerning domestic aggregate demand management, therefore, is the modern sector. Stabilization policy for the traditional sector, in contrast, must concentrate on reducing vulnerability to variations in natural conditions (e.g., through better water control) and in traditional export markets (e.g., through diversification or international commodity agreements).

(ii) If the traditional sector determines the real wage for the modern sector and there is no money illusion, the modern-sector labor market is very classical. Changes in aggregate demand will not alter its employment and production.

(iii) The modern sector often is like a very small, open economy in respect to its dependence on the foreign sector for critical raw material, intermediate and capital imports. Variations in noncompetitive raw material and intermediate imports may be the major cause of fluctuations in this sector (even if the real wage is fixed by the traditional sector). Attempts to maintain disequilibrium exchange rates exacerbate any destabilizing forces originating in the foreign sector.

(iv) Because of the importance of the foreign sector as a source for government revenues, fluctuations therein not only have potentially destabilizing effects on the supply and possibly the demand side, but also through government deficits. Government deficits, in turn, affect the money supply quite directly because of *de facto* or *de jure* obligations of the banking system to finance such deficits. The impact of changes in foreign exchange reserves on the money supply, on the other hand, may tend to be counteracting.

(v) The international capital market generally does not limit stabilization options in LDCs by fixing domestic interest rates. In part this is so because of the existence of Bransonian non-internationally traded assets and because of quantitative restrictions which break the link between international and domestic markets. Probably more important is the lack of integrated and well functioning financial markets — which limit stabilization policies even if there is no access to international markets.

(vi) International capital flows, nevertheless, may have significant destabilizing effects. The mechanism is through varying the constraint on imports, with the resulting supply impact noted above.

(vii) International creditors, moreover, often limit the policy options open to LDCs. Because foreign debts frequently are quite large, LDCs cannot blithely ignore the views of such creditors.

(viii) Given the important role of the foreign sector, perhaps stabilization policies should be directed towards it. Some attempts have been made in this direction, both on the level of individual countries and in cooperation with other countries. Stabilization problems, however, often are viewed as less important than concerns relating to growth, distribution and the foreign economic position. If a temporary foreign exchange surplus is available due to an export boom or increased capital inflows, for example, pressures are enormous to utilize it to alleviate other problems. Only rarely do governments find it feasible to conserve such an excess for use when the next foreign exchange deficit occurs. Only if governments are convinced that the costs of fluctuations are larger than previously perceived or that there are gains in other policy dimensions of increased stabilization are more resources likely to be utilized for stabilization purposes.

Table 1

Macroeconomic Model for DCs

I. Labor Market

Demand for Labor

$$E = E(Z) \tag{1}$$

Supply of Labor and the Definition of Unemployment Rate

$$u = u(E, N) \tag{2}$$

Determination of Money Wage Level

$$\frac{\dot{W}}{W} = W(u, L[(\frac{\dot{P}}{P})_{-1}]) \tag{3}$$

Determination of Real Wage Rate and Price Level

$$P = W f(L[\frac{E}{Z}], \mu, u) \tag{4}$$

II. Product Market

Definition of Net National Product

$$Z = C + I + G + X - IM \tag{5}$$

Consumption Function

$$C = C(Y, A) \tag{6}$$

Investment Function

$$I = I(z, r_k, \tau) \tag{7}$$

Government Expenditure

$$G = G_{ex} + G_{end}(Y, N, r_k) \tag{8}$$

Import Function

$$IM = IM(ER, P, Y) \tag{9}$$

Export Function

$$X = X(ER, P) \tag{10}$$

III. Financial Markets and Assets

Demand for Real Assets

$$V = A \cdot f^V (r^h_k, r^r_b, r^h_s, Y) \tag{11}$$

Demand for Bonds

$$B/P = A \cdot f^B (r^h_k, r^r_b, r^h_s, Y) \tag{12}$$

Demand for Foreign Securities

$$\frac{S \cdot ER}{P} = A \cdot f^S (r^h_k, r^r_b, r^h_s, Y) \tag{13}$$

Demand for Money

$$M/P = A \cdot f^M (r^h_k, r_b, r^h_s, Y) \tag{14}$$

Definition of Net Worth

$$A = V + \frac{M + B + S \cdot ER}{P} \tag{15}$$

Relation Between Holding Rate and Capitalization Rate

$$r^h_k = r_k - \frac{r^e_k - r_k}{r_k} \tag{16}$$

Relation Between Real and Nominal Short-Term Interest Rates

$$r^r_b = r_b - \frac{P^e - P}{P} \tag{17}$$

Relation Between Holding and International Rate for Foreign Securities

$$r^h_s = r_s + \frac{ER^e - ER}{ER} \tag{18}$$

Generation of Expected Rate of Change of r_k

$$\frac{r^e_k - r_k}{r_k} = F^k \left(L\left[\frac{r_k}{r_k}\right]\right) \tag{19}$$

Generation of Expected Rate of Change of Prices

$$\frac{P^e - P}{P} = F^P \left(L\left[\frac{\dot{P}}{P}\right]\right) \tag{20}$$

Generation of Expected Rate of Change of Exchange Rate

$$\frac{ER^e - ER}{ER} = F^{ER} \left(L\left[\frac{\dot{ER}}{ER}\right]\right) \tag{21}$$

Expected Income From Capital

$$\pi^e = F^\pi (\pi, P \cdot L[(\pi/P)_{-1}]) \tag{22}$$

Market Value of Capital

$$P \cdot V = \frac{\pi^e}{r_k} \tag{23}$$

IV. Identities and Miscellaneous Relations

Definition of Disposable Income

$$P \cdot Y = P \cdot Z + r_b \cdot B - P \cdot T + r_s \cdot S \cdot ER \tag{24}$$

Definition of Savings

$$d(P \cdot A) = P \cdot Y - P \cdot C \pm d^*(P \cdot V) \tag{25}$$

Definition of Income from Capital

$$\pi = P \cdot Z - W \cdot E - \tau_c(P \cdot Z - W \cdot E) \tag{26}$$

Capital Gains on Existing Capital

$$d^*(P \cdot V) = d(P \cdot V) - P \cdot I \tag{27}$$

Balance-of-Payments Surplus

$$H = P \cdot X - P \cdot IM + r_s \cdot S \cdot ER - ER \cdot dS \tag{28}$$

Tax Function

$$P \cdot T = T(P \cdot Z + r_b \cdot B + r_s \cdot S \cdot ER, \pi, \tau) \tag{29}$$

Government Budget Constraint

$$dM + dB = P \cdot G - P \cdot T + r_b \cdot B \tag{30}$$

V. Variable Definitions

A : Net Worth of Consumers

B : Government Debt Held by Private Sector

C : Consumption in Constant Currency

$d*PV$: Real Capital Gain on Existing Real Assets in Current Currency

E : Employment in Manhours

ER : Exchange Rate in Domestic Currency per Unit of Foreign Currency

ER^e : Expected Exchange Rate in Domestic Currency per Unit of Foreign Currency

G : Total Government Expenditures in Constant Currency

G_{ex} : Exogenous Government Expenditures in Constant Currency

G_{end} : Endogenous Government Expenditures in Constant Currency

H : Surplus on Balance of Payments in Current Currency

I : Net Investment in Constant Currency

IM : Imports in Constant Currency

L : Lag operator

M : Money Supply in Current Currency (Currency Plus Reserves)

N : Vector Expressing Total Population and Its Structure

μ : Standard Mark-up Factor (i.e., the Ratio of Price of Output to its Minimized Cost of Production Expected to Prevail Under Normal Employment Conditions)

P : Price Level for Output

P^e : Price Level Expected to Prevail

Π : Income from Real Assets in Current Currency

Π^* : Expected Income from Existing Real Assets in Current (not future) Currency

r_b : Nominal Rate of Interest on Government Debt

r^r_b : Real Rate of Interest on Government Debt

r_k : Capitalization Rate (in real terms) Applicable to Real Assets

r^e_k : Level of r_k Expected to Prevail

r^h_k : Holding Rate (in real terms) Applicable to Real Assets

r_s : Real Rate of Interest on Foreign Securities

r^h_s : Holding Rate (in real terms) Applicable to Foreign Securities

S : Foreign Securities Held by Private Sector

T : Taxes in Constant Currency

τ : Tax Rates (Subscript "C" refers to Corporations)

u : Unemployment Rate

V : Market Value of Existing Real Assets in Constant Currency

W : Nominal Wage Rate Per Manhour

X : Exports in Constant Currency

Y : Disposable Income in Constant Currency

Z : Net National Product in Constant Currency

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Discussion

Bent Hansen

In view of his general search attitude to the question of modeling stabilization policies for LDCs, Behrman might as well have entitled his paper "In Search of a Paradigm." I sympathize very much with this attitude. So much work has gone into long-term models of planning for LDCs, so little into short-term models for stabilization policies. Models set up for studying short-term problems of DCs do not carry over to LDCs without modification. Behrman's attempt in this paper to start out from a DC model based on models by Ando and Branson clearly demonstrates that the modifications required, even for relatively advanced countries (which is probably what Behrman had in the back of his mind) may be so profound that little is really left of the original DC model.

Behrman himself makes the point that LDCs are many different things. They range from preindustrialized to fairly industrialized countries; from private-enterprise countries via mixed economies with public ownership of modern enterprises and controls to varying degrees with the remaining private activities to communist countries; from being almost autarkic to heavy dependency on foreign trade and loans; and from virtually free foreign trade and payments to tightly controlled foreign economic relations. Platitudes apart, it would appear difficult to say anything general about the international aspects of stabilization policy for LDCs with such a variety of levels of development and institutional arrangements. Behrman himself emphasizes the lack of homogeneity of the LDCs and the primitive state of stabilization analysis for such countries; considering also his own failure in coming out with a definite LDC model, one would not have expected him to be able to have anything general to say about the stabilization problem in its relation to international transactions. Nonetheless, he does conclude the paper with eight "interesting points," which to me, however, just prove how difficult it is to come out with general conclusions in this matter. Let me comment briefly on these points before I return to the basic issue of the paradigm:

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Behrman's point (i) states that "the focus of aggregate demand stabilization questions...is the modern sector." But this cannot possibly be generally true. Countries at the preindustrialization level — and there are still quite a few — may experience both inflation and balance-of-payments difficulties, as well as fluctuations in the distribution between rich and poor and between urban and rural areas (both highly traditional) that call for stabilization policies. Had Behrman been talking about the "monetized sector," I could have followed him better.

Behrman then goes on in his point (ii) to explain that "changes in aggregate demand will not alter [the modern sector's] employment and production," granted that the traditional sector determines the real wage for the modern sector and there is no money illusion. Since it is also held that "the traditional sector is fairly independent of aggregate demand," the conclusion seems to be that demand management has consequences only for the price level and the balance of payments and not for domestic production. Now, this is first of all at variance with Behrman's own analysis, where he rightly points out that to the extent that the modern sector does not produce wage goods, the situation is indeed Keynesian, even though *real* wage rates are determined in the traditional sector. Moreover, the statement assumes equality between wage rates and marginal value product of labor, even in the short term; this assumption has been heavily criticized (from Patinkin to Grossman) for DCs and is probably even less realistic for LDCs, in particular when the modern sector in such countries is in a monopolistic position and exposed to price controls. The statement also contradicts the experience from so-called "stabilization programs" in LDCs which typically create recessions in the short term. Let it not be forgotten here that part of the modern sector's production is related to investment activities (construction), and nobody would presumably deny that such activities are dependent upon effective demand.

To the following points (iii) to (vii), I have less objection, partly because they are much less categorical (they are mostly conditioned by words such as "often," "may," etc.). It is certainly true that the availability of raw materials and intermediate imports may cause fluctuations in the modern sector; that destabilization via the budget may take place because of the predominance of foreign trade taxes; and that changes in the availability of foreign loans may have serious consequences for the stability of the domestic economy. Yet I find it a mistake to consider foreign trade only as a source of disturbances. The foreign trade leakage is obviously a stabilizer in regard to domestic production and prices; this is particularly important in relation to one of the major sources of instability in LDCs (and, let us add the Soviet Union, viz. crop fluctuations), the effects of which on prices, consumption, etc. are most easily neutralized through foreign trade.

In his final point (viii), Behrman raises an important question that is difficult to discuss without a concrete model. He says that "given the important role of the foreign sector, perhaps stabilization policies should be

directed towards it." What he has in mind here is presumably the possibility of nipping the disturbances "in the bud." It can be shown that the structure of models may be such that it is possible to neutralize the effects of disturbances on all target variables by using a smaller number of instruments than the number of targets [Hansen, 1971]. It is easy to give examples. If all export and import prices increase in the same proportion, the effects on the domestic economy and its targets, no matter how many they are, are neutralized by a proportional devaluation. But generally everything here depends upon the model structure. That foreign disturbances should be countered at the border, as it were, is, of course, an old idea. Commodity arrangements, buffer stock policies, etc., serve this purpose. There is a substantial literature on this issue, and substantial disagreement about this kind of policy. Behrman might have taken them up for discussion.

Returning to the problem of the paradigm, I believe that something general can be said, despite the disparity of the LDCs in regard to levels of development and institutional setups.

(a) First, of course, the diversity itself indicates that we should not search for *the* paridigm. Not even in its broad features may there exist a paradigm capable of covering all cases.

(b) Controls and public ownership may profoundly change the behavioral equations. These should be derived not only under the individual budget constraints, but also under the constraints implied by controls and public ownership. The main reference at this point is, of course, Clower and Grossman. The assumption of profit maximization may have to be dropped. Behrman mentions two well-known examples: the arguments of the investment function may have to be capital goods imports (licenses) and government capital grants rather than national income, interest rates, etc.; and that of the import function may have to be exports rather than national income. Also, the consumption function ought to be formulated on the assumption of such constraints; when the upper income brackets are prevented from buying imported luxury cars, do they increase savings, start drinking, or, perhaps, stop earning income?

(c) To be useful for designing short-term stabilization policy, a model should identify major sources of disturbances, major targets, and be able to accommodate all possible policy instruments. Without prejudice in regard to statistical frequency and size, crop fluctuations, public expenditure for investment and defense, and prices in foreign trade may from a short-term stabilization point of view perhaps be considered the major disturbances in LDCs. In addition to the traditional targets of growth, price stability, and foreign payments equilibrium, another — the need for equalization of income and wealth distribution, has recently emerged with increasing emphasis, often with a rather detailed specification. Policy instruments in LDCs often work via relative prices or, as already mentioned, take the form of special commodity arrangements designed so as

to nip the disturbances "in the bud." Considering, moreover, that fluctuations of crops and foreign trade prices are often concentrated on specific commodities, it follows that far-reaching disaggregation, down to major commodities, may be needed to discuss policy problems adequately.

Disaggregation, incidentally, has the advantage of making most of the "great issues" in model building for LDCs evaporate into thin air. With disaggregation on agriculture, modern industry, and traditional services, we can let supply constraints dominate in agriculture and modern industry (if raw material supplies are constrained, for instance) and demand constraints dominate in traditional services and modern industry (if capacity is underutilized and raw materials available). With agriculture broken down by major commodities we can accommodate both the view that total agricultural supply responds little to demand and prices in the short term, and the view that individual commodities respond strongly. And with a sufficiently detailed sector breakdown we can accommodate both the view that factor substitution is negligible for individual sectors and substantial for the economy as a whole through changes in the composition of demand and output by sector. And so on, and so forth. Most of these issues have only arisen because the LDCs have been presented in terms of oversimplified aggregate models.

(d) The data situation in LDCs, finally, not mentioned at all by Behrman, is much more decisive for the choice of model than it is in DCs. It is no secret that data are scanty and often of poor quality in LDCs; black and gray spots dominate the map. This situation gives rise to two considerations:

First, it raises the question of what we realistically can and should aim at. To hope for quantitative predictions with well-defined probabilistic properties is nothing but pipe dreams. Full-fledged econometric analysis on the total level is simply impossible, basic data being what they are. The most we can hope for is simulation studies that in the worst of cases may be little more than numerical examples.

Second, the scantiness of data points to disaggregation rather than the opposite. Almost all countries present official, aggregative national income statistics with some breakdowns by producing sectors and expenditure categories. Behind these aggregative "data" there are some primary price, quantity and/or value data for individual goods and services. It would be a great mistake to believe that one covers the total economy by using the aggregative "data" in an aggregated model and that in restricting oneself to using the primary data in a disaggregated model one would lose any information, despite the fact that a disaggregated model necessarily would have to leave parts of the economy uncovered. The "complete" coverage obtained by using aggregative data is more often than not a statistical illusion; the gaps in information have somehow been filled in by those who constructed the "data" and aggregative analysis serves only to hide such gaps.

All the considerations under (a) through (d), taken together, have led me to the conclusion that, at least for countries at a low level of development with relatively few direct controls, a Walrasian type of model specifying demand, supply, and price determination equations for all major, individual goods and services (sectors) is superior for discussions of short-term stabilization models. Such models tend to become large, but they are computationally feasible as models set up for Afghanistan [Hansen and Kreidieh, 1972] and Thailand [Neu, 1974] have already demonstrated. They make optimal use of existing information; they are honest in disclosing where hard information ends and soft information begins; and they are sufficiently detailed in their specification for allowing all important disturbances and policy instruments to be studied. But such Walrasian demand-supply models may be difficult, even impossible, to apply to more complex economies at higher levels of development or with heavy government controls.

Here other paradigms may have to be applied.

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