

PANEL DISCUSSION IMPLICATIONS OF GROWTH THEORY FOR MACRO-POLICY: WHAT HAVE WE LEARNED?

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We are witnessing, in the second half of this century, an unprecedented wave of growth across the world. The experience of the East Asian and OECD economies has proved that real convergence can be achieved within a few decades. However, the welfare and technological gap between the developed and the least developed countries continues to widen, even as large sections of the world economy have recently joined the international trading system.

Confronted with the extraordinary amount of quantitative and institutional data amassed by statistical and case studies, we need theories to interpret these phenomena. Economists of the "old" and "new" growth theories have gone a long way in explaining why some countries grow faster than others, but I believe that any model that could explain such a variety of experiences would have to be quite complex. Otherwise, we would already have discovered the "recipe for making miracles," as Lucas (1993) has wisely reminded us, and countries around the world could already have applied such a simple model. I will attempt here not to review models of growth theory, but to underline some of the most important traits of the theory that are relevant for macro-policy. Let me begin by reviewing some assumptions about growth and technology that seem to come out of the recent flurry of empirical work.

First, technological progress is of overriding importance in explaining growth in developed economies, while most of the growth in developing countries takes place through human and physical capital accumulation that incorporates ideas, products, or processes transferred from the more

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advanced countries.¹ A recent World Bank study by Nerhu and Dhreshwar (1994) estimates the factors contributing to growth for about one hundred countries in the post-World War II era. The average growth rate of total factor productivity for developing economies is a mere 0.07 percent per annum, while for developed economies it is 1.7 percent.²

Second, one of the most important relationships is that between GDP growth and the accumulation of human and physical capital. I believe that the failure of some studies to detect any important channel of causation from exports (or outward orientation) to growth reflects the fact that external trade acts not directly on the "growth residual" or growth in total factor productivity but through the embodiment of new technologies and new products in the economy, and is thus complementary to the accumulation process.

Third, technological leadership persists secularly. The United States overtook Great Britain in the late 1800s and it has maintained its leadership since then. As of 1990, the technologically closest competitors (Germany and France) could produce only 80 percent of U.S. output using the same measured inputs (Lau 1996). However, the OECD countries have narrowed the technological gap significantly since World War II.

And fourth, technical progress augments both physical and human capital. All three assets complement each other.

Two types of models are relevant to our discussion: first, a model of the growth process of a small open economy. Such models explain growth in terms of human and physical capital accumulation and in terms of shifts in the production efficiency frontier as a "quality ladder" or "expansion of varieties," generated by inventions, by the external effects of human capital, and by "learning by doing." In all such models,

¹ This has led some authors to describe East Asian growth as less than miraculous. In fact, recent empirical studies carried out by Young (1993) and Lau (1996) have confirmed that total factor productivity growth for these economies is not higher than the world average (and even null, for certain cases). But this should not distract from the basic fact that the Asian Tigers have converged at an unprecedented pace in the past three decades. Indeed, most of their growth is due to human and physical capital accumulation combined with the right policies: outward orientation and macroeconomic stability. Recent evolution has proved wrong the prediction of a slowdown in the Asian Tigers because of the law of diminishing returns. Singapore and Hong Kong have been developed countries for some time, and their growth rates continue to be among the highest in the world. The others, although entering the league of developed economies, also have not experienced a decrease in growth rates. The reason is that these economies, all small, have already established themselves as technological leaders in some niches and thus have started to generate technological progress themselves (Mateus 1995 and references therein).

² The same conclusion is reached in several studies by Lau (1996) and associates. Using a translog, they have found that physical capital is the most important factor of growth in developing countries and, jointly with human capital, much more important in developing than in developed economies. While local scale economies are important for developing countries, technological progress explains about one-half of the growth in developed countries.

the interaction between exports and technological diffusion is fundamental to a productivity increase in the domestic economy. This will be dealt with in the first section of this paper.

The second type of model is concerned with the international diffusion of technology and the convergence process. These models stress the importance of innovation and growth in the developed economies and the diffusion of inventions and new techniques to the follower economies. With the tendency for transfer costs to increase, the rate of convergence would decelerate as economies become more developed. This will be dealt with in the second section.

The third section will consider some aspects of globalization and the transfer of technology. Then I will refer to some other macro-policies that underlie the productivity of technology, and in the final section I will offer some conclusions.

GROWTH OF A SMALL OPEN ECONOMY AND MACRO-POLICIES

Most recent studies show that growth takes place through externalities generated by human capital accumulation, by the resources dedicated to R&D activities, and by the "learning by doing" effects that occur in the production process. Growth can occur with the expansion of existing production, the introduction of new goods, improvements in quality, or an increase in varieties.

Here we rely heavily on the contributions of Grossman and Helpman (1991a and b), Stokey (1991), and Young (1991). A fast-growing economy, with a technology consistent with a "growth miracle," is one that accumulates human capital—knowledge—at a fast pace, and uses that knowledge to build and operate private physical capital and infrastructure.³ Such an economy succeeds in concentrating its work force on the production of goods that are near its own quality frontier and, thus, in accumulating human capital rapidly, through the high learning rates associated with new activities and through the spillover of this experience to the production of still newer goods.

Because human capital accumulation takes place primarily in schools, the quality of and time allocated to the formal schooling of the labor force are the essential elements. Several studies have demonstrated that all the other activities that augment human capital (learning by doing, health, nutrition, research activity, "openness of mind to innovation") are related to the general literacy and numeracy of the population.

³ Singapore is an interesting case in this regard. Several economists have considered that despite its high growth rate, the lack of total factor productivity growth observed in the last three decades results from "excessive technological change" caused by state policies.

Obviously the learning process will occur at a faster pace if a society can benefit from world knowledge and "best practice technologies" so that workers and managers move up what Grossman and Helpman call the "quality ladder," continuously taking on new tasks and new processes. To import advanced capital goods and technologies and interact with more demanding markets requires that the economy be a relatively large-scale exporter. In other words, in order to start a "growth miracle," the economy must experience a large disparity between the mix of relatively sophisticated goods produced and the mix consumed by the local population, a difference that could even widen over time. A large volume of external trade is, thus, essential to a learning-based growth episode.⁴

Despite these deterministic theories, an important element of randomness crops up in technological development. Not only are inventions random, but so too are the outcomes of firm strategies to target a specific product or process, which eventually reveals itself to be either a "leading sector" or a "dead end." The United States and Japan have specialized in industries that are dynamic in both technological development and market impact, while Europe in the 1980s and 1990s has been unable to develop such sectors, a failure that explains in part why Europe is lagging in technological progress.⁵

Lucas (1988) and Krugman (1981) have shown that when an economy is too far apart in technological terms from others, it may never converge. Worse, it could even lose welfare by external trade. The logical consequence of Schumpeterian creative destruction has been witnessed in full force (at present, with more destruction than creation) in the case of the Eastern European economies.⁶ What would be the most sensible macroeconomic policy for these transition economies? Revert to autarky? Give production subsidies or impose tariffs on imports in the context of an "infant industry" argument? As the next section will make clear, and the experience of East Asian economies shows, there is no shortcut to the process of institutional change and industrial restructuring required

⁴ Forms of technology transfer do not take necessarily the form of patents. A survey carried out among entrepreneurs in East Asia has revealed that contact with final markets (and marketing firms), imports of machinery and related technical assistance, reverse engineering, and technical assistance among suppliers and subcontracting are all important (Rhee, Ross-Larson, and Pursell 1984).

⁵ Microeconomic studies have revealed that open competition and large market access and integration are important factors in this regard.

⁶ This most interesting historical experiment should be studied by the new development economists. Not only do the factories in these countries demonstrate an abysmal technological gap, but also these countries lack the institutions and economic fundamentals (macroeconomic stabilization) that are essential to put those economies on a path of sustainable growth. Within our model, this would require the integration of those economies into the international trading system, where the process of technology transfer could operate.

when integrating an economy into the international trade system. Indeed, the new theories have shown that the process may be long and painful.

However, I do think that this result—the possibility of welfare reducing trade—applies mainly to the manufacturing sector. It may apply in the case of the Czech Republic and Poland or Hungary, but not to Moldavia, Armenia, or Mozambique. In these latter cases the old Heckscher-Ohlin theory of intersectoral resource-based trade would apply, and the traditional pattern of specialization and welfare-enhancing free-trade policies would be relevant.

The policy implications of all these theories put high priority on human capital accumulation through formal schooling (universality of primary schooling and large-scale secondary schooling), along with the university and R&D activities required for invention and innovation. Because of the non-rival character of knowledge, government action (for example, subsidies or public organizations) to promote investments in those areas can generally lead to outcomes that are superior to pure decentralized market solutions. Patenting systems and property rights protection are also essential to increased R&D.

Another important implication is the need for an open and highly competitive market system to promote efficiency. In this regard, and to facilitate technology transfer from abroad, external trade policies that foster export growth and openness are essential.

INTERNATIONAL DIFFUSION OF GROWTH AND MACRO-POLICIES

Sometimes overlooked is the fact that technological growth, the “residual factor,” is much more important in developed than in developing economies and, therefore, that the transition from a developing to a developed economy requires the buildup of capacity for “leadership, invention, and innovation” specific to that country, within the context of comparative advantage. The developed economy has already built most of its human and physical infrastructure, and most of its growth has to come from technological progress. In industrializing countries, the accumulation of human and physical capital is dominant, and the country grows faster if it adopts the “best practice” available in the world stock of knowledge. This theory has an important policy consequence: A developing country cannot become developed unless it builds the capacity to invent and innovate on a scale that makes it a technological leader in some sectors or subsectors.

In this context, long-term growth in developed nations must have as its engine technological progress. Most such progress stems from the private research that underlies commercial discovery, motivated along Schumpeterian lines by the flow of profits that accrues to an innovator. As we know, the profit flow depends on some form of monopoly power,

secured by patents and property rights, to appropriate the benefits of the research investment. Another, more limited form of progress takes the form of "learning by doing," which improves techniques and processes economywide, for example, by the spread of computers and automation.

Here we will follow mainly the work of Barro, Mankiw, and Sala-i-Martin (1995) and Barro and Sala-i-Martin (1995a and b). For cross-country comparisons, the key element is that imitation typically is cheaper than invention. Most countries therefore prefer to copy rather than invent. Moreover, the relatively low cost of imitation means that the typical follower grows relatively fast—assuming an outward-looking society, alert to the new inventions and processes occurring randomly in different places all the time⁷—and tends to catch up to the leaders, given favorable government policies and favorable returns to the introduction of new technologies. As the pool of copyable material decreases, however, the costs of imitation tend to rise and the follower's growth rate tends to fall, unless the follower economy has already built in the necessary capacity for invention and innovation.⁸ Hence, in this model, a pattern of conditional convergence emerges that seems consistent with actual observations. A country that is a follower can avoid a deceleration in its growth rate (as the case of Singapore illustrates) if it develops enough technological capability to innovate and generate technological progress.

An important distortion occurs in these models when agents in the leader country have insufficient incentive to innovate because they do not take into account the benefits to follower countries from an increase in the pool of copyable ideas. This effect would be internalized if each innovator in the leader country retained international property rights over the use of her idea. This conclusion has been challenged by Helpman (1993). He concludes that a stricter enforcement of international property rights leads to loss of welfare to the follower countries and sometimes even to the leaders. However, his results are derived from a model that puts too much emphasis on a duopoly context and not enough on the impact of expanding the frontier of world knowledge.

Once again, one of the most important policy conclusions is that technological diffusion requires a fairly open world system, and an economy will most readily reap the benefits of technological progress if it maintains an outward orientation. Also note that the rate of technological transfer usually depends on at least a minimum of human capital, and the most advanced followers will copy the most advanced products. There is

⁷ In this regard, the experience of the East Asian economies is important.

⁸ This is the reason why the growth rate of countries such as Japan and Singapore did not decrease substantially, even after they had achieved catch-up. But in Japan a deceleration in the growth rate did occur from the '80s to the '90s, even if we abstract from the impact of the business cycle.

a continuum of imitators, by order of sophistication. So, developing countries should start early to build their own capabilities for invention and innovation.

The next section will develop further the importance of the phenomenon of globalization. We will discuss briefly the case for international portfolio diversification and criticize some of the current policy stands arguing for "fair trade."

GLOBALIZATION AND THE SPREAD OF TECHNOLOGY

An open system of free, market-oriented trade and a free flow of ideas and technologies are essential to fostering world growth and real convergence among nations. However, this conclusion has been hotly questioned recently because of the impact of increasing globalization on unemployment and the wage rates of low-skilled labor in developed economies. What does economic theory have to add to the debate?

What would be the impact on the rate of innovation in the leader countries of an expansion in the follower economies? This question is of paramount importance in view of the ongoing access of large entrants such as Russia and China into the world trading system. In a Grossman-Helpman type of model, the impact most likely is positive.⁹ Greater intensity of imitation will lead to a decline in the average length of time that a firm in a developed country can expect to earn positive profits. However, the profit rate enjoyed by industry leaders may be higher when the developing area is larger.

Present levels of globalization are not high, from a historical perspective. In fact, trade, capital flows, and human migration are not much higher, in relative terms, than the levels achieved before World War I. What is new is the large drop in transportation costs, and the much more efficient networks of telecommunications and computer technology. Krugman (1996) has assessed the impact of the dramatic reduction in transportation costs on globalization. He finds a convergence of real incomes, in which peripheral regions gain relative to the core regions. This result is consistent with some of the hypotheses just discussed.¹⁰

But even among developed countries, increased integration has made several industries more "footloose" than ever; they all face fierce competition with a much-reduced buffer for their competitive edge vis-à-vis their rivals. Today's technology can be accessed simply by having skilled technicians with the necessary scientific training—hence the frantic search for patent rights in order to secure royalties. Compar-

⁹ See, particularly, Grossman and Helpman (1991a).

¹⁰ This situation may apply to cases like the OECD versus the East Asian region, or Northern Europe versus Southern Europe.

ative advantage in these industries is *kaleidoscopic* (Bhagwati's terminology), because it will move across developed countries almost randomly.

Notwithstanding, several authors (for example, Obstfeld 1994) have shown that financial globalization, which generates international risk-sharing, can yield substantial welfare gains at the world level through its effect on expected growth in consumption. We know that growth depends on the availability of an ever-increasing array of specialized, hence inherently risky, production inputs. Global diversification will allow shifting the world portfolio from safe low-yield capital to riskier high-yield capital. Using some simple and purely illustrative exercises, Obstfeld estimates that the welfare gains accruing with international technology transfer can reach 22 percent in Southern Europe and 43 percent in North America, 107 percent in South America, and about 270 percent in developing Asia and Africa. Purely financial integration can add about 60 percent to North Europe, 100 percent in the Americas and about 200 percent to the developing countries.

LONG-RUN FUNDAMENTALS: SELECTED LESSONS ON FISCAL POLICY

Empirical studies have proved that economies do converge on a conditional basis. In the Solow model, "steady states" are defined by saving rates, population increase, and rates of technological progress. In the new theories, "steady states" depend on government policies, intertemporal discount rates, intertemporal marginal rates of substitution of consumption, and other variables like the time required for human capital accumulation, or various parameters related to external effects. Among these variables we are going to select the ones more directly related to macro-policies and thus controllable by the government.

It is often forgotten that innovation and diffusion take place in a macro environment, and the profitability of these processes depends on several important parameters that are controlled by macro-policy.¹¹ The rate of return of an R&D project, a new discovery in the productive process, or a new plant using an imported technology, depends on parameters like the marginal tax rate, the cost of private and public capital, and direct and indirect labor costs. In their extensive work, Barro and Sala-i-Martin (1995b, ch. 12) find that after the accumulation of human capital, the most important variables are the ratio of government consumption to GDP, the black-market premium on foreign exchange, and political instability. The first two relate mainly to fiscal policy and trade policy. Thus, we encounter once again the same policies emphasized by international organizations and in several large-scale studies by

¹¹ For a simple model that touches on most of these policies, see Easterly et al. (1993).

the OECD, the World Bank, and the NBER: macroeconomic stability and trade liberalization.

This section will raise some medium-term issues related to those policy parameters, in light of recent growth theories. Governments often have been accused of following relatively myopic rules because they are interested only in being reelected. But if we take dynamic consistency seriously, a credible government (one that may be rewarded by being reelected) is the one that can pursue growth-enhancing policies. Ideally, an optimal policy should not only produce effects over the short term, but shift the growth path towards a higher intertemporal welfare.

What are the implications of growth theory for the intertemporal budget constraint? This problem is related to the calls for a balanced budget over the cycle, as in the recent German proposal for the European Monetary Union. Can we derive any guidelines for the structure of the government budget? For example, what lessons have we learned in Europe, with our high social expenditures and wage replacement ratios? A major problem afflicting both Europe and North America is the question of the solvency of the social security system. Have we taken the challenge seriously? Is not our inability to learn some of the teachings of modern growth theory hampering the ability of our economies to reach a higher level of intertemporal welfare?

Blanchard-type models of overlapping generations suggest that public debt crowds out the private stock of capital. In the case of overlapping generations with an infinite horizon, Ricardian equivalence will not hold, for a number of reasons. Thus, for all these reasons, over the long term, a high and rising debt ratio would lower the long-term growth rate. A large empirical study carried out at the World Bank confirms this result. A 1 percentage point increase in the government surplus as a share of GDP is associated with a 0.37 percentage point increase in per capita GDP growth and a 0.24 percentage point increase in the investment ratio. An interesting negative and significant correlation exists between per capita growth and the variance of fiscal balances.¹² Studies carried out at the European Monetary Institute have also shown that increases in long-term risk premia are positively related to both debt ratios and budget deficits. The increase in gross public debt as a share of GDP from 38 percent in the early 1970s to 70 percent in the mid 1990s in the European Union has had a substantial impact on the slowdown of the economy.

These results underline the importance of the European Union initiative proposing a "stability pact" within the future Monetary Union.¹³ That proposal would require all countries to have balanced budgets over the

¹² See Easterly, Rodriguez, and Schmidt-Hebbel (1994), p. 24.

¹³ The other purpose is to avoid "free-rider" and "bail-out" problems among Monetary Union members.

business cycle but would allow the use of automatic stabilizers for stabilization purposes. Similar proposals have also been voiced in the case of the United States.

Budget Structure: Taxes and Expenditures

Using the neoclassical theory of public finance in a growth model enables us to illustrate some results concerning the optimal level of the public sector and the structure of taxes and expenditures. State activities are essential for welfare, but when overproduced they can lead to a substantial deceleration of growth, as various empirical studies have shown. The level and structure of state activities depend on several trade-offs: First, the provision of public goods can either increase societal welfare (basic education, sanitation and public health, defense) or increase the productivity of private activities (physical and human infrastructure). Second, the activities that reinforce property rights increase the expected rate of return and thus the probability of capital investment. However, in order to finance production of public goods, the state has to raise taxes, thereby distorting relative prices, decreasing the marginal productivity of capital, and reducing labor income and savings, thus decreasing the efficiency of the economy. Furthermore, some public goods are subject to congestion, which lowers individual utility. We could also consider the state's redistribution activities that prevent absolute poverty and partially correct skewed wealth and income distributions. These trade-offs have been recently modeled in abstract terms. The theory of project evaluation developed in the late 1970s and early 1980s has also recognized those effects, but apart from some interesting applications by international organizations, the theory has been largely neglected.

A wider use of consumption-based tax systems and a significant reduction in the scale of the public sector, with more taxation of benefits and better project and activity appraisals, together with better governance and more control over the number and behavior of beneficiaries, would go a long way towards correcting most of the major fiscal distortions prevailing in our societies. Removing current distortions would certainly enhance long-term growth substantially.

The Social Security Problem and the Costs of the Welfare State

One system that is clearly unsustainable on present parameters is the social security system, not only in developed countries but in transition economies and developing countries as well. The unfunded liabilities of social security systems in most of the OECD countries are above 100 percent of GDP. These liabilities put an enormous burden on future generations and could lead to unbearable indirect labor costs. (The World

Bank has estimated that in some Eastern European countries, with the present system, social insurance contributions could exceed 60 percent of payroll in the near future.) Coupled with unemployment schemes that create disincentives to work and other rigidities in labor markets, these distortions have created very high levels of unemployment in Europe for more than a decade. Increasing growth urgently requires reforms to lower marginal tax rates on saving and investment and to increase the incentive to work.

CONCLUSIONS

We can learn a great deal from theoretical models of growth as well as from the economic experiments with macro-policies of recent decades. From the interaction of these two fields, I would emphasize the following conclusions. First, the policy advice of international organizations that has centered on macroeconomic stability, trade liberalization, and market-oriented policies and has emphasized the building of human capital, seems to be vindicated by the new growth theory and by the current spurt of growth in at least a part of the developing world. Second, the potential for improving welfare through technological diffusion and portfolio diversification on a worldwide scale is still enormous. Some illustrative simulations show an increase in welfare of two to four times in the developing regions of the world. Besides getting the fundamentals right, however, realizing such benefits requires a continuous process of building human capital, transfer of technology, and financial integration.

I believe that most of the problems witnessed in developed countries can be resolved by domestic policies, and that blaming globalization and "social dumping" is misplaced. Reducing unemployment in Europe will require a more flexible labor market and cuts in the marginal rates of taxation and other "welfare state" costs.¹⁴ Stagnant wages for unskilled workers in North America could be addressed by more adequate redistribution policies.¹⁵ Similarly, slow growth in Japan requires external and domestic trade liberalization, side by side with cleaning up the aftermath of the inflationary bubble of the early 1990s.

¹⁴ Tax wedges in 1991 were 39 percent for blue-collar workers in the United States, but reached 60 percent in Italy, the Netherlands, and Belgium. For white-collar workers, tax wedges reach up to 90 percent and more in some European countries (data from the OECD, *Economic Perspectives*, January 1993).

¹⁵ Minford, Riley, and Nowell (1995) have proved, within the context of a model with constant returns to scale and non-traded goods where comparative advantage depends on endowments of immobile skilled labor, raw labor, and land, that technology transfer enhances world welfare—improving the terms of trade of the OECD or North while raising productivity in the "emerging economies" of the South. But they calculate, with reasonable parameters, that the impact of that integration translates into skilled wages increasing in the North by 1.6 percent per annum and unskilled wages falling by 2 percent per annum, which is a pretty dramatic redistribution of income.

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