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Richard W. Kopcke and Eric S. Rosengren — *Are the Distinctions between Debt and Equity Disappearing? An Overview*

Yolanda K. Henderson — *Is Leverage a Tax Dodge—or Not?*

Lynn E. Browne — *Why Do New Englanders Work So Much?*

Joe Peek — *A Call to ARMs: Adjustable Rate Mortgages in the 1980s*

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Contents

Are the Distinctions between Debt and Equity Disappearing? An Overview

Richard W. Kopcke and Eric S. Rosengren

During the 1980s, the proportion of business assets financed by debt exceeded that of any other period since World War II. The characteristics of financial securities also changed, as junk bonds, variants of preferred stock, warrants, and other forms of mezzanine financing became more common in credit markets and in private loan contracts. Furthermore, the potential risks and returns offered by all securities have been altered as otherwise familiar financial instruments increasingly contain novel options.

These innovations have challenged the traditional financial and legal distinctions between debt and equity. To examine the changes in business financing, their causes and the implications for public policy, the Federal Reserve Bank of Boston in the fall of 1989 sponsored a conference of academics, lawyers, investment bankers, economists, and government officials. This article offers an overview of the conference papers and the discussants' remarks. 3

Is Leverage a Tax Dodge—or Not?

Yolanda K. Henderson

In passing the Tax Reform Act of 1986, policymakers wanted to ensure that corporations would pay their fair share of tax. Congress broadened the corporate tax base, rescinded the investment tax credit, and instituted a new minimum tax. The issue of adequate tax payments has not gone away, however, because corporations have been taking larger interest deductions as a result of having substituted debt for equity on their balance sheets.

This study begins by measuring the aggregate tax consequences of corporate leverage decisions. It also examines the tax implications of recent transactions in which corporations effectively increased their leverage, not by changing their financing of new investment projects, but by reducing their outstanding net worth. The author argues that policymakers concerned with stemming further revenue losses should look to responses other than outlawing certain controversial forms of restructuring or restricting interest deductions that appear to be excessive. At most, they should consider altering tax laws to provide more neutral treatment of income from debt and equity capital. 11

Contents

Why Do New Englanders Work So Much?

Lynn E. Browne

Because of the softening of the New England economy in the past two years, the availability of labor has become a less pressing issue for New England businesses. However, projections of slower growth in the working-age population in the 1990s, attributable to changes in the age structure, hold out the possibility of tight labor markets and difficulties finding suitable workers in the future.

This article focuses on the fraction of the working-age population that chooses to work, called the participation rate, and its responsiveness to economic conditions. New England has had persistently high participation rates despite a relatively large population over age sixty-five. Although regional variations in participation have been remarkably durable, the author finds that participation rates do tend to respond positively to favorable economic conditions and to some extent at least, a strong demand for labor creates its own supply. 33

A Call to ARMs: Adjustable Rate Mortgages in the 1980s

Joe Peek

Adjustable rate mortgages, long-term loans that provide for interest rate changes at regular intervals over their lifetimes, have recently become a major source of residential mortgage financing in this country. Today adjustable rate mortgages probably account for close to 25 percent of total home mortgage debt.

While adjustable rate mortgages (ARMs) have grown to be an important factor in mortgage lending, their variety and complexity have led to confusion. This article discusses their advantages and disadvantages to both borrowers and lenders, and highlights the nature of the risks involved. The author concludes that while lenders have enthusiastically embraced the concept of ARMs, borrowers have been reluctant in their response, forcing lenders to provide low initial interest rates and restrictions on interest rate movements in order to sell their product. 47

Are the Distinctions between Debt and Equity Disappearing? An Overview

Richard W. Kopcke and Eric S. Rosengren

Vice President and Economist, and Assistant Vice President and Economist, respectively, Federal Reserve Bank of Boston.

During the 1980s, the proportion of business assets financed by debt exceeded that of any other period since World War II. Although much of this leverage accommodated new investment, during the last half of the decade corporations also replaced more than one-sixth of their outstanding stock with debt securities. Because of this surge in leverage, many analysts and policymakers are wary that businesses may have become too vulnerable, perhaps imperiling prospects for capital formation and employment opportunities.

As the financial structure of businesses changed during the past decade, the characteristics of financial securities also changed. Junk bonds, variants of preferred stock, yield enhancements, warrants, and other forms of mezzanine financing became more common in credit markets and in private loan contracts. Furthermore, the potential risks and returns offered by all securities have been altered as otherwise familiar financial instruments increasingly contain novel options (puts, indexed terms, resets, auctions, caps) and as derivative securities and various swap agreements are accepted as standard financial instruments.

These innovations have challenged the traditional financial and legal distinctions between debt and equity. Accordingly, public policy may need to adapt along with financial relationships, because income tax laws, regulations governing financial institutions, corporation law, and definitions of the legal rights and responsibilities of an enterprise's owners or creditors depend on clear boundaries to separate classes of creditors and equityholders. For example, if varieties of debt and equity instruments are more commonly regarded merely as alternative methods of financing businesses, both the bankruptcy law's distinctions among stakeholders and the income tax law's traditional distinction between interest payments (an expense) and profits (taxable income) may need to be amended. Similarly, many of the laws, regulations, and conventions that encourage financial intermediaries to hold debt rather

than equity may require revision. Whether these distinctions account for the recent increase in leverage or not, if policymakers regard leverage as excessive, reforms of the appropriate laws and regulations could foster equity financing.

In the fall of 1989 the Federal Reserve Bank of Boston sponsored a conference of academics, lawyers, investment bankers, economists, and government officials to examine the changes in business financing, the reasons why these changes have occurred, and the implications of these changes for public policy. In general, the participants observed that no simple theory explains fully the recent trends in business finance. For example, tax laws alone do not determine a corporation's capital structure. A satisfactory explanation might also depend on agency costs, objectives of stakeholders, the importance of corporate control, financial regulations, the relative cost of funds, and the dynamic strategies of management. Consequently, an attempt to reduce leverage through a simple reform of tax law, financial regulations, or bankruptcy law may not succeed. Even if it were successful, the cost of reforming policy could exceed its benefits, especially if other objectives of these policies were compromised in order to regulate leverage. Many participants also questioned the threat posed by the recent surge in debt financing. Some thought that the trend toward greater leverage has run its course, and equity financing will become more prevalent.

The conference comprised three sections. The first section surveyed the financial and legal theories concerning an enterprise's choice of capital structure. The financial survey concluded that a promising financial theory is more likely to describe the optimal form of financial contracts, rather than confining itself to determining the optimal degree of leverage. The fundamental innovation is the recent change in the characteristics of contracts, rather than a simple increase in leverage. The legal survey found that, for solvent corporations, the distinction between the rights of creditors and those of shareholders is sharp. But for insolvent corporations the rights of various stakeholders are often negotiable, and this in time may erode the distinctions between the discrete contracts of debt instruments and the relational contracts of equity instruments.

The second section discussed the practical motives of savers and investors that might account for the recent increase in leverage. Corporations have demonstrated a preference for financing their assets with their own cash flow, and if external financing is necessary they favor debt over equity. Accordingly, a corporation has no fixed target for its leverage; when opportunities to expand assets are sufficiently inviting and when the cost of debt financing is relatively attractive, leverage will tend to increase. While the inclination to supply more debt has increased during the current economic recovery, the demand for debt instruments also may have increased as regulations and accounting conventions encouraged pension funds to match their assets to their sponsors' liabilities. Nevertheless, the substantial retirement of equity during the past five years remains a novel puzzle.

The last section examined the influence of income tax laws and financial regulations on leverage. Although the tax law encourages corporations to rely on debt financing, neither the timing nor the magnitude of recent changes in the tax law can explain the surge in debt financing. Popular proposals for reforming the tax code in order to remove this bias in favor of debt financing would either reduce revenues considerably or introduce new distortions into the income tax. Because the effects of tax laws on corporate financial decisions are poorly understood, conducting financial regulation through these laws may be costly. Instead, minimum capital requirements may be applied directly to corporations. In addition, the regulations that strongly encourage banking institutions and other financial intermediaries to hold debt rather than equity may be relaxed. Although these regulations were intended to make these intermediaries and the economy more stable, they can foster risky investments, making the economy less stable. Accordingly, the benefit from reforming financial regulations may be relatively great.

The Changing Nature of Debt and Equity

Why do businesses rely so greatly on debt financing? Why are debt instruments including more equity features? While biases in the income tax code are important determinants of capital structure, the first two sessions discuss other explanations. The participants in these sessions agreed that new views of financial instruments are becoming necessary as debt and equity contracts become less distinct. The members of the finance sessions examined the economic incentives for issuing a spectrum of securities, while those of the legal session discussed the rights and responsibilities of the investors who hold these securities.

The Finance Perspective

Franklin Allen, of the University of Pennsylvania, introduced several themes discussed throughout the conference: that financial innovation has introduced hybrid securities blending the characteristics of debt and equity, that the characteristics of these securities are not determined by tax laws alone, and that the incentives of stakeholders may better explain firms' financial structures. Financial theories focusing on tax burdens, the cost of bankruptcy, or asymmetric information among stakeholders do not explain either the rapid introduction of hybrid securities or the significant changes in leverage over the past ten years.

Allen suggested that financial theories defining optimal ratios of debt to equity are not as promising as those describing the optimal forms of securities.

The recent introduction of many hybrid securities suggests that financial theories defining optimal ratios of debt to equity are not as promising as those describing the optimal forms of securities. The diverse interests of heterogeneous stakeholders might be satisfied best by a variety of financial instruments. In the case of public corporations, pure debt and equity contracts are not necessarily best suited to the interests of management and the various providers of external financing. The optimal payments to "creditors" might depend on the performance of the corporation, and the optimal division of voting rights need not allow one vote per share and majority rule. Furthermore, the spectrum of securities that might best meet the needs of corporate stakeholders might not ensure efficient capital markets and, therefore, might not be optimal from a social point of view.

Oliver D. Hart, from the Massachusetts Institute of Technology, contended that the theory regarding the control of assets is more robust than Allen suggests. The major attribute of equity, according to Hart, is ownership. Owners of an asset not only hold a residual claim on its returns but also choose how to employ that asset. Even without differences in the tastes of stakeholders or difficulties in verifying a firm's performance, for example, equityholders differ from creditors because of their ability to control the enterprise.

Robert C. Merton, from the Harvard Business School, suggested that promising theories regarding the choice of capital structure appear not to depend on the demands of investors. Because investors are concerned with the risk of their portfolios rather than the risk of particular securities, firms need not issue a variety of securities, since intermediaries could repackage the financial claims issued by firms to create portfolios that are most appealing to investors. For example, if firms issued equity only, financial intermediaries could acquire these equities and issue the appropriate spectrum of securities backed by the firms' assets. In this case, the operation of the firms would be insulated from any defaults that might occur on "their" financial liabilities.

The Legal Perspective

Charles P. Normandin, from the Boston law firm of Ropes & Gray, observed that the traditional legal distinctions between the rights and responsibilities of shareholders and those of creditors have been strained. Management possesses broad fiduciary responsibilities that provide it with substantial discretion to operate the business in the best interest of shareholders. For solvent firms, the relationship of management to creditors is contractual, providing specific responsibilities defined by loan agreements. Despite challenges claiming that management's fiduciary responsibility should be extended to creditors, recent judgments have found that creditors cannot expect the courts to intervene in their contracts. Considerable problems may arise as firms seek financing from different sources at different times, but creditors must either protect themselves through appropriate contractual commitments or refuse to supply funding.

The insolvent corporation and its management owe fiduciary duties to the various classes of creditors as well as to stockholders, but the law gives only vague guidance for balancing these often incompatible responsibilities. In such cases, the classification of claimants will become more difficult, and the legal rules governing the concessions among claimants may become too restrictive to achieve an acceptable reorganization. Consequently, the traditional distinctions among stakeholders may blur, as the courts try to cope with financial innovations.

Robert E. Scott, from the University of Virginia School of Law, disagreed with Normandin's view that firms have a voluntary contractual agreement with creditors and a fiduciary responsibility to shareholders. Instead, the firm's relation with both creditors and shareholders is contractual. Two different contracts can apply to the firm. Discrete contracts provide detailed specifications that standardize the contract and simplify the monitoring of the contractual relation. Relational contracts are used when the uncertainty and complexity of the relationship prevent all contingencies from being specified, requiring a more general contractual commitment. While debt has been considered a discrete contract and equity a relational contract, these designations are being eroded by financial innovations. As debt instruments include characteristics of equity, they too must be considered relational contracts. When courts interpret these contracts they should promote value-maximizing transactions.

Normandin observed that management has broad fiduciary responsibilities to shareholders, but creditors must protect themselves through appropriate contractual commitments.

Richard T. Peters, a partner in the Los Angeles law firm of Sidley & Austin, discussed the legal uncertainty surrounding the distinctions between debt and equity. Future litigation will focus on the standing of debt and hybrid securities used in highly leveraged transactions when a firm declares bankruptcy. Since many of these securities could be considered substitutes for existing capital, they may not be treated as traditional debt instruments in corporate reorganizations. Until the courts decide more cases involving leveraged buyouts, particularly how the instruments issued in leveraged buyouts are classified in a reorganization and how voting power and responsibilities of management should be allocated among the different classes of creditors, negotiating reorganizations will remain difficult.

Why Debt and Equity Have Changed

Why are businesses now relying on debt financing more than in the past? The next two sessions discussed the motives of businesses and institutional investors that may account for this surge in leverage. The first session examined the firm's motivations for issuing debt, discussing the influence of external financing and conflicts among stakeholders on a firm's choice of capital structure. The second session discussed how the goals, traditions, and regulations governing pension funds may have increased the demand for debt relative to that for equity.

The Firm's View of Debt and Equity

Stewart C. Myers, from the Massachusetts Institute of Technology, surveyed the evidence for three theories of capital structure: the trade-off theory, the pecking order theory, and the organizational theory, and concluded that some combination of the pecking order theory and the organizational theory best fits recent trends in capital structure.

The trade-off theory contends that firms issue debt until the value of the tax shield on debt equals the expected costs of bankruptcy. Myers observed that this simple model cannot explain two empirical regularities. First, stock prices rise for firms announcing actions that will increase their leverage, while stock prices fall for firms announcing actions that will reduce their leverage. The trade-off theory predicts that stock prices should increase with any change in leverage, because managers should always be approaching, rather than retreating from, the optimal capital structure. Second, the most profitable firms in an industry borrow less. The trade-off theory predicts that they should borrow more, because firms with higher profits have more taxable income to shield by issuing debt.

The pecking order theory is not consistent with a static optimal capital structure. Firms prefer internal to external financing, and if external financing is necessary they prefer debt to equity. Managers will never issue shares when the firm is undervalued; knowing this, investors will always view a new equity issue as bad news. The pecking order theory predicts that the issuing of new equity is bad news, while the retirement of equity is good news. It also predicts that profitable firms will tend to have low leverage.

The organizational theory assumes that management maximizes assets under its control rather than

shareholders' wealth. Accordingly, management maximizes the value of equity and employee surplus, which includes perks, overstaffing, and above-market wages. Issuing new debt is good news, because it increases the value of the tax shield while diminishing employee surplus by increasing the burden of interest payments. Management prefers to rely on internal financing, so more profitable firms will have lower leverage. Myers believes that the pecking order theory and the organizational theory explain patterns of corporate finance better than the trade-off theory, and that a promising theory of corporate finance would appear to require more study of the conflicts between management and investors.

Myers proposed an organizational theory of capital structure that assumes that management maximizes assets under its control rather than shareholders' wealth.

O. Leonard Darling, of Baring America, predicted that most companies will be reducing their debt. Lower leverage is necessary because the costs of financial distress now exceed the benefit of debt's tax shield for many firms. Reducing leverage will tend to create conflicts among management, shareholders, and creditors, and each firm's strategy for reducing leverage will depend on whether the firm is privately or publicly held. Publicly held companies will adopt strategies that maintain the value of equity in order to deter hostile takeovers. Privately held companies may be more willing to force transfers from creditors to equityholders by threatening creditors with bankruptcy.

Robert A. Taggart, Jr., from Boston College, contended that the recent increase in corporations' leverage at a time when internal funds were plentiful poses a problem for most traditional theories of finance. The surge in debt financing was used to retire outstanding equity, a fact that neither the trade-off theory nor the pecking order theory can explain adequately. Although the organizational theory might complement the pecking order theory to explain this change in capital structure, the organizational theory needs further development in order that we may understand better how shareholders' valuations can influence managers' behavior.

The Lender's View of Debt and Equity

Zvi Bodie, from Boston University, contended that recent financial innovation can be attributed partly to changes in the demand for securities by lenders. He illustrated this argument by discussing how regulations and accounting requirements have influenced the recent behavior of the pension fund industry.

The investment policies of pension funds, which hold 25 percent of outstanding common stock and 39 percent of outstanding corporate bonds, are guided by government regulations and sponsors' needs to meet their obligations to their plans' beneficiaries. Regulations and accounting conventions increasingly have encouraged pension funds to "immunize" their portfolios by matching their assets to their sponsors' liabilities. This demand has fostered the development of derivative securities such as index options and futures contracts. It has also encouraged pension funds to hold fixed-income securities whose duration matches that of their liabilities more closely than do the durations of stock or floating-rate bonds. Thus, both the increase in leverage and the introduction of new securities can be attributed partly to the demands of investors such as pension funds.

Peter L. Bernstein, from Peter L. Bernstein, Inc., was skeptical that the recent increase in corporate leverage might be explained by pension funds' needs to run a matched book. Pension funds, like the many other investors who purchased debt, were attracted by the high real returns on debt available in the early 1980s. Pension funds purchased much of the corporate debt even though these securities were not as appropriate as government debt for immunization strategies because government debt, unlike corporate debt, cannot be called when interest rates fall. To a

Bodie attributed both the increase in leverage and the introduction of new securities in part to the demands of investors.

degree, the pension funds' demand for corporate debt was fostered by the equity features of these securities.

Benjamin M. Friedman, from Harvard University, also was not convinced that hedging by investors such as pension funds could explain the increase in corporate leverage. While pensions may wish to hedge their liabilities, derivatives of government securities would be more suitable than corporate debt. Junk bonds, the fastest growing component of corporate debt, are not appropriate for hedging because of their relatively short durations and because of their substantial risk of deferred repayments, diminished repayments, conversion to equity, or outright default.

Implications for Public Policy

The final two sessions examined the effects of public policies on the capital structure of businesses. The first session considered whether the recent reforms of the income tax code encouraged businesses to rely on debt financing more than they had in the past. This session also discussed the potential problems of using the tax codes to regulate the capital structures of businesses. The second session considered how the regulation of financial intermediaries, such as banks, fosters debt financing. This session also discussed whether new banking regulations might promote more equity financing without necessarily making financial intermediaries less secure.

Taxation of Debt and Equity

Alan J. Auerbach, from the University of Pennsylvania, questioned the importance of taxation in explaining the recent increase in leverage. Neither the timing nor the magnitude of tax changes can account for nonfinancial corporations' recent reliance on debt. The recent revisions of the tax law have had mixed effects; for some investors the relative advantage of holding debt has increased, for others equity has become more attractive.

Although changes in the tax law are not clearly responsible for the recent increase in leverage, for decades the tax law has encouraged firms to rely on debt financing, by imposing a lower tax burden on corporate assets financed by debt than on assets financed by equity. Auerbach considered several proposals that either would integrate corporate and personal taxes or would tax corporations on their cash flow. These proposals entail a large loss of tax revenues or introduce new complications and distortions into the tax code. Given the uncertainty about the causes and costs of increased leverage, it is not clear that the benefits of these tax changes would exceed their costs.

David F. Bradford, from Princeton University, reemphasized that the effects of tax laws on corporate financial decisions are still poorly understood. For example, why do corporations pay dividends rather than repurchase their stock, given that stock repurchases would increase most shareholders' net returns? Until we better understand the effects of taxation, we should be very cautious about using the tax code to regulate business capital structures.

Auerbach stated that neither the timing nor the magnitude of tax changes can account for nonfinancial corporations' recent reliance on debt.

Emil M. Sunley, from Deloitte Haskins & Sells, agreed that changes in tax laws do not explain the increase in corporate borrowing and that the social costs of increased leverage may have been overstated. He also was skeptical of proposals to eliminate the tax bias favoring income accruing to corporate assets financed by debt. Integration of corporate and individual taxes would redistribute tax burdens unevenly across industries and across firms within industries. Furthermore, some technical problems with integration remain unresolved, such as the proper treatment of holding companies or multiple classes of stock. Cash flow taxes also have problems concerning the proper treatment of investments and debt undertaken before the tax reform and the proper division of tax revenues between the United States and countries that tax corporate income.

Regulation of Debt and Equity

Richard W. Kopcke and Eric S. Rosengren, from the Federal Reserve Bank of Boston, contended that the regulation of financial intermediaries can affect

corporate capital structure. Household portfolios have been shifting from equity toward the liabilities of financial intermediaries. In turn, the assets of these intermediaries are invested mostly in debt instruments. Consequently, this shift in household portfolios has tended to increase the supply price of equity financing relative to that of debt.

This bias in favor of debt financing may be attributed partly to the regulations that govern financial intermediaries. While "deposit insurance," explicit or implied, attracted households' funds, government regulations had not allowed intermediaries such as banks and insurance companies to purchase equities. Contracts governing pension funds' investments also constrained their holding equities, to a degree. Although these regulations were intended to make intermediaries, financial markets, and the economy more stable and secure, they might foster relatively risky investments. Instead of restricting the assets that intermediaries may purchase, often favoring debt over equity, regulations should control risk by enforcing substantial minimum capital requirements, to be funded by common stock.

Ben S. Bernanke, from Princeton University, was skeptical that savers' preferences could explain the increase in leverage over the past twenty years. He noted that pension funds, the fastest growing intermediary, hold a larger share of their assets in equity than do households. The decisions of firms, rather than those of investors, would appear to be responsible for the recent increase in leverage. Although the motivation for financial regulation is weak, he agreed that such regulation should emphasize capital requirements rather than asset restrictions.

Kopcke and Rosengren contended that the regulation of financial intermediaries can affect corporate capital structure.

Albert M. Wojnilower, from The First Boston Corporation, criticized the recommendation that asset restrictions be reduced. Allowing depository institutions to hold equity and requiring them to value their assets using current market prices would destabilize the financial system. He agreed that binding capital requirements would make the economy more stable. Moreover, extending capital requirements to large nonfinancial corporations would reduce the systemic risk stemming from the failure of highly leveraged businesses. Violation of these requirements could entail a loss of tax benefits on excessive debt and, potentially, the dismissal of senior management.

Conclusion

During the past decade, firms have significantly increased their reliance on debt that frequently possesses some of the features of equity. Although the prevailing income tax laws have encouraged firms to issue debt, the timing and magnitude of the changes in leverage do not coincide with changes in the tax code.

Many of the conference participants discussed how the conflicting interests of diverse stakeholders may have encouraged the recent increase in corporate leverage. For example, disagreements among investors, management, and employees regarding the control and use of assets increasingly result in takeovers financed substantially with debt.

Several participants emphasized the importance of financial intermediaries for financing business investments. Intermediaries issue liabilities that are most appealing to savers, using the proceeds to purchase the securities issued by businesses. As intermediaries have become more important, binding financial regulations, which generally restricted their ability to purchase equity, may have fostered greater leverage by increasing the relative supply price of equity.

Participants agreed that traditional distinctions between debt and equity will be challenged by the introduction of new hybrid securities. Legal, tax, and regulatory policies, which may have fostered these financial innovations, must themselves change in order to cope with emerging patterns of business financing. Promising revisions of public policy would foster financial contracts that minimize the social costs of resolving conflicts among a business's stakeholders, while promoting a relatively efficient and stable flow of resources from savers to investors.

Are the Distinctions between Debt and Equity Disappearing?

At the Federal Reserve Bank of Boston's most recent economic conference, on October 4, 5, and 6, 1989, a group of academics, lawyers, investment bankers, economists, and government officials convened to examine the recent changes in business financing, why these changes have occurred, and the implications of these changes for public policy. The conference agenda is outlined below.

The Changing Nature of Debt and Equity: A Financial Perspective
Franklin Allen, The Wharton School, University of Pennsylvania
Discussants: Oliver D. Hart, Massachusetts Institute of Technology
Robert C. Merton, Graduate School of Business Administration, Harvard University

The Changing Nature of Debt and Equity: A Legal Perspective
Charles P. Normandin, Ropes & Gray
Discussants: Robert E. Scott, University of Virginia School of Law
Richard T. Peters, Sidley & Austin

Why Have Debt and Equity Changed? The Firm's View
Stewart C. Myers, Massachusetts Institute of Technology
Discussants: O. Leonard Darling, Baring America Asset Management Company, Inc.
Robert A. Taggart, Jr., Boston College

The Lender's View of Debt and Equity: The Case of Pension Funds
Zvi Bodie, Boston University School of Management
Discussants: Peter L. Bernstein, Peter L. Bernstein, Inc.
Benjamin M. Friedman, Harvard University

Implications for Public Policy: Tax Policy and Corporate Borrowing
Alan J. Auerbach, University of Pennsylvania
Discussants: David F. Bradford, Woodrow Wilson School of Public and International Affairs, Princeton University
Emil M. Sunley, Deloitte Haskins & Sells

Implications for Public Policy: Regulation of Debt and Equity
Richard W. Kopcke and Eric S. Rosengren, Federal Reserve Bank of Boston
Discussants: Ben S. Bernanke, Princeton University
Albert M. Wojnilower, The First Boston Corporation

The proceedings of Conference Series No. 33 will be available later this year without charge on request to the Research Library—D, Federal Reserve Bank of Boston, Boston, Massachusetts 02106.

Is Leverage a Tax Dodge—or Not?

Yolanda K. Henderson

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In passing the Tax Reform Act of 1986, policymakers wanted to ensure that corporations would pay their fair share of tax. In response to reports that profitable corporations were paying low rates of tax and sometimes even receiving refunds, Congress broadened the corporate tax base, rescinded the investment tax credit, and instituted a new minimum tax. The issue of adequate tax payments has not gone away, however, because corporations have been taking larger interest deductions as a result of having substituted debt for equity on their balance sheets. These actions undermine the attempts of the architects of the Tax Reform Act to increase corporate taxes in order to compensate for reduced tax collections from individuals. They also add to general concerns about the size of federal budget deficits.

This study begins by measuring the aggregate tax consequences of corporate leverage decisions. Section I constructs measures of effective tax rates on debt and equity income. The tax law encourages corporations to use debt instead of equity because they can deduct interest payments from taxable income. Under current tax rates, the U.S. Treasury collects about $8 billion less in annual revenues than if the leverage ratio were at its 1970s average and about $14 billion less when compared to the ratio at the beginning of the 1980s.

Section II examines the tax implications of recent transactions in which corporations effectively increased their leverage not by changing their financing of new investment projects, but by reducing their outstanding net worth. Share repurchases and cash acquisitions, including leveraged buyouts, generate additional capital gains revenues and sometimes additional corporate income tax revenues. In the aggregate, it appears that these revenues might offset roughly $5 billion of the revenue losses measured in Section I.

Section III discusses prospects for the use of high proportions of debt to finance future corporate investments. Developments in tax law and continuing risks of bankruptcy should hold down the use of debt

issues to fund capital expansion. On the other hand, innovations in financial markets and financial institutions that make debt less risky or that reduce its costs to corporations with previously low access to debt might enable U.S. corporations to expand their leverage to match those of their foreign counterparts.

Section IV argues that policymakers concerned with stemming further revenue losses should look to responses other than outlawing certain controversial forms of restructurings or restricting interest deductions that appear to be excessive. Even though the recent rise in leverage cannot be attributed to changes in tax law, debt continues to be taxed more lightly than equity. Policymakers might therefore consider altering tax laws to provide more neutral treatment of income from debt and equity capital. However, increased leverage is beneficial under some circumstances, and some tax proposals have negative side effects, so policymakers should choose carefully among the possible responses. Section V concludes the article.

I. Leverage and Revenues—Avoiding Double Taxation

In 1960, the corporate leverage ratio (defined as credit market debt relative to the sum of this debt plus net worth) was 26.0 percent (first panel of chart 1). The ratio rose through 1970, reaching 31.5 percent. By the beginning of the next decade, leverage was reduced to 23.4 percent, but then rose again to 34.4 percent by 1988. To summarize these patterns, the average annual corporate leverage ratio in the 1980s was comparable to those in the 1960s and 1970s. The extent of the change during the 1980s, as well as the final level of the ratio, are higher than observed in either of the two previous decades, however.

During the 1960s and 1970s, nonfinancial corporations on average raised 26 percent of their funds through debt instruments and 74 percent through equity. Since 1984, over 40 percent of their funds have come from issuing debt (second panel of chart 1). In these statistics, debt refers to all interest-bearing funds and includes bonds, mortgages, commercial paper, and bank loans. Equity comprises both retained earnings and new share issues.

This change in the mix of finance affects government tax receipts on income generated in the corporate sector. This section indicates that government revenues decline by 27 cents if a dollar is earned by capital financed by debt rather than equity. The rise in the debt-to-equity ratio in recent years has caused revenues to be about $8 billion lower in 1988 than they would have been if the ratio had remained at its 1970s average.

The Taxation of Debt

Corporations deduct interest payments from taxable income. Interest income is fully taxable to recipients at the personal income tax rate, or at the corporate income tax rate if the debt is held by a corporation. If the recipient is a tax-exempt entity, such as a pension fund, it pays no tax on interest received. Foreigners generally pay zero or low rates of tax to the U.S. government on interest received from U.S. corporations. Overall, the tax rate on corporate debt is a weighted average of the tax brackets of households and other holders of debt.

Table 1 summarizes the historical treatment of debt at approximately ten-year intervals since 1970 (and the appendix provides the details of these calculations). In addition, the year 1986 is included to indicate the value of these tax rates just prior to the Tax Reform Act enacted that year. All the tax rates in this table are computed with respect to nominal interest. (The issue of the effective rate of tax on real interest receipts is deferred until the discussion of tax incentives in Section III.)

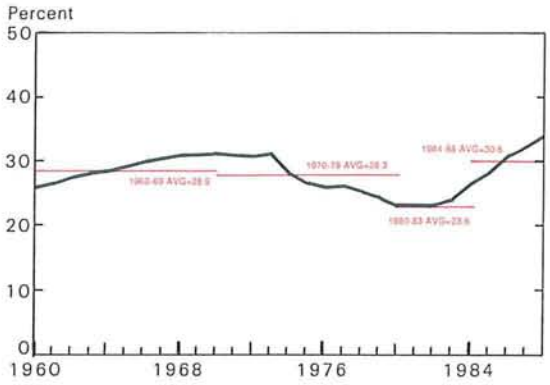
The tax rate paid recently by individuals is relatively low compared to rates from the previous two decades. Weighted according to the distribution of interest income among recipients, the rate was 21.5 percent in 1988, compared to 25.5 percent in 1986 and 28.5 percent before the tax cuts in the Economic Recovery Tax Act of 1981. For the most part, households are indirect holders of corporate debt because they have deposits in financial institutions making loans to corporations or purchasing their bond issues. The earnings on these accounts are taxed much as if households held corporate debt directly, except that households also receive imputed income in the form of checking account services rather than a market rate of interest on checking accounts. The second line of the table is a multiplicative adjustment to reflect the fact that this imputed income is not taxed. An estimated 14 percent of households' interest earnings are currently in the form of imputations, leaving a net tax rate of 18.5 percent. All other years are adjusted similarly.

Insurance companies also hold corporate debt, and their current 34 percent tax rate is also the lowest

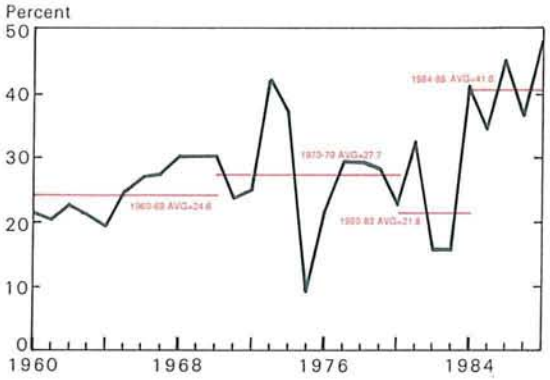
Chart 1

Corporate Financing through Debt Instruments

Debt Outstanding Relative to Debt plus Net Worth[a]



Debt Issued Relative to Debt, Internal Funds, plus Net New Equity Issued



[a]Net worth measured using the replacement cost of tangible assets.

Source: Board of Governors of the Federal Reserve System, *Balance Sheets for the U.S. Economy 1949-1988, Flow of Funds Accounts*, and FAME database.

experienced during the past two decades.[1] The remainder is held by untaxed retirement funds and by foreigners, who pay a very low overall tax rate to the U.S. government on their interest income.[2] Since 1970, tax-exempt institutions and foreigners have increased their share of debt holdings from under 30 percent to 40 percent.

Reflecting these various trends, the weighted tax rate on corporate debt is about 13 percent, compared to 16 percent before Tax Reform, and about 20 percent in 1970 and 1980.

The Taxation of Equity

Equity income is taxable both to corporations and shareholders (table 2 and the appendix). As in the computations related to debt, the rates in this section take nominal earnings as the tax base. (Rates based on real incomes are discussed in Section III.) As noted above, the corporate tax has declined over time. The top tax rate under the corporate income tax is now 34 percent, compared to 46 percent between 1979 and 1986. In 1970, the basic rate was 48 percent, but a surtax effectively brought the rate to 49.2 percent. Unlike the case in many European countries, corporate-level taxation does not depend on whether earnings are retained by the corporation or paid out to shareholders as dividends.[3]

The taxation of shareholders varies with the form in which income is earned. Except for a small exclusion that existed prior to the Tax Reform Act of 1986, households are taxed on dividends at the same rates that apply to other sources of income, such as wages and salaries. Most dividends are earned by shareholders with high incomes. As a result, the weighted average rate indicated for 1988, 25.7 percent, reflects a high fraction of dividends paid to taxpayers in the 28 and 33 percent brackets, and a relatively low fraction in the 15 percent bracket. The trend over time shows the effects of successive cuts in marginal brackets that ranged up to 70 percent between 1965 and 1980. In 1980, for example, the weighted average tax rate on dividends was 39.0 percent. As corporate shareholders, insurance companies have been subject to much lower rates, because only 20 percent of intercorporate dividends (15 percent prior to the 1986 reform) are included in taxable income.[4] The U.S. government collects taxes on dividend income earned

Table 1
Federal Tax Rates on Interest Income from Corporate Debt

	1970	1980	1986	1988
Households				
Weighted Individual Income Tax Rate	.248	.285	.255	.215
Multiplicative Adjustment for Untaxed Imputed Interest	.794	.858	.842	.860
Net Tax Rate	.197	.245	.215	.185
Insurance Companies				
Corporate Income Tax Rate	.492	.460	.460	.340
Foreigners	.026	.037	.021	.021
Weights for Debt Holders				
Households	.503	.490	.494	.502
Insurance Companies	.222	.159	.106	.099
Foreigners	.008	.027	.089	.087
Tax-Exempt Institutions	.267	.324	.311	.312
Weighted Tax Rate	.209	.194	.157	.128

Source: See the Appendix.

by foreigners, but the statutory rate of 30 percent is often reduced to between 5 and 15 percent by tax treaties.[5]

Capital gains are now fully taxable to individual shareholders. Earlier, only 40 to 50 percent were included in taxable income. Full inclusion has more than offset the effects of cuts in statutory marginal personal income tax rates in the 1986 Tax Reform Act. Accounting for these changes in tax rates and the exclusion rate, capital gains are now taxed at a weighted average rate of 21.5 percent, compared to 13.8 percent in 1986 and approximately 16 percent in both 1970 and 1980.

Calculating an effective rate of tax involves further assumptions, however, because capital gains are not taxable until they are realized. Also, if shareholders do not sell their shares before they die, tax on gains accrued during their lifetime is forgiven entirely. To calculate an effective present-value capital gains tax, it is necessary to make assumptions about these advantages of deferral and forgiveness at death. A common assumption is that deferral reduces the effective rate by half; this corresponds roughly to a 10-year holding period on average (King and Fullerton 1984, chapter 6 and works cited therein). A shorter holding period would lead to a higher effective tax rate. The forgiveness of capital gains taxes at death is usually assumed to halve the effective rate again (same citations). With these adjustments, the current effective capital gains rate is still at a historic

Table 2
Federal Tax Rates on Income from Corporate Equity

	1970	1980	1986	1988
Corporate Income Tax Rate	.492	.460	.460	.340
Dividend Income				
Households				
Weighted Individual Income Tax Rate	.308	.390	.329	.257
Insurance Companies				
Multiplicative Adjustment for Intercorporate Dividends	.15	.15	.15	.20
Net Corporate Income Tax Rate	.074	.069	.069	.068
Foreigners	.131	.144	.117	.117
Capital Gains Income				
Households				
Weighted Individual Income Tax Rate on Capital Gains	.165	.157	.138	.215
Advantage of Deferral and Step-up of Basis at Death	.25	.25	.25	.25
Net Tax Rate	.041	.039	.035	.054
Insurance Companies				
Tax Rate on Capital Gains	.35	.28	.28	.34
Advantage of Deferral	.5	.5	.5	.5
Net Corporate Income Tax Rate	.175	.14	.14	.17
Foreigners	0	0	0	0
Weights for Equity Holders				
Households	.790	.688	.645	.607
Insurance Companies	.028	.037	.031	.033
Foreigners	.032	.041	.057	.064
Tax-Exempt Institutions	.150	.234	.268	.296
Weighted Tax Rate for Equity Holders				
Dividends	.250	.277	.221	.166
Capital Gains	.037	.032	.027	.038
Total Tax Rate, Corporations plus Equity Holders				
Dividends	.619	.609	.579	.449
Capital Gains	.511	.477	.475	.365
40% Dividends, 60% Capital Gains	.554	.530	.517	.399

Source: See the Appendix.

high, but the 5.4 percent rate is much more modest than that on realized gains. Insurance companies also enjoy the benefits of deferral, making their effective capital gains rate equal to 17 percent if the same deferral assumption is made as for households, as in King and Fullerton. (This assumption probably understates this effective tax rate, to the extent that insurance companies trade more frequently.) Foreigners do not pay capital gains taxes on their holdings of U.S. equities.

Changes in portfolios have tended to reinforce the historical trend of reduced taxation of dividends and to offset the increased taxation of capital gains. Tax-exempt institutions, including pensions and nonprofit organizations, held 30 percent of corporate equities in 1988, double their share in 1970. Over this same period, households have reduced their share of ownership from 79 percent to 61 percent. Applying ownership weights identically to dividend and capital gains income and further assuming that corporations typically pay out about 40 percent of their earnings in dividends (Poterba 1987) provides a total tax rate on corporate equity.[6] Including the effects of the corporate income tax, the overall rate is now estimated at 40 percent, down from over 50 percent in the previous years shown.

Revenue Effects of Financing Investment by Debt Rather than Equity

The findings in tables 1 and 2 may be combined to yield revenue results. The difference between the effective tax rates on equity and debt has fallen, but it remains substantial. Every dollar of corporate earnings attributable to debt was recently taxed at a rate of 13 cents, while a dollar attributable to equity was taxed at 40 cents. This difference of 27 cents compares to 36 cents in 1986, 34 cents in 1980, and 35 cents in 1970. As expected, the recent tax differential reflects the reduction in the corporate tax rate in the 1986 reform. The differential is lower than the corporate rate in all years because the weighted tax rate for equity holders has been lower than that for debt holders.

In addition to these tax rates, the reduction in revenues from increasing leverage depends on the size of corporate debt and equity, the rates of return attributable to each, and the change in leverage relative to historical values. (For simplicity, any changes in the mix of holders of debt and equity resulting from changes in the aggregate leverage ratio are ignored in these calculations.)[7] Table 3 indicates how these factors affect revenues. In equation (1), revenues equal the effective tax rate on debt (t^D) times interest paid on debt (I) plus the effective tax rate on equity (t^E) times taxable corporate earnings (Y). Equation (2) restates the first in terms of effective tax rates, an interest rate (I/D), a rate of return to equity (Y/E), and leverage (D/[D+E]). Equation (3) then converts this result into the change in revenue due to a 1 percentage point change in the leverage ratio.[8]

The value of corporate debt plus equity is estimated at $5,570 billion in 1988, from the Federal Reserve data used to generate the first panel of chart 1. The effective interest rate (I/D) is assumed to be 10.8 percent, from the observed Moody's Baa corporate bond rate. The rate of return to corporate equity (Y/E) is assumed to be 9.0 percent, from data on corporate income statements and balance sheets.[9]

These assumptions imply that revenues fall by $1.23 billion if leverage increases by 1 percentage point. The aggregate revenue loss associated with

Table 3
Equations for Computing Revenue Effects of Leverage

(1) Tax Revenues as a Function of Interest and Earnings

$$T = t^D \times I + t^E \times Y$$

(2) Tax Revenues as a Function of Rates of Return on Debt and Equity and the Leverage Ratio

$$T = \{t^D \times (I/D) \times (D/[D+E]) + t^E \times (Y/E) \times (E/[D+E])\} \times (D+E)$$

(3) Change in Tax Revenues from a Percentage Point Increase in the Leverage Ratio

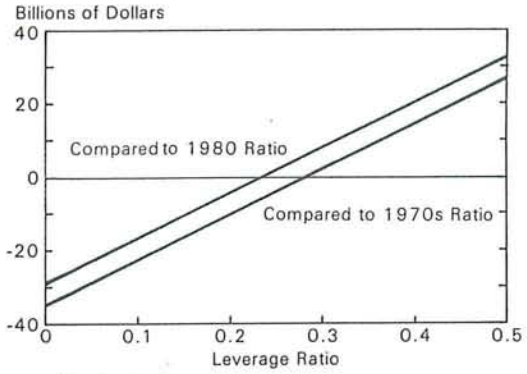
$$\Delta T = .01 \times \{t^D \times (I/D) - t^E \times (Y/E)\} \times (D+E)$$

Notation

- T Estimated revenues from corporate-source income (the sum of the corporate income tax and the individual income tax, including withholding taxes on foreigners).
- t^D Effective tax rate on interest (from table 1).
- I Corporate interest payments.
- t^E Effective tax rate on equity income (from table 2).
- Y Corporate earnings net of interest and other deductions, gross of tax.
- D Corporate debt.
- E Corporate equity.

Chart 2

Revenue Loss from Corporate Leverage, Using 1988 Parameters



Source: See the text.

recent leverage ratios depends on which historical value is used as a reference point. Comparing the 1988 ratio of 34.4 percent to the 1980 ratio of 23.4 percent (first panel of chart 1) yields a revenue loss of $13.5 billion (chart 2). Using the 1970s average leverage ratio of 28.3 percent for comparison yields a revenue loss of $7.5 billion. These revenue losses may be compared to corporate profits tax receipts of $112 billion in 1988, and income tax receipts on dividends, capital gains, and interest estimated at roughly $40 billion.[10]

These calculated revenue losses may be conservative if changes in leverage primarily have reflected shifts in demand for debt and equity, rather than shifts in portfolio preferences. In this case, a lower leverage ratio would probably be associated with a lower rate of return on debt relative to equity, as well as a lower weighted average tax rate on interest

Table 4

Corporate Debt Issues and Selected Uses, 1970–1988

Billions of Dollars

	Net Debt Issued by Nonfinancial Corporations	Share Repurchases	Cash Acquisitions			
			Total		Leveraged Buyouts	
			Source A	Source B	Source C	Source D
	(1)	(2)	(3)	(4)	(5)	(6)
1970	28.4	1.2	n.a.	4.3	n.a.	n.a.
1971	25.9	0.7	n.a.	3.5	n.a.	n.a.
1972	31.5	2.1	n.a.	4.5	n.a.	n.a.
1973	68.4	1.6	n.a.	5.1	n.a.	n.a.
1974	50.8	2.1	n.a.	4.4	n.a.	n.a.
1975	13.2	2.1	n.a.	4.3	n.a.	n.a.
1976	40.1	1.9	n.a.	7.6	n.a.	n.a.
1977	66.7	3.4	4.3	8.4	n.a.	n.a.
1978	71.0	3.5	7.2	11.7	n.a.	n.a.
1979	68.1	4.5	16.9	16.8	n.a.	0.6
1980	57.8	5.0	13.1	16.0	n.a.	1.0
1981	103.3	4.0	29.3	28.6	3.1	2.3
1982	43.9	8.1	26.2	18.7	3.5	2.8
1983	54.8	7.7	21.2	22.2	4.5	7.1
1984	169.6	27.4	64.2	44.1	18.8	10.8
1985	132.4	41.3	70.0	71.1	19.6	24.1
1986	203.7	41.5	74.5	57.5	46.4	20.2
1987	145.5	54.3	62.2	48.2	35.6	22.1
1988	207.5	52.1[a]	65.2[a]	n.a.	42.9	60.9

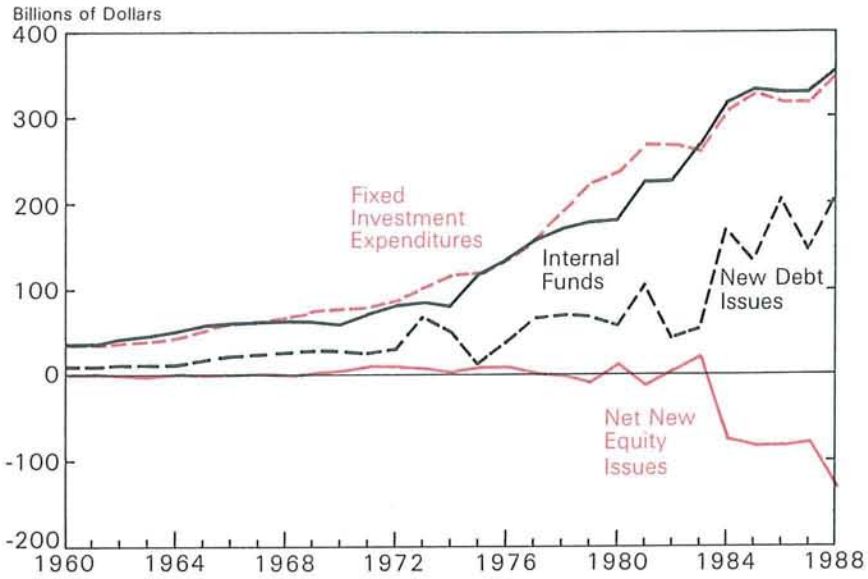
[a]Obtained by doubling the preliminary estimate for the first half of 1988. The authors indicate that their revised data will show an increase over the preliminary estimate.

n.a. = not available.

Source: Column 1: Board of Governors of the Federal Reserve System, *Flow of Funds*. Columns 2 and 3: 1970–76 from Shoven (1987); 1977–88 from Bagwell and Shoven (1989). Column 4: Hatsopoulos, Krugman, and Poterba (1989). Column 5: *Mergers and Acquisitions* magazine, as reported in U.S. Joint Committee on Taxation (1989) and by telephone. Column 6: *Mergerstat Review 1988*.

Chart 3

Sources and Uses of Funds of Nonfinancial Corporations



Source: Board of Governors of the Federal Reserve System, *Flow of Funds Accounts* and FAME database.

relative to equity earnings, as a consequence of a rebalancing of portfolios to accommodate corporate demand for leverage (see footnote 7). Taking these effects into account would raise the computed revenue loss from leverage.

II. Corporate Restructurings and Tax Revenues

The computations in section I indicated the revenue consequences when corporations finance new investments using debt rather than equity. To some extent, the increase in the leverage ratio in recent years has been caused not by an expansion of debt in order to augment the capital stock, but rather with a reduction in net worth. Since about 1984, corporations have been repurchasing their own shares in record amounts, and they have also been purchasing the shares of other corporations through mergers and acquisitions. In addition, management groups and financiers have been taking companies private by purchasing the stock of other shareholders. This section measures the revenue consequences of these restructurings, and finds that they generate tax receipts that partially offset the losses measured in section I.

Background on Corporate Restructurings

Share repurchases, cash mergers, and cash acquisitions of other companies have increased sharply in the last several years (table 4). At the high end of the estimates, total share repurchases plus cash mergers and acquisitions averaged $30 billion from 1980 to 1983, $92 billion in 1984, and over $110 billion in each subsequent year through 1988.

The concomitant increase in corporate debt suggests that corporations financed many of these transactions by borrowing. From 1980 to 1983, net issues of corporate debt averaged $65 billion annually (table 4). Net debt issues jumped in 1984, to $170 billion, and have remained above $130 billion in each year since. This rise in debt has exceeded the increase in corporate investment over this period (chart 3).

More direct evidence indicates the use of debt issues and asset reductions in financing these transactions. In the largest stock buybacks announced for 1988, internal cash flow and "cash on hand" figured prominently, but debt was an important source for

Table 5
Financing for Largest Announced Stock Buybacks in 1988

	Value (Billions of Dollars)	Percent of Shares Repurchased	Reported Financing
UAL Corporation	2.84	63	Borrowing from banks, asset sales
IBM	2.00	3	Internal cash flow
CSX	1.86	38	Cash, short-term borrowing, asset sales
Sears Roebuck	1.75	10	Asset sales
RJR Nabisco	1.38	8	Funds on hand
Digital Equipment	1.26	10	Internal cash flow
Gillette	1.19	23	Borrowing from banks and commercial paper market
Schlumberger	1.11	11	Funds on hand
Dow Chemical	1.04	6	Funds on hand
GTE	1.01	8	Internal cash flow
Tenneco	.99	12	Asset sales
Ameritech	.97	15	Internal cash flow
Hewlett-Packard	.95	11	Internal cash flow
Minnesota Mining & Mfg.	.83	6	Internal cash flow
BellSouth	.71	4	Funds on hand
Georgia-Pacific	.70	19	Internal cash flow and borrowing
J.C. Penney	.69	11	Long-term borrowing from insurance companies
MCI Communications	.68	16	Funds on hand and new issues of preferred stock
Fireman's Fund	.67	39	Funds on hand and stock of the seller
Pacific Telesis	.59	5	Funds on hand

Note: This list is drawn from the *Wall Street Journal* compilation of January 3, 1989. The data are generally taken from announcements, not actual purchases, and may include more than one announcement. However, companies that did not appear to follow through on plans to repurchase shares during 1988 were dropped from the list.
Source: *Wall Street Journal* and company news releases.

share repurchases by UAL, Gillette, Georgia Pacific, and J.C. Penney (table 5).[11] Rosengren (1989) found that 50 percent of the financing in a sample of recent hostile takeovers came from debt, 15 percent from sales of physical assets, and 35 percent from internal funds and new equity issues. Finally, leveraged buyouts (LBOs) are a subset of acquisitions in which companies are taken private in transactions funded predominantly by debt. The source used for column 6 of table 4 includes buyouts in which at least half the funding came from borrowing, but ratios of debt to other sources of funds as high as 10 to 1 are not uncommon in LBOs, and one survey found an average ratio of over 5 to 1 (Jensen 1987).

An Analytical Overview

Share repurchases and cash acquisitions reduce government revenues by lowering the amount of income subject to corporate taxation. This is true regardless of whether these transactions are financed by increases in debt or reductions in assets. When corporations purchase shares by issuing debt, the "double tax" applicable to equity income is replaced by the single level of tax applicable to interest. When corporations pay for shares by reducing their financial or physical assets, funds paid out to shareholders are no longer subject to corporate taxation (assuming they are not reinvested in the corporate sector). Thus the analysis in section I of the change in revenue attributable to change in leverage is directly applicable. The method of finance affects only the extent of the change in leverage. For a given value of share repurchases or cash acquisitions, debt-financed restructurings have a larger effect on leverage than do asset-financed restructurings.[12] The revenue estimates of section I already took into account the aggregate change in leverage in recent years, however, so no further adjustment to that set of calculations of revenue losses is necessary.

In other respects, share repurchases and cash mergers increase revenues. As part of these restructurings, shareholders sell corporate equities and therefore incur a capital gains tax. Because households must now include all capital gains from sales of corporate stock in their taxable income, this may be a

significant source of revenue. Additionally, reorganized corporations resulting from mergers and acquisitions may be more efficient and therefore may generate greater operating revenues than the former structures would have generated. This, too, would augment tax revenues. The remainder of section II calculates these increases in revenues.

Revenue Gains from Restructuring

Capital gains taxes from shareholders who sold their stock in corporate restructurings and greater corporate income tax revenues due to higher operating income after companies were reorganized totalled about $5 billion in 1988. These revenues offset as much as two-thirds of the current revenue losses from the aggregate increase in the debt-equity ratio compared to the 1970s value.

Table 6 indicates how the estimate for capital gains tax revenues was derived. Judging from preliminary data for 1988, the total value of shares sold in buybacks and cash mergers and acquisitions might have been $140 billion (line 1).[13] In repurchases and corporate acquisitions, potential sellers are offered a premium over the prevailing price.[14] Taking 40 percent as an estimate, the pre-buyout value is $100 billion (line 3). Adding another 30 percent to account for normal capital gains (Henderson 1989) yields estimated total capital gains in these transactions of $70 billion.[15]

Table 6
Estimate of Capital Gains Revenues from Share Repurchases and Cash Acquisitions, Using 1988 Data
Dollar Values in Billions

(1) Value of shares sold	$140.0
(2) Buyout premium	.4
(3) Value before buyout [(1)\[1+(2)]]	$100.0
(4) Normal capital gain relative to selling price	.3
(5) Basis [(3) × [1 − (4)]]	$ 70.0
(6) Capital gains [(1)−(5)]	$ 70.0
(7) Households' share	.4
(8) Households' capital gains [(6)×(7)]	$ 28.0
(9) Tax rate	.215
(10) Capital gains tax [(8)×(9)]	$ 6.0
(11) Value of acceleration[a]	.379
(12) Value of capital gains revenues[b]	$ 4.3

[a]Applied to normal capital gain only.
[b][(1)−(3)]\(6) × (10) + [(3)−(5)]\(6) × (10) × (11)
Source: See text.

According to data on stock market volume, households' share of trades was about 20 percent in 1988 (Securities Industry Association). The rest was probably accounted for by untaxed institutions, judging from the ownership data in appendix table 1. The calculations double this household share, to account for the fact that all owners sell in a takeover situation. Using the capital gains tax rate of 21.5 percent from table 2, capital gains revenues from these transactions were $6 billion (line 10). The government gains because shares were sold earlier than they would have been without the reorganization and because purchasers offer a premium to shareholders. If shares would have been sold ordinarily after ten years instead of five, and if a 10 percent discount rate is applied, the revenues are worth $4.3 billion (line 12).[16] This is close to three-fifths of the $7.5 billion revenue loss shown in chart 2 when comparing the 1988 leverage ratio to those in the 1970s.

Increased operating efficiency is another possible source of greater tax revenue in the case of an acquisition of another company or through an LBO. If resources are used more productively following the restructuring, annual receipts from the corporate income tax will rise.[17] This additional revenue is likely to be small in the aggregate. The value of cash acquisitions reported since 1970 is about one-tenth of the current value of outstanding equity (table 4 and Federal Reserve *Balance Sheets*). One study indicated that a sample of management buyouts increased operating revenues by 25 percent three years later (Jensen, Kaplan, and Stiglin 1989). This estimate is likely to be too high for measuring permanent effects of all acquisitions on aggregate revenue collections. Even if it measures accurately the effects for LBO companies, it does not count income losses elsewhere in the economy. Part of these shareholders' gains undoubtedly came at the expense of employees, suppliers, and shareholders in other corporations. Assuming operating income rises by 10 percent, applying this to one-tenth of pre-tax corporate earnings (from National Income Accounts data), and computing corporate income tax liabilities at a 34 percent rate, the additional tax revenue is only $1.0 billion (.1 x $307 billion x .1 x .34).[18]

III. Incentives for Debt Finance

Future revenues depend upon what happens to corporate leverage. On the one hand, some may point to the ups and downs of corporate leverage

patterns (first panel of chart 1) as an indication that recent revenue losses associated with leverage are a temporary aberration. On the other hand, the string of five successive years of high use of debt relative to equity finance (second panel of chart 1) may suggest that corporations have a new, higher target for leverage. This section reviews some of the major determinants of corporate leverage and indicates the prospects for the future.

On the whole, changes in tax policy under the Tax Reform Act of 1986 and typical fluctuations in business conditions will discourage corporations from increasing leverage further. By contrast, corporations' desire to lower their cost of capital in order to enhance their international competitiveness may encourage them to raise their use of debt. As discussed below, however, they are unlikely to increase leverage substantially unless their relationships with financial institutions change.

National Business Conditions

Given the choice between issuing new shares and issuing new debt, corporate shareholders generally prefer to finance investment using debt, to prevent the dilution of their returns. During economic slowdowns, however, they will be more cautious in using debt because of the bankruptcy risk associated with the obligation to pay interest on a regular basis. Historical evidence supports these points. The recessions in 1970, 1974–75, and from 1980 to 1982 coincided with reduced reliance on new debt issues (charts 1 and 3). The national economic expansion since 1982 has contributed to lower perceived risks, and therefore higher leverage, in keeping with the trend observed during the expansion between 1961 and 1969. This explanation fits the patterns in the 1980s at least as well as any other. It also suggests that 1980 is an outlier, so policymakers should not attach great weight to revenue losses computed by comparing leverage ratios at the beginning and end of the 1980s.

The tendency for debt financing to be cyclical suggests a limit to future increases in leverage.

The tendency for debt finance to be cyclical suggests a limit to future increases in leverage. As long as business cycle fluctuations remain part of our economic future, it is hard to envision sustained high use of debt for many years.

Tax Incentives

Taxes affect financing decisions because they alter the pretax rate of return (or "hurdle rate") required on an investment in order to satisfy investors' expectations for an after-tax return. Debt finance lowers corporations' hurdle rate because interest payments are deductible. But because of risks associated with high leverage, corporations are willing to incur some added cost from using equity finance. On the whole, it appears that the Tax Reform Act did not reduce the hurdle rate for debt-financed investments relative to equity-financed investments. Therefore increases in corporate leverage since 1986 cannot be explained by changes in tax incentives. Furthermore, these changes in tax incentives cannot be used to argue that corporations will continue to increase their use of debt.

The analysis of section I provided a key insight on tax incentives. By reducing the top corporate income tax rate from 46 percent to 34 percent, the Tax Reform Act of 1986 lowered the taxes paid on a dollar of income attributable to equity compared to those paid on income attributable to debt. Holding all other factors constant, this change will tend to reduce corporate leverage.

The calculations of section I are not a perfect measure of incentives, however, for two broad reasons. First, they indicate tax liabilities in 1988, but not taxes expected in the future from current financial decisions. Second, they do not consider how additional tax provisions of the Tax Reform Act may indirectly affect the market for corporate debt and equity.

For consistency, calculation of future taxes resulting from current activity requires reexpressing future returns in constant dollars. This sharpens the distinction between effective taxation of income from debt and equity because corporate interest deductions and capital gains income are both overstated as a result of inflation.[19] Another adjustment relates to the weights on dividend and capital gains taxes for equity finance. Under the so-called "new view" of dividends, the individual income tax on dividends affects capital costs at the margin only to the extent that corporations issue new shares (see Fullerton,

Henderson, and Mackie 1987 and references therein for further analysis and discussion). New share issues historically have accounted for no more than about 5 percent of equity funds raised, which provides a much less important role for dividend taxation than the "old view" in which the analysis is based on a payout rate of around 40 percent.

Added together, these adjustments reinforce the conclusion that the Tax Reform Act will discourage increases in corporate leverage. Fullerton, Gillette, and Mackie (1987) found that the effective marginal tax rate on corporate investment financed by debt rose from −0.339 to +0.099 because of the Tax Reform Act. The tax rate on equity investments rose only slightly, from 0.522 to 0.535. (Both sets of numbers also take into account revisions in depreciation allowances and the repeal of the investment tax credit, which are applicable equally for debt and equity finance.)

The Tax Reform Act did not decrease the hurdle rate for debt-financed investments relative to equity-financed investments.

The Tax Reform Act may also have affected corporate leverage indirectly by removing other corporate deductions, by changing the competition for borrowed funds, and by revising the taxation of other assets. Under one view of corporate behavior, corporations attempt to lower their capital costs by using the most attractive tax avoidance mechanism available. In the early 1980s, generous depreciation allowances provided a reduction in taxable income, and the investment tax credit further reduced corporations' tax liabilities. When these tax shelters were removed in the 1986 Act, corporations might have turned to debt finance as an alternative mechanism to lower their tax obligations. Givoly, Hayn, Ofer, and Sarig (1989) found some empirical support for this view.[20] This analysis does not explain why leverage started to rise noticeably around 1984, however.

The Tax Reform Act could also have an indirect effect on corporate leverage through its relative effects on tax rates of corporations and other borrowers. In an economy in which debt is issued by corporations, noncorporate businesses, and households, the "optimal" issuer of debt is the sector with the highest marginal tax bracket, because that sector attaches the highest value to deductibility of interest and is therefore willing to pay the highest rates. Before the Economic Recovery Tax Act of 1981, households and owners of noncorporate businesses were the "optimal" debtors because their top tax bracket of 70 percent exceeded the 46 percent rate of corporations. Their relative preference for deductions was reduced when the 1981 Act lowered their top tax bracket to 50 percent, while keeping the corporate rate at 46 percent. The 1986 reform made corporations the "optimal" debtors by reducing their top rate to 34 percent and lowering high-income taxpayers' rates to 28 and 33 percent. This analysis accounts for general changes between the 1970s and the 1980s (see Steuerle 1989a), but not for patterns within each decade.

Finally, Tax Reform changed the relative attractiveness of corporate securities and other assets. For example, the Act eliminated various tax shelters, causing households to prefer corporate equities to these other investments. (Or, to put it another way, corporations might be able to attract more equity investors without paying a higher rate of return.) Sorting out the net effects on corporate finance requires analyzing the various provisions of the Tax Reform Act, figuring out which assets are the closest substitutes for corporate securities, and evaluating the behavior of households and institutions in different circumstances.[21] In the most comprehensive analysis of portfolio effects performed so far, Galper, Lucke, and Toder (1988) concluded that the net impact of the Tax Reform Act is a slight decrease in corporate debt-equity ratios.

In summary, an analysis of tax changes casts doubt on the view that corporations will continue to increase their leverage. In essence, lower statutory corporate income tax rates reduce the tax penalty for using equity finance, and this one change dominates other changes under most modes of analysis.

International Competition

Another argument for continued high use of debt is that the United States ratio is out of line with practices abroad (Kopcke 1989b). In an economic environment where U.S. companies face severe international competition, high leverage may be their only means to lower capital costs. Other measures, such as fiscal and monetary changes, require government action.

This argument is similar to the one that main-

tains that corporations are using interest deductions as a substitute for other tax shields lost in the Tax Reform Act. Unlike depreciation allowances, however, interest payments require a form of finance that increases the risk of bankruptcy. Some observers are skeptical that the current institutional arrangements between financiers and corporations could support a further large increase in leverage. For example, McCauley and Zimmer (1989) indicate that, unlike the situation in the United States, banks in Japan and Germany are also shareholders in the companies to which they make loans. When these foreign corporations face financial crises, bankers are likely to provide assistance, thereby lowering the bankruptcy risk associated with a given degree of leverage. Also, McCauley and Zimmer point out that corporations in the United States may not be effective in cutting capital costs by increasing leverage if they must pay a sizable risk premium for additional borrowing.

In at least one respect, however, institutional arrangements now support higher leverage in the United States. The development of the so-called junk bond market has lowered the cost of intermediation and made debt more accessible to mid-sized corporations. On the other hand, some recently issued debt may eventually be converted to equity. Highly leveraged transactions (HLTs) by banks often involve stock warrants as well as debt instruments.

An analysis of tax changes casts doubt on the view that corporations will continue to increase their leverage.

Summary

Debt is attractive to corporations because it enables existing corporate shareholders to maximize their share of returns, and because it encourages expansion by reducing the cost of capital. Corporations took advantage of these long-standing benefits when they increased their use of debt starting in the mid-1980s. Their increased preference for leverage appears to lie in the lower perceived risks associated with sustained economic recovery. A similar phenomenon had occurred in the latter half of the 1960s. A further significant expansion in debt finance, and its attendant consequences for tax revenues, would require a continued shift in benefits relative to costs. Changes in tax policy under the Tax Reform Act of 1986 have, on net, probably diminished the comparative benefit of debt finance. Use of debt may rise for other reasons, such as a change in the relationships between corporations and their creditors that would lower bankruptcy risks. But unless such shifts in the cost of debt relative to equity materialize, the revenue losses associated with the use of debt finance will probably level off or even subside.

IV. Implications for Tax Policy

This study has found that the relationship between corporate leverage and tax revenues is complex. In the aggregate, increases in the use of debt reduce revenues for the U.S. Treasury and tax burdens for corporations. But, somewhat paradoxically, some of the most leveraged transactions reduce tax revenues the least (or even raise revenues) because the buying and selling of ownership rights and tangible assets result in capital gains revenues. These additional revenues offset a large share of recent revenue losses. This suggests that policymakers concerned with revenue losses should not attempt to restrict certain forms of corporate restructurings such as leveraged buyouts.

Future revenue losses will be held down unless financial arrangements cause a reduction in the bankruptcy risk associated with debt, or unless corporations' preferences make them willing to bear more risk. A reduction in the riskiness of debt would produce some desirable results. It would enable corporations to adopt a financial structure that lowers their cost of capital, and therefore would promote economic growth through a higher rate of investment. Policymakers should probably not react by penalizing leverage in this case. The strongest case for a change in tax policy will be made if policymakers believe that corporations are taking on undue risks through their leverage decisions. Even in this case, policymakers must weigh their concerns about leverage and reductions in tax revenues against goals for economic growth, and they may be constrained by administrative feasibility.

Restrictions on Interest Deductibility

One potential policy response is to disallow or otherwise restrict corporate interest deductions when

corporations rely "too much" on debt. It may be argued that in these cases debt takes on some characteristics of equity. This approach has not been fruitful in the past, however. Under the terms of the 1969 Tax Reform Act, the U.S. Treasury was to promulgate regulations distinguishing debt from equity. The Treasury finally advanced tentative regulations in 1980, made subsequent revisions, but formally abandoned its efforts in 1983 after deciding that such rules were unworkable.

The legal distinction between debt and equity has evolved over time.[22] Early tax court decisions focused on a corporation's debt-to-equity ratio in distinguishing interest from payments to shareholders. Companies with "excessive" ratios had to limit their interest deductions. As a result of these decisions, many corporations came to view 4 to 1 as a safe limit. However, since the mid-1950s, courts have relied less and less on this principle, in some cases disallowing and in other cases permitting interest deductions for corporations with low leverage ratios, and in still other cases permitting interest deductions for corporations with high leverage ratios, especially where these high ratios were temporary. In the case of closely held corporations where debtholders and shareholders are likely to be the same individuals, the courts now tend to consider whether independent lending institutions would have advanced funds on the same terms as the insiders. If not, then debt must be reclassified as equity. More generally, interest deductions have been disallowed when the terms of payment to debtholders have fluctuated significantly with the fortunes of the business. It is doubtful whether these legal distinctions between debt and equity could restrict interest deductions to any significant extent, since securities that corporations regard as debt have generally passed muster in the courts.

Tax Incentives

Another approach to discouraging leverage is equalization of the tax treatment of debt and equity. The revenue results differ, depending on whether taxes on debt are increased to the level of taxes on equity, whether taxes on equity are reduced to the level of taxes on debt, or whether the tax treatment of both should be amended to meet somewhere in the middle. Additional factors should matter in choosing among these options. Proposed measures differ in their level of administrative difficulty. They also have different implications for fairness. Lower taxes on equity income (without any offsetting changes in tax rates) may be viewed as unfair since upper-income taxpayers own a disproportionately large fraction of corporate securities. On the other hand, those who believe that income from all sources should bear identical tax treatment may favor policies to eliminate the "double tax" on income from corporate stock ownership. Finally, these policies differ in their effect on the cost of capital. All else equal, tax policies that lower the cost of capital promote investment and economic growth. Also, policies that eliminate the extra corporate tax will tend to lead to more efficient allocation of capital, thus also increasing national income.

All else equal, tax policies that lower the cost of capital promote investment and economic growth.

Raising the taxes owed on debt to those on equity provides the greatest increase in revenues, but is not a desirable way to discourage leverage. The anomaly under a separate corporate income tax is that equity is taxed twice, not that debt is taxed only once. A double tax on debt would put the United States out of line with tax structures in the rest of the world. In all other industrialized countries, corporations are allowed to deduct interest payments in computing taxable income (Sinn 1987). The resulting increase in the cost of corporate capital would deter corporations from locating investments in the United States, especially when added to the more restrictive capital cost recovery provisions in the Tax Reform Act of 1986 (see Henderson 1986).

Taxing equity income only once would, of course, cause revenues to fall. But advantages include a lower cost of capital. Higher investment and an improved allocation of capital would tend to raise national income, resulting in some positive feedback effect on tax revenues. (Policymakers could also choose to offset revenue losses by raising personal income tax rates, but this would raise the required returns on investment, and partially offset their attempt to lower the cost of capital.)

A single level of tax on equity income could be achieved by integrating the corporate and personal income tax systems. Under full integration, shareholders would be allocated a portion of corporate

income corresponding to their fraction of outstanding equity. This income would be added to other income reported on their tax return, as in the existing treatment of partnership income.

So far, full integration has been considered too cumbersome to be implemented, in part because of additional recordkeeping and reporting requirements for corporations and stockholders. Under an integrated tax, shareholders would have to adjust the basis of their stock to account for undistributed earnings on which they had been taxed. Without an adjustment, they would incur excess capital gains taxes when they sold their shares. Corporations, in turn, would face a simultaneity problem under an integrated tax if they themselves held shares. They would find it difficult to allocate their income to shareholders on a timely basis because it would depend on income they received from their ownership of shares. As a final example, policymakers would have to decide whether to apply limitations on operating losses, capital losses, and tax credits to the corporation as a whole or to individual shareholders. Limits imposed shareholder by shareholder would be more in keeping with the principle of integration, but would complicate shareholders' tax calculations. Limits imposed on the corporate entity would be simpler, but might lead to undesirable tax shelter activity, similar to that which necessitated complicated corrections to partnership taxation in the Tax Reform Act of 1986. Many other administrative difficulties are cited in McLure (1979, Chapter 5) and the U.S. Congressional Budget Office (1985, Chapter 8). As a result of these difficulties, full integration is not practiced in any country (Sinn 1987), although it is currently under preliminary study at the U.S. Treasury Department. The widespread use of computers may now facilitate implementation of a fully integrated income tax, but policymakers would probably need to streamline the tax laws compared to those now applicable to partnerships.

A much simpler approximation to full integration would involve using the corporation to pay taxes on behalf of shareholders and doing away with any further individual income tax on corporate distributions and, perhaps, capital gains (Steuerle 1989b). The tax rate could be set at any level, but likely candidates are the top rate of corporate tax (34 percent) or the top rate of individual tax (28 percent). This proposal would leave some difference in the tax between debt and equity to the extent that these top rates are above the average rates on interest income.

Many foreign countries have instituted partial integration through favored treatment of dividend distributions. Of the twenty-four countries surveyed in Sinn (1987), eighteen have a partly integrated tax system, and of these, five in effect fully eliminate the extra corporate-level tax on dividends (table 7). In the early rounds leading up to the Tax Reform Act, proposals included allowing corporations to take a partial deduction for dividend payments. Partial integration still taxes income from debt at a somewhat lower rate than income from equity. Such a policy also maintains double taxation on the buildup of value through retained earnings. In the absence of

Table 7
Alternative Systems for Taxing Income from Corporate Equity and International Practices in 1986

Classical System
- No distinction between retained earnings and dividend distributions under the corporate income tax.
- No adjustment of individual shareholders' tax to reflect corporate income tax paid.
- Used in Australia, Luxemburg, the Netherlands, New Zealand, Switzerland, and the United States.[a]

Partial Integration
- Split Rate System or Partial Imputation of Dividends
  - Split rate system has a differential corporate income tax rate for retained earnings and dividend distributions.
  - Alternatively, partial imputation system permits a portion of the corporate income tax paid on dividends to be deducted from the individual income tax paid by shareholders.
  - Used in Austria, Belgium, Canada,[a] Denmark,[a] Finland,[a] France, Iceland, Ireland,[a] Japan, Spain, Sweden,[a] Turkey, United Kingdom.[a]
- Full Imputation of Dividends
  - Full corporate income tax paid on dividends can be deducted from the individual income tax paid by shareholders.
  - Used in Greece, Italy, Norway,[a] Portugal, West Germany.

Full Integration
- Taxation of retained earnings and dividends at shareholders' individual income tax rates. No separate corporate income tax.
- Not used anywhere.

[a]Capital gains realized at least one year after purchase of shares are taxable under the individual income tax. In other countries, long-term capital gains are not taxed. Most countries tax capital gains on assets held less than one year.
Source: Sinn (1987), figure 3.1 and text.

other changes, these earnings would still be taxed under the corporate income tax and when they were realized as capital gains.

A policy to reduce the tax on dividends without reducing the tax on retained earnings and capital gains would tend to favor established companies at the expense of growing corporations that do not pay dividends (Kopcke 1988). Also, depending on one's views on tax incentives (see, for example, the "new view" described in section III), it might cause revenues to fall substantially without providing much of a reduction in capital costs.

The final alternative would be to equalize the effective corporate taxes on debt and equity without changing total tax payments (Hatsopoulos, Krugman, and Poterba 1989). Under this plan, corporations would take a deduction based on their total capital, and the rate of deduction could be set initially so as to approximate current interest deductions in the corporate sector. The details of this plan would have to be worked out in order to provide changes in the rate of deduction as actual capital costs changed. The elimination of full deductibility of interest payments would put the United States' tax treatment of debt at odds with that in other countries, however, and might lead to complicated arrangements to change the "location" of finance. Large U.S. corporations have already taken advantage of lower interest rates in Japan by issuing yen and dual-currency bonds combined with currency swaps (Smith, Smithson, and Wilford 1989, pp. 220).

V. Conclusions

U.S. corporations have increased their use of debt in recent years, thereby avoiding the "double taxation" of equity income. Costs to the U.S. Treasury were held down by the Tax Reform Act of 1986, which reduced the tax differential between debt and equity finance by lowering statutory tax rates for corporations. Also, corporations have accumulated debt and reduced equity in the course of reorganizations. However controversial mergers and acquisitions might be, these moves as well as corporations' repurchases of their own shares have caused the realization of capital gains which in turn provided more tax revenues. This article has estimated the revenue cost of a more leveraged corporate sector to be between $8 billion and $14 billion in 1988. (The choice of a historical reference point inevitably causes the variation in these estimates, since there is no established "normal" leverage ratio.) But the higher capital gains and corporate income tax revenues generated by corporate restructurings, estimated at roughly $5 billion, must be counted as an offset.

Revenue costs could rise in the future if corporations use high ratios of debt finance to fund new investments. This seems unlikely, given the usual fluctuations in business conditions and changes introduced in the 1986 Tax Reform Act. On the other hand, pressures to lower the cost of capital may lead to new relationships between financial intermediaries and corporations that result in higher leverage. Under this situation, policymakers should not attempt to restore revenues by raising taxes on debt finance, because this would discourage investment. The clearest case for intervention is if policymakers feel that corporations are taking on too much risk in their financing policies. Even in this case, policies that equalize the tax treatment of debt and equity have differing results for revenues and capital costs, and policymakers must choose between competing goals. Tax integration proposals generally require sacrificing some revenue in return for a low cost of capital, and some forms of integration provide greater relief to corporations paying dividends than to those retaining their earnings. Alternatively, a general deduction for capital costs regardless of the source of finance does not sacrifice revenues and has no direct effects on the cost of capital, but poses some difficulties in a world where interest deductions generally are fully deductible.

Appendix: Calculation of Tax Rates in Tables 1 and 2

The calculations of effective tax rates on income from corporate debt and equity follow the procedures used to provide U.S. data for an international comparison of tax policies by King and Fullerton (1984). The current study modifies this methodology by excluding taxes imposed by state and local governments. State and local income taxes have less of an effect on tax disparities between debt and equity because the rates of tax are lower. Few states have corporate or personal tax rates exceeding 10 percent, and several do not have any tax on these forms of income (Advisory Commission on Intergovernmental Relations). In any case, a thorough analysis would have to consider data on the geographic distribution of corporate profits, interest deductions, interest earnings, dividends, and capital gains. Obtaining this information would be a major study in itself, and King and Fullerton made only rough calculations of state and local taxes in the United States (they were more significant for other countries in their study). On the other hand, federal withholding taxes on foreigners' interest and dividends earned in the United States are included in the revenue calculations in this study. King and Fullerton omitted them because they limited their analysis to domestic ownership of assets.

Table 1

Households' weighted tax rates on interest income for 1980, 1986, and 1988 are from the U.S. Treasury Department's Individual Tax Model, as reported in Cilke and Wyscarver (1987). For 1970, the rate was estimated by examining historical changes in marginal tax rates at different income levels during the 1970s as reported in Steuerle and Hartzmark (1981), and applying this information to the average marginal tax bracket of interest recipients observed in 1980. The adjustment for imputed interest is calculated using the procedure of King and Fullerton, p. 223, based on data from the Flow of Funds on checkable deposits. The corporate income tax rate for insurance companies is the top statutory rate, as reported by Pechman (1987), table A-8.

The effective withholding tax rates on foreigners' interest income were obtained from Lewis (1988–89) and telephone conversations with the author. The rate for 1970 is based on data for 1973, since that was the earliest year available for disaggregated categories of taxes. The rate for 1988 was assumed to be identical to that in 1986. Interest paid to foreigners was $646 million in 1973, $2.604 billion in 1980, and $11.781 billion in 1986. The corresponding taxes withheld were $17 million, $96 million, and $249 million, respectively.

The weights for debt holders were obtained using the procedures of King and Fullerton, pp. 240–243. The first step was to measure corporate net debt in each year from the Flow of Funds accounts (appendix table 1). These data are the difference between liabilities (consisting of bonds, mortgages, bank loans, issues of commercial paper, bankers' acceptances, and finance company loans) and assets (consisting of demand and time deposits, security repurchase agreements, commercial paper held, and consumer credit).

Because the Flow of Funds reports detailed information on only total corporate and foreign bonds, not nonfinancial corporate bonds, as well as total mortgages, not nonfinancial corporate mortgages, it is necessary to assume that these categories of nonfinancial corporate debt are distributed among holders in the same proportions as the available debt categories (appendix table 2 for 1988 data). Using the King-Fullerton methodology and Flow of Funds data, each type of net debt was allocated to individuals and institutions in four sectors: households, insurance companies, tax-exempt institutions, and foreigners (appendix table 3 for 1988 data). Most forms of corporate debt were assigned directly to one class of holders, as in King and Fullerton. Households hold very little corporate debt directly, but are taxed on interest received from intermediaries such as commercial banks that hold corporate obligations. The household category includes these indirect forms of ownership. The final allocation of ownership of corporate net debt in each year is shown in appendix table 4.

Table 2

In table 2, the corporate tax rate is identical to that in table 1, and the shareholder tax rates were computed separately for dividends and capital gains. Households' weighted tax rates on dividend income are also from Cilke and Wyscarver and Steuerle and Hartzmark. Insurance companies are taxed according to the corporate income tax rate, but a large fraction of dividends is excluded from the base. These statutory exclusion rates are reported in Pechman (1987) and earlier editions.

Effective withholding tax rates on foreigners' dividend income were obtained from the same sources as for interest income. Dividends paid to foreigners were $1.476 billion in 1973, $3.148 billion in 1980, and $6.507 billion in 1986. The corresponding taxes withheld were $193 million, $453 million, and $759 million, respectively.

The household tax rates on capital gains are taken from the U.S. Congressional Budget Office (1988), table 8. The advantage of deferral and step-up of basis at death is taken from the estimate of King-Fullerton and is assumed not to vary from year to year. Insurance companies' tax rate is the statutory corporate rate on capital gains as reported in Pechman, and the deferral assumption comes from King-Fullerton.

The distribution of ownership of corporate equities was calculated from Flow of Funds data using the methodology described in King and Fullerton, pp. 239–240 (appendix table 5). Seven percent of the recorded household holdings is allocated to nonprofit institutions in all years.

Appendix Table 1

Composition of Corporate Net Debt

Billions of Dollars

	1970	1980	1986	1988
Corporate Liabilities	343.3	741.9	1317.1	1651.1
Bonds	166.8	365.6	664.2	885.0
Mortgages	58.9	85.0	61.4	96.2
Bank Loans n.e.c.	103.6	229.9	464.7	501.9
Acceptances	3.1	17.1	28.1	32.6
Finance Company Loans	10.9	44.3	98.7	135.4
Corporate Assets	66.5	139.8	294.7	308.1
Demand Deposits	44.1	57.1	114.3	120.0
Time Deposits	5.3	37.9	87.5	99.6
Security Repurchase Agreements	.2	28.4	70.5	79.5
Net Commercial Paper	2.3	−8.6	−10.0	−28.4
Consumer Credit	14.6	25.0	32.4	37.4
Net Total (Liabilities Less Assets)	276.8	602.1	1022.4	1343.0

Source: Calculated by the author from Board of Governors of the Federal Reserve System, *Flow of Funds Accounts* using the methodology of King and Fullerton (1984), chapter 6.

Appendix Table 2

Holdings of Corporate and Foreign Bonds and Total Mortgages, 1988

	Corporate and Foreign Bonds		Total Mortgages	
	Billions of Dollars	Percent of Total	Billions of Dollars	Percent of Total
Individuals and Nonprofit Institutions[a]	115.5	8.3	174.6	5.4
Commercial Banks	83.4	6.0	669.2	20.5
Savings Institutions	77.1	5.5	971.1	29.8
Mutual Funds	68.4	4.9	0	0
Finance Companies	0	0	68.8	2.1
Real Estate Investment Trusts	0	0	7.8	.2
Mortgage Pools	0	0	810.9	24.9
Life Insurance Companies	437.0	31.4	232.6	7.1
Other Insurance Companies	60.3	4.3	5.2	.2
Private Pensions	180.5	13.0	5.7	.2
State and Local Government Retirement Funds	160.6	11.5	15.6	.5
Rest of the World	180.2	12.9	0	0
Sponsored Credit Agencies	0	0	152.6	4.7
Brokers and Dealers	29.2	2.1	0	0
State and Local General Funds	0	0	98.6	3.0
U.S. Government	0	0	48.0	1.5
Total	1392.2	100.0	3260.7	100.0

[a]Includes nonfarm, noncorporate business.

Source: Board of Governors of the Federal Reserve System, *Flow of Funds Accounts*.

Appendix Table 3

Holdings of Nonfinancial Corporate Liabilities and Assets, 1988

Billions of Dollars

	Bonds[a]	Mortgages[a]	Bank Loans n.e.c.	Acceptances	Finance Company Loans	Total Liabilities	Total Assets[b]	Net Debt (Liabilities Less Assets)
Individuals and Non-profit Institutions	73.4	5.2	0	0	0	78.6	37.4	41.2
Commercial Banks	53.0	19.7	501.9	32.6	0	607.3	253.2	354.1
Savings Institutions	49.0	28.7	0	0	0	77.7	45.9	31.8
Mutual Funds	43.5	0	0	0	0	43.5	0	43.5
Finance Companies	0	2.0	0	0	135.4	137.4	−28.4	165.8
Real Estate Investment Trusts	0	.2	0	0	0	.2	0	0.2
Mortgage Pools	0	23.9	0	0	0	23.9	0	23.9
Life Insurance[c]	89.7	2.2	0	0	0	91.9	0	91.9
Other Insurance Companies	38.3	.2	0	0	0	38.5	0	38.5
Private Pensions	114.7	.2	0	0	0	114.9	0	114.9
Life Insurance Pensions[c]	188.1	4.7	0	0	0	192.8	0	192.8
State and Local Government Retirement Funds	102.1	.5	0	0	0	102.6	0	102.6
Rest of the World	114.6	0	0	0	0	114.6	0	114.6
Total of Above	866.4	87.5	501.9	32.6	135.4	1623.9	308.1	1315.8
Sponsored Credit Agencies	0	4.5	0	0	0	4.5	0	4.5
Brokers and Dealers	18.6	0	0	0	0	18.6	0	18.6
State and Local General Funds	0	2.9	0	0	0	2.9	0	2.9
U.S. Government	0	1.4	0	0	0	1.4	0	1.4
Total	885.0	96.2	501.9	32.6	135.4	1651.1	308.1	1343.0

[a]Allocation uses the percentages in appendix table 2.

[b]Demand deposits of $120.0 billion allocated to commercial banks. Time deposits of $99.6 billion allocated to commercial banks ($53.7 billion) and savings institutions ($45.9 billion). Security repurchase agreements of $79.5 billion allocated to commercial banks. Net commercial paper (−$28.4 billion) allocated to finance companies. Consumer credit of $37.4 billion allocated to individuals.

[c]Allocation of life insurance company holdings to insurance and pensions according to relative reserves.

Source: Calculated by the author from Board of Governors of the Federal Reserve System, *Flow of Funds Accounts* using the methodology of King and Fullerton, chapter 6.

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[1] The modeling here abstracts from the use of the Menge formula for taxing life insurance companies. Prior to the passage of the Deficit Reduction Act of 1984, the tax rate on interest earned by life insurance companies depended on the rate of interest. With an adjustment for this formula, King and Fullerton (1984) estimate that the tax rate for insurance companies was 41 percent in 1980. Throughout this paper, the top statutory corporate income tax rate is used as an estimate for all corporations. Most corporate income is taxable at this rate.

[2] By eliminating withholding taxes on interest from portfolio investments, the Deficit Reduction Act of 1984 eliminated a large share of foreigners' taxes on interest earned in the United States. In 1986, these taxes amounted to only about $250 million, compared to about $12 billion in interest paid to foreigners, for an effective rate of two percent (Lewis 1988–1989). Even before the 1984 legislative changes, the statutory withholding rate of 30 percent was reduced substantially by tax treaties. Withholding taxes represent the entire income tax liability of foreign investors to the U.S. government because they do not file tax returns in the United States. Apart from these measured revenue effects, the withholding taxes may have been largely irrelevant in determining foreigners' willingness to invest in the United States because these taxes could be credited on their tax returns in their home country.

[3] Foreign industrialized nations often allow some form of dividend relief, either through a credit or lower rate on dividend payments (see McLure 1979, U.S. Treasury 1984, volume I, Appendix C, and Sinn 1987, chapter 3). For further discussion, see section IV of this paper. The United States had a surtax on undistributed profits in 1936 and 1937.

[4] Absent the relief for intercorporate dividend distributions,

Appendix Table 4

Ownership of Corporate Net Debt

Billions of Dollars

	1970	Percent of Total	1980	Percent of Total	1986	Percent of Total	1988	Percent of Total
Households	136.1	(50.3)	289.0	(49.0)	494.6	(49.4)	660.5	(50.2)
Individuals and Nonprofit Institutions	19.9		21.2		21.7		41.2	
Commercial Banks	71.4		163.3		304.0		354.1	
Savings Institutions	31.3		36.6		14.9		31.8	
Mutual Funds	2.9		6.3		30.3		43.5	
Finance Companies	9.5		54.7		110.3		165.8	
Real Estate Investment Trusts	.5		.2		.1		.2	
Mortgage Pools	.6		6.7		13.3		23.9	
Insurance Companies	60.1	(22.2)	93.8	(15.9)	106.0	(10.6)	130.4	(9.9)
Life	53.0		76.3		75.7		91.9	
Other	7.1		17.5		30.3		38.5	
Tax-exempt Institutions	72.2	(26.7)	191.3	(32.4)	310.9	(31.1)	410.3	(31.2)
Private Pensions	24.8		57.6		83.2		114.9	
Life Insurance Pensions	17.6		63.3		136.9		192.8	
State and Local Government Retirement Funds	29.8		70.4		90.8		102.6	
Rest of the World	2.2	(0.8)	16.2	(2.7)	89.2	(8.9)	114.6	(8.7)
Total	270.6	(100.0)	590.3	(100.0)	1000.7	(100.0)	1315.8	(100.0)
Addendum								
Sponsored Credit Agencies	2.9		5.9		3.5		4.5	
Brokers and Dealers	1.4		1.5		15.0		18.6	
State and Local Government General Funds	.6		2.0		2.0		2.9	
U.S. Government	1.3		2.5		1.3		1.4	

Source: Calculated by the author from Board of Governors of the Federal Reserve System, *Flow of Funds Accounts* using the methodology of King and Fullerton (1984), chapter 6.

the corporate income tax could be a "triple tax" rather than a "double tax."

[5] Withholding taxes represent the entire income tax liability of foreign investors to the U.S. government. As in the case of withholding taxes on interest, withholding taxes on dividends may not deter foreigners' investment in U.S. equities because these taxes can be credited on their tax returns in their home country.

[6] The total tax rate on dividends is equal to the corporate income tax rate plus the shareholder tax on dividends times the quantity one minus the corporate income tax rate. The total tax rate on retained earnings is computed as the corporate income tax rate plus the shareholder tax on capital gains times the quantity one minus the corporate income tax rate. This latter calculation assumes that, on average, retained earnings give rise to capital gains on a dollar-for-dollar basis. McLure (1979) made the identical assumption in a study of corporate taxation. Some authors also add in the discounted value of the additional tax on future dividends paid out of income generated by current retained earnings. Proponents of the "new view" of dividend taxation (discussed briefly in section III) point to this future tax in arguing that dividend taxes are irrelevant in the corporations' cost of retaining earnings. Dividend taxes must be paid currently if the corporation decides not to retain earnings, or eventually if it does retain earnings.

[7] As corporate leverage changes, the expected interest rate and rate of return to equity change in order to achieve a balance between the securities that corporations issue and what households and institutions wish to hold in their portfolios. As corporations increase their demand for debt, they must offer a higher interest rate to induce households and institutions to supply debt (holding all other factors constant). The changing distribution of holdings would also affect the weighted average tax rates on income from debt and equity. As former equity holders have shifted into debt, they have probably raised the observed tax rate on interest. This is because households' ownership of equity is more concentrated in the upper part of the income distribution than is their ownership of debt. Also, tax-exempt institutions own a smaller proportion of corporate equity than of debt. The revenue estimates in this section take the 1988 interest rates, returns on equity, and weighted ownership rates as the reference point, and thus provide more conservative estimates of current revenue losses from increased leverage than would be obtained from an analysis using historical rates of return and ownership rates. By symmetry, estimates of future revenue losses (gains) from further increases (decreases) in leverage are overestimated (underestimated) when

Appendix Table 5
Ownership of Corporate Equity
Billions of Dollars

	1970	Percent of Total	1980	Percent of Total	1986	Percent of Total	1988	Percent of Total
Households	677.5	(79.0)	1080.2	(68.8)	1888.1	(64.5)	1892.8	(60.7)
Individuals	634.9		1033.5		1719.8		1697.2	
Commercial Banks	0.1		0.1		0.1		0	
Savings Institutions	2.8		4.2		7.0		8.0	
Mutual Funds	39.7		42.4		161.2		187.6	
Insurance Companies	24.2	(2.8)	57.6	(3.7)	89.5	(3.1)	103.2	(3.3)
Life	11.0		25.3		27.2		28.9	
Other	13.2		32.3		62.3		74.4	
Tax-exempt Institutions	128.6	(15.0)	366.6	(23.4)	785.2	(26.8)	923.3	(29.6)
Private Pensions	67.1		223.5		456.4		511.2	
Life Insurance Pensions	3.6		21.0		49.2		60.7	
State and Local Government Retirement Funds	10.1		44.3		150.2		223.7	
Nonprofit	47.2		77.8		129.4		127.7	
Rest of the World	27.2	(3.2)	64.6	(4.1)	166.6	(5.7)	198.4	(6.4)
Total	857.5	(100.0)	1569.0	(100.0)	2929.4	(100.0)	3117.7	(100.0)
Addendum								
Brokers and Dealers	2.0		3.3		17.7		12.3	

Source: Calculated by the author from Board of Governors of the Federal Reserve System, *Flow of Funds Accounts* using the methodology of King and Fullerton (1984), chapter 6.

current ownership rates are used. For further discussion of the expected distributional shifts when leverage changes, see Auerbach (1989b).

[8] This revenue calculation does not take into account the changing generosity of other deductions or credits. For example, depreciation allowances may exceed or fall short of the value of economic depreciation, and investment tax credits offset tax liability prior to 1986. At best, the calculation indicates the effects of debt and equity finance holding constant all other aspects of corporate tax law. For further details of how taxation of income from corporate activity is influenced by factors other than the financing mix, see Henderson (1986). In particular, the cutbacks in capital cost recovery provisions in the Tax Reform Act of 1986 caused the total effective tax rate for corporate-source income to rise even though the statutory income tax rate for corporations fell from 46 percent to 34 percent.

[9] Using a single interest rate rather than a weighted rate for debt of different maturities may be justified by the relatively flat current term structure of interest rates. The equity rate of return is computed by starting with corporate earnings subject to taxation relative to the book value of corporate equity for corporations outside of finance, insurance, and real estate, as reported in recently available data from tax returns (1985 *Statistics of Income: Corporation Income Tax Returns*). It is then adjusted downward according to Federal Reserve data on the ratio of net worth computed using the book value relative to the replacement value of assets (1988 *Balance Sheets for the U.S. Economy*) Finally, it is adjusted upward to reflect a judgmental adjustment for the increase in taxable corporate income from the Tax Reform Act of 1986. Traditionally, the rate of return on stocks has been higher than the rate of return on bonds (Ibbotson Associates 1987). Both their calculations and the methodology used in this study indicate a reversal of this pattern in the 1980s.

[10] According to equation 2 in table 3, total revenues (T) for 1988 were approximately $158 billion.

[11] Cash on hand could be the result of previous debt issues or asset sales, or of retained earnings. More formal econometric research has indicated that cash flow in excess of investment opportunities and lower than desirable debt-equity ratios increase the likelihood that firms will repurchase shares (Shoven 1987, Bagwell and Shoven 1988).

[12] If debt is used to purchase shares, leverage changes by $1/(D+E)$ times the purchase amount. If assets are reduced, leverage changes by a factor of $D/(D+E)^2$. The latter ratio equals the former ratio times $D/(D+E)$, which is less than one.

[13] An extrapolation from Bagwell and Shoven (1989) gives an estimate of $117.3 billion (see table 4), but they indicate that further data will increase the estimate.

[14] Studies of repurchases have indicated premiums on the order of 20 percent (Bradley and Wakeman 1983). In the case of hostile takeovers, historical premiums have averaged over 30 percent, and in more recent times they have averaged about 50 percent. For LBOs, the Securities and Exchange Commission calculated average premia of 40 percent between 1980 and 1988 (U.S. House of Representatives Committee on Energy and Commerce 1989).

[15] This may be high for share repurchases because those who sell shares back to the issuing company are most likely to have the highest original purchase price (Bagwell and Shoven 1989).

[16] The calculations should also take into account the revenue obtained from shares that would have been held until death and therefore would never be taxed on the appreciation in value over

the owner's lifetime. This revenue is difficult to estimate. It is probably small compared to the sources of revenue that are taken into account. The amount of the premium offered in part reflects these capital gains and other tax liabilities (Hayn 1989).

[17] One of the anomalies of our system of taxation is that this increased profitability is taxed twice—once through the capital gains tax when the restructuring takes place and again through the tax on corporate income (Kopcke 1989a).

[18] Other studies have found that leveraged buyouts increase tax revenues on net, even accounting for the corporate income taxes lost from higher debt-equity ratios. Because LBOs are a narrow and relatively unusual subset of debt transactions among U.S. corporations, and because the studies do not consider offsetting revenue losses elsewhere in the economy, the results should not be generalized into broader revenue estimates.

In response to Congressional inquiries, Kohlberg Kravis Roberts & Company (KKR) undertook a study of the 17 companies in which it had sponsored a leveraged buyout and in which it still maintained an equity position (Kohlberg Kravis Roberts 1989). The study indicated that, considering the year of the buyout and three subsequent years, total taxes paid by the LBO company and its creditors and investors increased by over 70 percent as a result of the buyout. The study did not attempt to compare the KKR companies to any control group, or to apply the methodology to additional LBOs. Another recent study used 1989 tax law and income flows resulting from 48 large LBOs announced between 1979 and 1985 (Jensen, Kaplan, and Stiglin 1989). On the basis of the most favored set of assumptions and discounting future revenues back to the time of the LBO, the resulting tax gains were twice the size of the resulting tax losses. Under more conservative assumptions, gains were 10 percent higher than losses. Finally, Gravelle (1989) conducted an analytical study of LBOs and showed that the sign of the revenue effects is quite sensitive to the assumed holding period for stock in the absence of the buyout and to assumptions about the permanence of increased debt.

A common impression from these studies is that leveraged buyouts are highly specialized transactions. In most cases, a company is taken over with the purpose of radical restructuring, followed by a public offering of its stock or sales to other investors within three to seven years. For those reasons, there are additional capital gains revenues beyond those considered in this study. (There are also some additional tax losses. LBO companies are able to use loss carrybacks when high debt burdens result in net operating losses, and they tend to omit dividend payouts, which lowers personal income tax receipts.) To the extent that the initial high debt ratios are reduced in future years, the ongoing tax losses associated with leverage are diminished.

These specialized characteristics imply that the tax losses from LBOs may be lower than for other debt transactions—and LBOs may even generate revenue gains. They also imply that the findings for LBOs are not likely to affect the majority of U.S. corporations, since it is doubtful that many companies have the potential to generate such high rates of return for their investors as a result of concentrated restructurings.

Another important point, already mentioned in the text, is that the studies of LBOs look at the revenue effects for these companies only, rather than examining the economy at large. When leveraged buyouts result in greater operating revenues, these gains can come from taking business away from other corporations, which in turn earn lower profits and therefore pay lower taxes. Gains in operating revenues may also come about through reducing costs, but these also result in lower incomes (and therefore tax payments) for the persons or companies affected. Because the studies of LBOs do not examine effects on other parts of the economy, they are of limited relevance for calculations of aggregate revenues.

[19] Because the tax code has not distinguished nominal and real interest payments, taxable income of corporations tends to be understated in times of inflation, but this is exactly matched by an overstatement of taxable income for their creditors. (This statement abstracts from other aspects of taxation that cause corporate income to be overstated.) Corporations are in a higher statutory tax bracket than their creditors on average and therefore the tax loss is greater than the tax gain once a correction is made for inflation (see Henderson 1986 for further discussion). The basis for capital gains is not indexed to inflation, so taxes relative to real capital gains are higher than indicated in the revenue figures presented above. See Poterba (1989) for estimates of the inflation- and deferral-adjusted effective capital gains rate under various assumptions on nominal returns and holding periods.

[20] To the extent that these other deductions had caused firms to experience tax losses in the early 1980s, interest deductions were less valuable because they were only partially used. This argument, presented in Auerbach (1989b), provides another reason why the use of debt might have been held down in the earlier period and increased subsequent to 1986.

[21] For example, households that tend to roll over their equity portfolios frequently would be especially deterred from holding equities because of the large increase in taxes on realized capital gains. On the other hand, households that do not trade shares frequently now have an increased incentive to hold corporate equities because of the reductions in dividend tax rates and the top statutory corporate income tax rate in the 1986 Act. Pensions and endowments funds should also now shift funds into corporate equities because they are not affected by individual income taxes and are benefited by the corporate rate reduction.

[22] For further elaboration on the material in this section, see Wolfman (1982 pp. 117–123 and 1987 supplement pp. 18–21).

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Why Do New Englanders Work So Much?

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Back in the not so distant past of 1987, the New England unemployment rate was only 3 percent. Concerns about labor shortages were widespread among employers: workers were hard to find at any reasonable wage and even if employers did find them, workers frequently moved on to another job in short order. The subsequent softening of the New England economy has caused a loosening of the regional labor market and the availability of labor has become a less pressing issue for New England businesses. However, projections of slower growth in the working-age population in the 1990s, attributable to changes in the age structure, hold out the possibility of tight labor markets and difficulties finding suitable workers in the future.

Increased in-migration may augment population growth. In addition, increases in the fraction of the working-age population that chooses to work can increase the supply of workers without any change in the size of the population. This article focuses on the fraction of the working age population that chooses to work, called the participation rate, and its responsiveness to economic conditions. If participation in the labor force increases in response to higher wages and rising employment opportunities, labor shortages are less likely. Increased labor demand would, in effect, generate its own supply.

Part I of this article defines participation and briefly examines the changes in regional participation rates since the mid-1970s. Part II discusses the theoretical links between participation rates and economic conditions. In part III an attempt is made to explain the variation in regional participation rates over the period 1974 to 1988 using pooled cross-section time series regressions. Part IV focuses on the implications of the regressions for individual regions, with emphasis on the New England experience. Conclusions are presented in part V. Participation rates tend to respond positively to favorable economic conditions; to

some extent at least, a strong demand for labor creates its own supply. However, while participation rates respond to economic conditions, regional variations in participation have been remarkably persistent and are unlikely to be eliminated by the normal workings of the economy.

I. What Is the Participation Rate? How Has It Changed?

The participation rate is the proportion of the noninstitutional population 16 years of age and over that is in the labor force. The labor force, in turn, consists of all persons who are employed or unemployed. A person is considered to be employed if he does any work for pay or works at least 15 hours without pay in a family business during the week in which the data are gathered. The unemployed are not simply those without jobs. To be considered unemployed one must have made some effort to find work in the previous four weeks. Thus, the labor force consists of those who are employed or seeking employment and the participation rate is the fraction of the population old enough to work that is actually at work or looking for work. Those who are not in the labor force consist of those who do not want to work, those who cannot work, and also those who may want to work but have not recently looked for work.

The civilian participation rate excludes members of the armed forces from both the labor force and the noninstitutional population. (The effect of the exclusion is small: in 1988 the civilian participation rate for the country as a whole was 65.9 percent, the participation rate including the armed forces was 66.2 percent.) Because state and regional participation rates refer to civilian participation, all subsequent discussion is in terms of civilian participation rates.

In 1988 New England had the second highest participation rates of any region for both men and women. Only the West North Central region had higher participation rates. As can be seen in table 1, regions with relatively high participation rates for one sex generally have high participation rates for the other. Traditionally, however, female rates in New England have been higher relative to those elsewhere than male rates. New England had the highest or second highest female participation rate in every year since 1974 (chart 1). The male rate through much of the 1970s, although above the national average, was exceeded by rates in three or four other regions; but in the 1980s New England advanced in the rankings as male participation levelled off in New England while declining in regions with higher rates.

The female participation rate in New England is still higher relative to that elsewhere than is the male rate. For example, the difference between New England's female participation rate of 60 percent and the neighboring Mid Atlantic region's rate of 52 percent was substantially greater than the gap between male participation rates in the two regions (78 and 74 percent respectively.)

All regions have experienced the same trends since the mid-1970s of rising female participation, declining male participation, and increasing participation overall. Given the magnitude of these changes over time, particularly the sharp rise in female participation, it is striking that regional differentials in participation rates have been so persistent. There has certainly been no convergence. Participation in the Mid Atlantic and East South Central regions has remained well below that in other regions; New England and the West North Central region have consistently ranked at or near the top.

This is not to say that no shifts have occurred at all. As noted, male participation held up better in New England than in most of the country during the 1980s. The East North Central region, on the other hand, experienced a sharp decrease in male participation. In 1974 male participation was higher in the East North Central states than in any other part of the country; in 1988 five regions had higher male participation rates. In 1974 female participation in the West

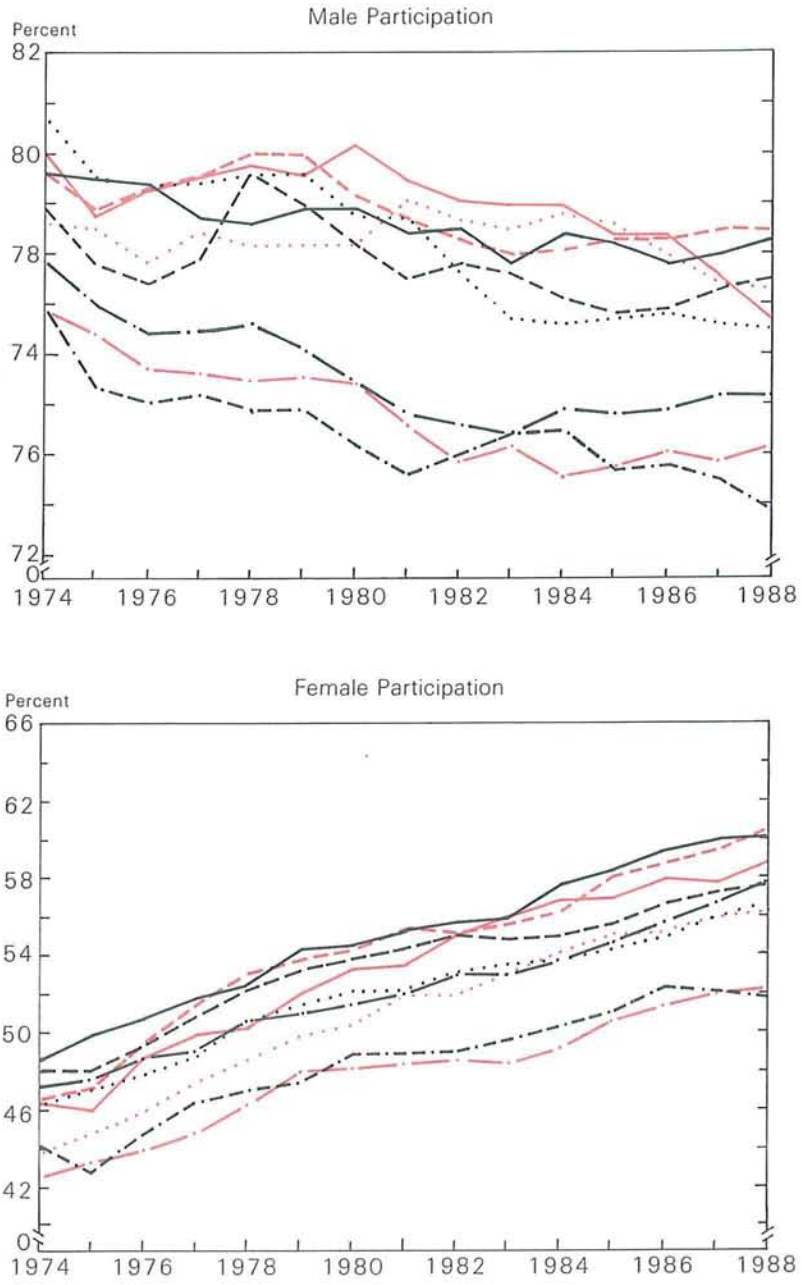
Table 1
Participation Rates in 1988

	Total	Male	Female
New England	68.8	78.3	60.2
Mid Atlantic	62.6	74.2	52.4
East North Central	66.1	76.5	56.7
West North Central	69.1	78.5	60.6
South Atlantic	66.0	75.2	57.8
East South Central	61.7	72.9	51.8
West South Central	66.4	77.3	56.4
Mountain	67.5	76.7	58.9
Pacific	67.3	77.5	57.6
United States	65.9	76.2	56.6

Census regions are defined in the appendix.
Source: U.S. Bureau of Labor Statistics, *Geographic Profile of Employment and Unemployment*, 1988.

Chart 1

Regional Participation Rates for Men and Women, 1974-88



Source: U.S. Bureau of Labor Statistics, *Geographic Profile of Employment and Unemployment*, 1974-88.

North Central states was roughly the national average; by 1978 the West North Central region had the highest female participation rate of any region. New England reclaimed that position during most of the 1980s, but in 1988 the West North Central states once again were at the top.

What accounts for these different rates of change and what explains the persistence of high and low participation rates? Why did participation rise more rapidly in New England than the nation in the 1980s, more slowly in the East North Central states? What, if anything, does industrial New England have in common with the more rural West North Central states that explains both regions' high participation rates?

II. A Little Theory

Analyses of labor force participation generally focus on the influence of wages and the unemployment rate. Wages and unemployment rates are seen as potentially important determinants of participation, but in both cases, the direction of their effect is theoretically ambiguous. The starting point in analyzing participation is the trade-off between work and leisure. People desire both leisure and consumption goods. However, income is required in order to purchase goods; and to earn income, people must forgo leisure and devote time to work. In this trade-off, the wage rate can be seen as the price of leisure. Enjoying an extra hour of leisure requires that the individual forgo the wage that could have been earned by working that hour and the goods those earnings could have purchased.

The starting point in analyzing labor force participation is the trade-off between work and leisure.

While the wage can be considered the price of leisure, the relationship between the wage and the quantity of leisure demanded is ambiguous. An increase in the wage means that an extra hour of leisure involves a greater sacrifice of income and goods than before; the higher price of leisure, therefore, creates an incentive to substitute work (and the resulting goods) for leisure. At the same time, the higher wage means the same or even less time devoted to work yields more income and more goods than before. The individual might choose to enjoy more of both goods and leisure. If this income effect dominates the incentive to substitute work for leisure, higher wages will cause an increase in the demand for leisure and a reduction in the quantity of labor supplied; if the substitution effect is dominant, higher wages cause an increase in the quantity of labor supplied.

The analysis has been extended to take into account time devoted to child care, home maintenance and other activities that are neither market work nor leisure. As in the case of leisure, an increase in the wage rate would have a substitution effect favoring market work and reducing the time spent in these activities. The direction of the income effect is less clear and depends upon whether devoting more time to these "home work" activities increases the individual's well-being. Higher wages might cause one to work less and devote more time to one's children, for example. If, however, home work is a necessary evil, higher wages would not cause any more time to be spent in these activities, although time devoted to market work might still be reduced in favor of leisure.

Increased productivity in home work amounts to a price reduction for such activities; while this would have a substitution effect favoring home work, it also means that one can achieve the same or higher production at home while devoting more time to either work or leisure. It has been suggested and seems plausible that such productivity gains have been major contributors to the long-term rise in female participation in the labor force.

The participation rate is the fraction of the population that is working or looking for work rather than the number of labor hours supplied. Can the line of reasoning outlined above be applied to the participation rate? If one sees work schedules as very rigid and the participation rate as the result of one-time decisions to work or not, individuals do not have the option of enjoying a higher wage and doing less work, and higher wages can only encourage more people to substitute work for leisure (Cain and Dooley 1976 and Ben-Porath 1973). Most analysts do not see the participation rate in this light, however. Even if individuals have limited flexibility in how many hours they work in a day, they have some control over how many days they work in a week, or weeks in a year, or years in a lifetime. The participation rate, then,

reflects not simply one-time decisions to work or not but also decisions to work (or not) this week, or month, or year rather than some other week, or month, or year. Thus, participation may respond either positively or negatively to changes in the wage.

While one cannot say on theoretical grounds how changes in the wage rate affect the quantity of labor supplied, increased income from sources other than the individual's own labor would permit more enjoyment of both leisure and goods and thus would be expected to reduce the quantity of labor supplied. Conversely, reduced income from other sources would cause one to curtail one's consumption of leisure, as well as goods, and increase the quantity of labor supplied. This is the basis for the "additional worker" hypothesis which holds that higher unemployment rates will lead to higher participation rates. If a spouse or family member loses his job, the loss of this income source will cause the individual to cut back on leisure and increase the quantity of labor supplied—by working more hours or choosing to work if not already doing so.

The "discouraged worker" hypothesis, in contrast, argues that higher unemployment rates are associated with lower participation rates. Persons not in the labor force think they will have difficulty finding a job and do not look; persons in the labor force but unemployed become discouraged in their job search and cease to look. Put in terms of the trade-off between work and leisure, the higher the unemployment rate the more time a job seeker is likely to spend in job search and, thus, the lower the earnings that can be expected from a decision to seek work. The price of leisure is therefore lower. Additionally, the higher unemployment rate means more people without jobs, more people for whom the decision to substitute leisure for work implies the sacrifice of expected rather than actual earnings. Thus, plausible arguments exist in favor of either a positive or negative relationship between participation rates and unemployment rates as well as between participation and wages.

The foregoing discussion suggests additional factors that might affect participation. If income from sources other than the individual's own labor has a negative effect on participation, one would think that expectations of future income would also have an effect, with positive income prospects discouraging current participation and negative or uncertain prospects encouraging participation.

One important source of uncertainty about future income is the cost of living; fear that higher prices will reduce real income levels could encourage people to work. Uncertainty with respect to future employment opportunities, on the other hand, might function more like the unemployment rate; while some people may be encouraged to work (and build up savings) in order to protect future standards of living, others may be discouraged because the possibility of future job loss reduces the expected return from work. (The latter effect seems more likely in the case of persons who do not currently hold jobs and for whom job search would entail some cost.)

Different population groups face different wage and employment opportunities; they have different levels of non-wage income; their productivity in home work may differ. Accordingly, their participation rates may differ. For example, lower participation rates for black than for white males may be attributable to less attractive wage prospects and greater likelihood of unemployment. Lower participation rates for women than for men may be explained by lower market wages and higher productivity in the home. Of course, cultural factors may also play an important role; low female participation rates may reflect tradition and differing "tastes" for home and market work.

III. Regional Participation Rates over Time

Can the changes in regional participation rates since the mid-1970s be explained in terms of wages, unemployment rates and some of the other factors suggested by the preceding discussion? The answer is that changes in employment opportunities have had some effect but regional variations in participation are durable.

Pooled cross-section time series regressions were used to identify the factors affecting participation rates in the nine census regions during the period 1974 to 1988. Separate regressions were run for male and female participation rates because these have exhibited such divergent patterns over time. Representative results are shown in table 2.

In equations 1 and 4, an attempt was made to explain participation rates using wages, unemployment rates and a simple time trend. Reasons for including wages and unemployment rates as explanatory variables have been discussed in the preceding section. A "male" wage was used in the equations explaining male participation rates and a "female" wage in the equations for female participation rates. Industry wages (total earnings divided by total em-

Table 2
Regression Results
Dependent Variable = Participation Rate (Labor Force Relative to Working Age Population)

	Male					
	1	2	3	1b	2b	3b
Constant	83.9*	90.0*	115.2*	81.7*	95.6*	90.3*
	(24.5)	(7.8)	(15.1)	(37.8)	(22.7)	(17.0)
Real annual earnings[a] (−1)	.22*	.28*	.01	.27*	.30*	.24*
	(2.9)	(2.4)	(.1)	(3.4)	(3.8)	(3.0)
Unemployment rate (−1)	−.32*	−.39*	.14	−.06	−.06	−.02
	(−4.0)	(−3.4)	(1.6)	(−1.7)	(−1.5)	(−.6)
Time	−.11*	−.25*	−.25*	−.13*	−.04	.07
	(−3.1)	(−2.6)	(−4.2)	(−10.5)	(−1.3)	(1.2)
Employment growth		.12*	.05		.05*	.04
		(2.1)	(1.3)		(2.3)	(1.8)
Volatility of employment changes		.78*	.40*		.02	.02
		(2.8)	(2.2)		(.2)	(.2)
Growth in prices		−.05	.01		−.01	−.009
		(−1.9)	(.7)		(−1.3)	(−1.2)
Volatility of price changes		.13*	−.04		.03*	.02
		(2.8)	(−1.2)		(2.0)	(1.3)
Growth in working age population		−.15	−.17*		−.09*	−.05
		(−1.6)	(−2.8)		(−2.2)	(−1.4)
% Adults over 65		−.18	−.60*		−1.45*	−1.27*
		(−.7)	(−3.4)		(−8.6)	(−7.2)
Small children/young adults		.25*	−.05		.13*	.13*
		(2.3)	(−.6)		(2.2)	(2.0)
Real property income per adult			.41*			−.06
			(11.8)			(−1.2)
Real transfers per adult			−.73*			−.18*
			(−10.9)			(−3.0)
New England				2.5*	2.9*	3.8*
				(10.4)	(10.1)	(8.3)
Mid Atlantic				−1.8*	−1.3*	.2
				(−4.5)	(−2.9)	(.3)
East North Central				1.4*	−.3	.4
				(3.3)	(−.6)	(.7)
West North Central				3.0*	4.8*	4.7*
				(14.7)	(14.2)	(14.0)
East South Central				−1.0*	−1.5*	−2.3*
				(−4.8)	(−6.9)	(−4.2)
West South Central				2.1*	−.6	−.9
				(8.5)	(−1.5)	(−2.0)
Mountain				3.0*	−1.1*	−1.0
				(13.4)	(−2.2)	(−1.9)
Pacific				1.1*	−2.2*	−.8
				(2.7)	(−4.5)	(−1.2)
$\bar{R}^2$	.24	.38	.75	.92	.95	.96

[a]"Male" earnings for equations explaining male participation rates; "female" earnings for the female equations.
*Significantly different from zero at the 5% level.
Notes: Regressions are pooled time series and cross section using data on 9 regions over 15 years.
The set of regional dummies omits South Atlantic, hence all coefficients on regional dummies are differences from South Atlantic.
See Appendix for definitions of variables and sources.

	Female					
	4	5	6	4b	5b	6b
Constant	−8.9	25.6	52.4*	−11.6*	3.5	−2.7
	(−1.9)	(1.6)	(5.4)	(−4.0)	(.5)	(−.3)
Real annual earnings[a] (−1)	−.13	−.35	−1.08*	.03	.09	.11
	(−1.0)	(−1.7)	(−7.0)	(.2)	(.6)	(.7)
Unemployment rate (−1)	−.38*	−.59	.14	−.03	−.11*	−.12
	(−3.3)	(−3.6)	(1.2)	(−.6)	(−2.0)	(−1.9)
Time	.81*	.63*	.61*	.78*	.89*	.97*
	(16.5)	(4.8)	(7.9)	(44.4)	(17.9)	(10.9)
Employment growth		.15	−.002		.06	.06
		(1.9)	(−.1)		(1.9)	(1.9)
Volatility of employment changes		1.31*	.66*		.41*	.42*
		(3.2)	(2.7)		(2.9)	(2.9)
Growth in prices		−.04	.08*		.03*	.03*
		(−1.2)	(3.3)		(2.6)	(2.2)
Volatility of price changes		.12	−.20*		.003	.01
		(1.8)	(−4.4)		(.1)	(.4)
Growth in working age population		−.15	−.07		−.20*	−.20*
		(−1.2)	(−1.0)		(−3.4)	(−3.2)
% Adults over 65		−.59	−1.08*		−1.43	−1.33*
		(−1.7)	(−5.0)		(−5.4)	(−4.7)
Small children/young adults		−.51*	−.78*		−.09	−.03
		(−2.9)	(−7.0)		(−1.0)	(−.3)
Real property income per adult			.66*			−.09
			(15.1)			(−1.1)
Real transfers per adult			−.70*			−.06
			(−7.8)			(−.6)
New England				2.8*	2.1*	2.7*
				(8.0)	(4.8)	(3.9)
Mid Atlantic				−4.2*	−4.8*	−4.1*
				(−7.5)	(−6.6)	(−4.0)
East North Central				−.3	−2.7*	−2.5*
				(−.6)	(−4.5)	(−3.9)
West North Central				2.3*	3.7*	3.7*
				(7.1)	(7.6)	(7.3)
East South Central				−3.7*	−4.1*	−4.9*
				(−11.2)	(−11.8)	(−5.8)
West South Central				−1.1*	−2.8*	−3.3*
				(−3.5)	(−5.4)	(−5.0)
Mountain				1.2*	−1.6*	−1.7*
				(4.0)	(−2.0)	(−2.1)
Pacific				1.2*	−1.9*	−1.2
				(2.3)	(−2.8)	(−1.3)
$\bar{R}^2$	.68	.75	.91	.96	.98	.98

ployment) were calculated for each region for each year. These were then weighted according to the distribution of male (female) employment in each region, according to the 1980 Census, to obtain the male (female) wages. Thus, the male wages are more sensitive to developments in industries in which men account for a disproportionate share of employment, while the female wages are more reflective of changes in female-oriented industries. The time trend approximates the influence of unspecified cultural, demographic and economic factors that change steadily with time.

In equations 2 and 5, the list of explanatory variables was substantially expanded. The rationales for including these variables can be briefly summarized as follows. The growth rate and standard deviation of changes in the consumer price index are intended to capture concerns about the effect of inflation on future purchasing power; the growth rate and standard deviation of changes in employment represent expectations about future employment opportunities, as well as tendencies for labor force patterns to persist. The growth in the working-age population provides a measure of the potential competition for jobs. The fraction of the adult population that is over 65 is included because the elderly have much lower participation rates. The ratio of children under 5 to the population aged 18 to 44 is intended to capture links between the presence of young children and participation.

Possible sources of regional variations include differences in educational levels, marital status, racial composition, urbanization and cultural attitudes.

Transfer income and dividends, interest and rent (property income) were added to the list of explanatory variables in equations 3 and 6. These are forms of non-wage income and would be expected to discourage participation. As discussed in the appendix, however, they are not independent of past earnings and they have cyclical patterns as well as strong upward trends, which make any association with participation difficult to interpret. Because of these ambiguities, equations 2 and 5, which exclude transfer and property income, were judged superior to equations 3 and 6, despite the former's lower explanatory power.

Finally, the three sets of equations are shown with the addition of regional dummy variables. The regional dummy variables are intended to capture the collective effects of unspecified, long-standing sources of regional variations in participation rates. Possible sources include differences in educational levels, marital status, racial composition, urbanization and cultural attitudes. The influence of these factors, which do not change much over time, cannot readily be sorted out with only nine regions. Ideally, the dummy variables would represent only factors not already included in the equations. However, if some of the included variables also exhibit persistent regional differences, the dummy variables may pick up their influence. (The South Atlantic region was arbitrarily chosen as the base region and each dummy variable shows how much higher or lower participation would be in a particular region than in the South Atlantic for the same values of the other explanatory variables.) A more complete discussion of the explanatory variables appears in the appendix.

Male Participation Rates

Regional variations in male participation rates are very durable. The variations in male participation rates over time are smaller than the variations across regions. A comparison of the regressions with and without regional dummies indicates that unspecified, long-standing variations in participation, represented by the regional dummies, account for most of the overall variation.

With that qualification, male participation rates respond positively to the real wage and negatively to unemployment rates. In other words, higher real wages encourage men to seek work, while high unemployment rates discourage labor force participation.

The unemployment rate seems to play a greater role in explaining variations in participation from one region to another than in explaining variations from year to year. Comparing the equations with and without regional dummies, one finds that the contribution of the unemployment rate is much smaller—and statistically insignificant—when the regional dummy is included. The likely explanation is that there are persistent differences in regional unemployment rates that are associated with regional variations

in male participation; however, the effect of such differences is subsumed in the regional dummies.

Male participation rates are positively related to the five-year rate of growth in employment and negatively related to the growth in the working-age population. Although the latter relationship is not always statistically significant, it would appear that male labor force participation is encouraged by a growing demand for labor and discouraged by growing competition for jobs. Male participation may also be related positively to past volatility in employment. Such a positive link to volatility suggests a precautionary motive for labor force activity. As in the case of the unemployment rate, when regional dummies are introduced, the variation in employment changes no longer makes a contribution.

Male participation rates do not appear to be related to the growth in consumer prices. Some equations suggest that price volatility encourages participation but this is not a consistent result. Male participation does not seem to be motivated by fears of inflation.

Male participation rates have fallen over time. In some versions of the equation, time alone has a significant influence; but other versions suggest that time may only be a proxy for other variables, such as the increasing fraction of the population in the older age groups or decreases in the number of young children.

Increases in the fraction of the adult population that is over 65 are associated with lower rates of participation in the equations including regional dummy variables. Those over 65 are much less likely to work than those between 16 and 65; accordingly one would expect that the more elderly people, the lower participation. The presence of young children is positively linked to male participation.

Dividends, interest, and rent and transfers per adult are strongly associated with participation when regional dummies are not included in the equation—dividends, interest, and rent positively and transfers negatively. Both have much less influence when the regional dummies are included and behave more as expected. How should one interpret these results?

Theory says that non-wage income should encourage the consumption of leisure and reduce participation. However, dividends, interest, and rent and transfer income are not independent of wages or even of participation rates. High wages and high participation and employment levels permit the accumulation of assets that generate dividends, interest, and rent. Thus, high income from dividends, interest, and rent may reflect the existence of high wages and participation rates in the past; and this association with past earnings may dominate any tendency for non-wage income to discourage participation. Since the former effect is a long-term one, it would manifest itself more in variations among regions than over time.

Transfer payments are also linked to past earnings because much transfer income consists of social security income and government retirement benefits. However, this association between transfers and retirees is more likely to lead to a negative relationship between transfers and participation rates, attributable not only to transfer income discouraging work but also to high concentrations in certain regions of persons who would have low participation rates under any circumstances and who also receive high transfers. Including in the equation the fraction of the adult population over 65 should control for the presence of the elderly, but not for other groups characterized by low participation and high eligibility for transfers. Transfer payments also have a countercyclical pattern, rising in economic downturns. Thus, the apparent association with participation could reflect the response of both transfers and participation to changing economic conditions rather than participation responding to transfers. As noted previously, equation 2 was judged superior to equation 3 (and 5 superior to 6) for these reasons.

Male labor force participation appears to be encouraged by a growing demand for labor and discouraged by growing competition for jobs.

Female Participation Rates

Regional variations in female participation rates are also very durable. However, in contrast to male participation rates, which have not changed much over time, female rates have climbed steadily upwards in all regions. A simple time trend explains much of the variation in female participation.

Rising female participation appears to be associated with a relative decline in the number of young

children in the population. The ratio of the number of children under five to the number of adults eighteen to forty-four has declined in most regions. Whereas male participation rates are positively related to the presence of children, female rates are negatively related; so the decrease in the ratio of small children to adults tends to raise female participation rates. (One probably should interpret this relationship as meaning that decisions to work and decisions to have children are intertwined, rather than that the absence of children causes higher female participation rates.) Increases in the fraction of the adult population over 65 may have dampened the rise in female participation rates.

No statistically significant relationship was found between female participation rates and real wages; female participation, unlike male, did not respond to higher wages. This result runs counter to many studies of participation, which have found that female participation rates respond positively to real wages. The explanation may be the time period covered by this article. During the period under study real wages were stagnant in most regions; nevertheless, female participation increased substantially. It may also be that the measure of wages used here, even though weighted towards female-oriented industries, does not adequately represent the earnings opportunities open to women. However, a simple comparison of regional participation rates and earnings certainly supports the regression results (table 3). New England had high female participation and, in the late 1980s, relatively high earnings; the West North Central region, with equally high female participation, had low earnings. The Mid Atlantic states had a very low female participation rate despite the highest earnings of any region.

Unemployment rates, on the other hand, do help explain the variation in female participation, with higher unemployment rates discouraging participation. A comparison of the equations, including and excluding the regional dummy variables, suggests that the unemployment rate plays a greater role in explaining variations in female participation among regions than it does over time. Female participation also seems positively related to the volatility of employment growth. While women may be discouraged from seeking work by high unemployment rates, a history of variable employment seems to encourage participation. Growth in employment opportunities seems to foster participation, although the result is not statistically significant; the growth in the working-age population negatively affects participation.

Table 3
Regional Comparison of Female Participation Rates and Earnings

	1988 Participation		1987 "Female" Earnings/ Employment[a]	
	Percent	Rank	$	Rank
New England	60.2	(2)	19,144	(3)
Mid Atlantic	52.4	(8)	20,683	(1)
East North Central	56.7	(6)	18,156	(4)
West North Central	60.6	(1)	15,696	(7)
South Atlantic	57.8	(4)	16,871	(6)
East South Central	51.8	(9)	15,666	(8)
West South Central	56.4	(7)	17,080	(5)
Mountain	58.9	(3)	15,545	(9)
Pacific	57.6	(5)	19,799	(2)

[a]1987 earnings divided by employment, deflated by the U.S. Consumer Price Index.

Source: U.S. Bureau of Labor Statistics, *Geographic Profile of Employment and Unemployment*, 1988; U.S. Bureau of Economic Analysis; U.S. Bureau of the Census.

Some versions of the equation suggest that female participation is positively related to the growth in regional consumer prices; women work as a hedge against inflation.

As was the case for male participation rates, female participation was positively related to income from dividends, interest, and rent and negatively related to transfer income in the equations excluding regional dummy variables. When the dummy variables were included, neither dividends, interest, and rent nor transfer payments had a statistically significant effect on participation. Possible interpretations of this pattern have already been discussed.

In summary, participation rates for both men and women respond positively to employment opportunities, but the responses are not strong and the nature of the responses varies somewhat between men and women. Participation of both men and women is deterred by higher unemployment rates. The influence of unemployment rates on participation seems more important in explaining variations across regions than over time. This result is consistent with a pattern that has recurred in the literature: studies that look at variations in participation across metropolitan areas, states, or regions generally find a stronger link to unemployment rates than studies that look at participation rates over time. Strong growth in employment seems to be associated with

higher participation; strong growth in the working-age population, a measure of competition for work, with lower participation rates. Female participation rates were found to be positively related to the volatility of past employment changes; male rates, but not female, were positively related to real wages.

The rising proportion of adults of retirement age seems to have dampened both male and female participation rates over time. The presence of young children is associated with higher male participation rates and lower female participation.

Perhaps the most striking conclusion arising from these regressions, however, is the durability of regional variations in male and female participation rates. Long-standing variations in participation rates across regions have tended to persist, despite dramatic changes in the economic fortunes of different regions and despite a dramatic increase in female participation during this period. While the regional dummy variables may subsume some of the influence of other variables, such as unemployment rates, which exhibit persistent differences, the point remains: regional differences in participation are remarkably durable.

IV. Implications for New England

The magnitude of the unspecified sources of regional variations in participation rates is indicated by the regional dummy variables. Depending upon the equation chosen, participation rates in New England would be 2 to 4 percentage points higher than in the South Atlantic given the same unemployment rate, age structure of the population, price and employment performance in the two regions. Comparing the dummy variables for New England with those for other regions, one can see that not only would participation in New England exceed that in the South Atlantic, but that it would exceed that in all regions except the West North Central, given the same values of the other explanatory variables.

The explanatory variables are not, of course, the same for New England as for other regions. Comparing the values for New England with those elsewhere, one discovers that New England has had persistently high participation rates despite a relatively large population over sixty-five. The number of young children in New England is relatively low, a pattern consistent with higher female participation but lower male participation. Real wages in New England changed over the period of study. By the mid-1980s real wages were above average, contributing to higher male participation rates. Participation rates were also bolstered in the 1980s by strong employment growth relative to population. Unemployment rates were below average for most of the study period. All of these effects were quite small, however, in comparison with the unspecified causes of high participation represented by the New England dummy variable.

That participation rates would be so much higher in New England—and also the West North Central region—than in other parts of the country for given values of the explanatory variables means that some other factor or group of factors, not included in the equation, has had a powerful and persistent influence on participation. One suspects that education plays a role: the fraction of the adult population with at least 12 years of education is above average in both regions. (The education level is higher still in the Pacific and Mountain states.) Other explanations are also possible. With nine regions, one cannot readily distinguish between factors that do not change much with time. What is apparent is that the high participation rates in New England and the West North Central states have deep-seated and enduring origins.

The low participation rates of the East South Central and Mid Atlantic states are also due in large part to unspecified, long-standing factors. However, low male participation rates in the East South Central also reflect low wages and an older population. In the Mid Atlantic states, in contrast, wages are higher than average; but the elderly population is large. Transfer payments and property income are very high in the Mid Atlantic states. In both regions, unspecified factors play a greater role in depressing female rates than male.

The high participation rates in New England and the West North Central states have deep-seated and enduring origins.

While the equations provide only limited insight into the reasons why participation rates vary from

one region to another, they do shed light on how regional participation rates have shifted over time. In particular, male participation rates did not fall as much in New England as in the rest of the country because real wages held up better in New England than elsewhere and because employment growth was strong in the 1980s relative to the growth in the working-age population. Relatively strong growth in employment and low unemployment rates also boosted female participation in the region; above-average increases in the cost of living in the region may have made a small contribution to rising female participation as well.

That participation rates respond to favorable employment opportunities should provide some comfort to those concerned about the possibility of labor shortages.

In contrast to New England, the economic performance of the West North Central states deteriorated between 1974 and 1988. However, changes in the age structure of the population helped to bolster participation in that region. Although the West North Central states have a relatively old population, the fraction of the adult population over 65 did not increase as much in this region as in the rest of the country.

Sharp declines in male participation in the East North Central states can be attributed to declining real wages and higher than average unemployment rates, especially in the early 1980s, as well as to a larger than average increase in the proportion of the adult population over 65. Recent declines in male participation in the West South Central and Mountain regions also reflect poor wage and unemployment performance, and in the case of the Mountain region a sharp increase in the fraction of adults over 65. In the late 1970s and early 1980s, relatively strong wage growth and low unemployment rates tended to raise participation in these regions. Rapidly rising living costs may have contributed to increasing female participation in the Mountain states.

V. Conclusions

This article has attempted to explain regional variations and changes in the participation rate, the fraction of the working-age population that is employed or seeking employment. It found that the decision to work or seek work responds positively to favorable employment opportunities. Strong growth in employment encourages participation, while rapid growth in the working-age population, the number of potential job seekers, has a negative effect.

That participation rates respond to favorable employment opportunities should provide some comfort to those concerned about the possibility of labor shortages. Strong growth in employment relative to the growth in the population, low unemployment rates and high real wages tend to increase participation. New England's experience in the 1980s is illustrative. Although economic conditions have recently deteriorated, for most of the 1980s employment growth in New England was stronger than average, while population growth was slower than average; unemployment rates were low and wages increased relative to those elsewhere. The strong demand for labor elicited an increase in supply. The region's already high participation rates increased more than participation rates nationwide.

Although participation rates respond to the growth in employment opportunities and to unemployment rates and, for men, earnings differentials, much of the variation in participation rates from one region to another seems to reflect immutable regional characteristics rather than economic variables that may change over time. Because of the importance of these persistent regional characteristics, variations in participation rates are remarkably durable. Despite striking changes in the economic fortunes of different parts of the country during the period under study, New England and other regions that had relatively high participation rates in the mid-1970s generally had high participation rates in the 1980s. The persistence of such differentials is even more remarkable when one considers that female participation rates rose dramatically over the period. Surely the forces responsible for rising female participation rates would be more powerful in some regions than in others. Surely one would see a tendency for regions with low participation rates to catch up. However, that has not been the case.

For state and local policy-makers concerned about the possibility of future labor shortages, the lessons are twofold and slightly contradictory. First,

the labor supply is not fixed. Participation rates will rise in response to favorable employment opportunities and, to a limited extent, will compensate for slow population growth. Second, while low participation rates in some areas might seem to indicate potential sources of future labor supply, the regional experience suggests that tapping such a resource will be difficult: regional differences in participation rates have been very persistent.

Appendix: Definitions of Variables and Sources

All variables refer to the nine census regions and the years 1974 to 1988 except where noted.

Census regions:

New England (NE): CT, ME, MA, NH, RI, VT.
Mid Atlantic (MAT): NY, NJ, PA.
East North Central (ENC): IL, IN, MI, OH, WI.
West North Central (WNC): IA, KS, MN, MO, ND, NE, SD.
South Atlantic (SAT): DC, DE, FL, GA, MD, NC, SC, VA, WV.
East South Central (ESC): AL, KY, MS, TN.
West South Central (WSC): AR, LA, OK, TX.
Mountain (MT): AZ, CO, ID, MT, NM, NV, UT, WY.
Pacific (PAC): AK, CA, HI, OR, WA.

Dependent variable:

Male and female civilian participation rates—civilian labor force relative to the civilian population 16 years of age and over. Separate equations were run for male and female participation rates because of the strikingly different patterns of change over time exhibited in chart 1 of the text.

Source: U.S. Bureau of Labor Statistics, *Geographic Profile of Employment and Unemployment*, issues for the years 1974–77 and 1982–88. Data for the years 1978–81 were obtained from unpublished tabulations supplied by the Bureau.

Explanatory variables:

Real annual earnings—calculated as earnings by place of work relative to total employment. Earnings were calculated for the major industry categories for each year and were weighted according to the 1980 distribution of male (female) employment in the regions to obtain earnings measures reflective of developments in male (female) oriented industries. The earnings figures were deflated by the U.S. Consumer Price Index. Earnings were lagged one year.

Regressions were run using the "male" and "female" earnings and also using total earnings divided by total employment. The choice of the earnings variable did not affect the results very much, although "male" earnings seemed to explain male participation slightly better than total earnings. Including both "male" and "female" earnings variables in the same regressions did not produce satisfactory results; the signs of the two wage variables were unstable.

Source: Employment and earnings figures were obtained from computer tapes supplied by the U.S. Bureau of Economic Analysis.

Unemployment rates—number unemployed relative to the civilian labor force. The unemployment figures were lagged one year to reduce the possibility of distortions arising from the fact that the denominator of the unemployment rate is the numerator of the participation rate.

Source: Same as participation rates.

Time—1974 to 1988 for all regions. The time trend is intended to represent cultural, demographic, and economic developments that have changed over time in all regions and that are not adequately represented by other variables in the equation.

Persons over 65/ adults—the population 65 years of age and over relative to the population 18 years of age and over. Although the working age population is defined as those 16 years of age and over, historic data on the age structure of the regions require a division at 18.

Source: U.S. Bureau of the Census, *Current Population Reports*, Series P-25, Nos. 875 and 1024.

Employment growth—growth in employment between year t − 5 and year t.

Volatility of employment changes—standard deviation of employment changes between year t − 5 and year t.

These variables were included to approximate expectations and uncertainties surrounding future employment opportunities.

Source: U.S. Bureau of Economic Analysis, tape data.

Growth in prices—growth in prices between year t − 5 and year t.

Volatility of price changes—standard deviation of price changes between year t − 5 and year t.

A consumer price index for each region was calculated by averaging (no weights) the available indices for metropolitan areas located in the region. No index is available for a metropolitan area within the East South Central region, so an adjacent metropolitan area was used. Using the U.S. CPI or the CPI for the largest metropolitan area in each region does not produce markedly different results.

The past rate of growth in the CPI was intended to represent expectations of future inflation, while the standard deviation of price increases was included as a measure of uncertainty about inflation. Because of the crudeness of the regional indices, earnings were deflated by the U.S. CPI.

Source: U.S. Bureau of Labor Statistics, *Handbook of Labor Statistics*, 1983 and 1989.

Small children/young adults—population under 5 relative to the population aged 18 to 44.

Source: *Current Population Reports*.

Growth in working-age population—Because population figures have been revised over time, it was decided to estimate the working-age population by multiplying a consistent series of total population figures by the ratio of the population 18 and over to the total population. The growth in the working age population was calculated as the change between years t − 5 and t.

Source: Total population figures were obtained from computer tapes supplied by the Bureau of Economic Analysis. Data on the age structure of the population came from the *Current Population Reports*.

Property income per adult—dividends, interest and rent relative to the population 18 years of age and over.

Transfer income per adult—transfers relative to the population 18 years of age and over.

Dividends, interest, and rent and transfer payments per adult were included in some equations, but the nature of their relationship to participation is problematic. Theory argues that higher non-wage income should lead to greater consumption of leisure and lower participation. However, both dividends, interest, and rent and transfer payments are positively related to past earnings and income levels—transfers because a large portion of transfer payments consists of social security payments and government retirement pay, the magnitude of which depends—in part—upon past earnings; dividends, interest, and rent because higher income levels permit greater asset accumulation, which generates more income in the form of dividends, interest, and rent. Thus, high transfers and high dividends, interest, and rent may be the result of high wage rates in the past and even of high participation rates. Such a relationship might well appear as a positive link between current participation and these non-wage income sources. However, such a link would not mean that theory is wrong, only that the measures of non-wage income are not truly independent of earnings.

A further complication arises from the fact that, particularly in the case of transfers, so much non-wage income is associated with retirement. In other words, high transfer income may be negatively related to participation because some transfer payments are available only to population groups, such as the elderly, that would have low participation rates under any circumstances. One can attempt to control for this by taking into account the age structure and other characteristics of the population.

Source: Income data from the Bureau of Economic Analysis; adult population calculated as described above.

Regional dummy variables—do not change over time. The South Atlantic was arbitrarily chosen as the base region. Each dummy shows how much higher or lower participation would tend to be in the region in question than in the South Atlantic for the same values of the other variables. These variables are intended to represent the collective effects of long-standing sources of regional variations in participation rates. Possible sources of such variations are differences in educational levels, marital status, racial characteristics and cultural attitudes. The influence of factors that do not change much over time cannot readily be sorted out with only nine regions.

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A Call to ARMs: Adjustable Rate Mortgages in the 1980s

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Adjustable rate mortgages, long-term loans that provide for interest rate changes at regular intervals over their lifetimes, have recently become an important source of residential mortgage financing in this country. Widely available for some years in Australia, France, Great Britain, and West Germany, among others, adjustable rate mortgages became a viable option for U.S. borrowers nationwide only in the early 1980s. For the prior half-century, the United States relied almost exclusively on fixed-rate, long-term, level-payment mortgage instruments.

Attempts in 1971 and 1974 by the Federal Home Loan Bank Board (FHLBB) to authorize residential ARMs met with stiff resistance by Congress (Cassidy 1984). Opposition was widespread among consumer groups and labor unions, who feared borrowers would be subjected to unmanageable increases in their mortgage payments. By the end of the 1970s, however, as the condition of the thrift industry rapidly deteriorated, the political climate began to change (Guttentag 1984). In December 1978 the FHLBB allowed federal savings and loan institutions in California to originate variable rate loans in competition with state-chartered institutions. This authority was expanded nationwide in 1979, but still with severe interest rate limitations. These limitations were eased slightly in 1980 and in April 1981 the FHLBB substantially relaxed its restrictions on ARMs originated by thrifts.[1] In March of 1981, the Comptroller of the Currency authorized national banks to originate ARMs for owner-occupied one- to four-family homes.

Chart 1 shows the ARM share of residential mortgages originated in the United States. By early 1982, the share had jumped to 40 percent of originations, and it rose as high as 68 percent in August 1984 and 69 percent in December 1987. As the chart shows, however, the growth was not uninterrupted. The share fell below 30 percent during four

months of 1983 and to 21 percent in June 1986. The share had again fallen to 21 percent by December 1989. Nevertheless, the growth in originations led to an expanding stock of ARMs in lenders' portfolios. Whereas ARMs accounted for 9 percent of total home mortgage debt at the end of 1983 (Nothaft 1984), by mid-1985 this share had risen to almost 20 percent (Goodman and Luckett 1985), and today this share is probably close to 25 percent.

While ARMs have grown to be an important factor in mortgage lending, their variety and complexity have led to confusion. The purpose of this article is to discuss the advantages and disadvantages of ARMs to both lenders and borrowers, and to highlight the nature of the risks involved. The article then explores the basic characteristics of ARMs and the development of the ARM market in the 1980s. The evidence indicates that lenders have enthusiastically embraced the ARM concept. Borrowers, on the other hand, have been reluctant, and this has forced lenders to offer low initial interest rates and restrictions on interest rate movements in order to sell their product.

I. The Attraction of ARMs for Lenders

The role of financial intermediaries is to improve the efficiency of capital markets by linking those who save and those who borrow. They perform this intermediary service by converting their assets into forms better suited to the preferences of their creditors in terms of denomination, liquidity, maturity, and risk characteristics. Traditionally, thrift institutions have done so by accepting deposits with relatively short terms that represented a safe, liquid asset for savers, while providing long-term mortgages collateralized by long-lived residential structures.[2]

An intermediary earns most of its income as compensation for providing intermediary services. Thrifts have engaged in three types of intermediation: credit (default), maturity, and interest rate. Each of these has an associated risk. Credit intermediation consists of providing safe deposits to small savers while making loans subject to default risk. Maturity intermediation consists of lending long term while borrowing short term. The borrower from the thrift avoids the risk and transaction costs of refinancing a series of shorter-maturity loans, while the thrift takes the risk that liquidity needs may force it to sell the loan before it matures, suffering any transaction costs. Interest rate intermediation consists of holding assets that reprice at lengthier intervals than do liabilities.[3] For example, if a thrift issues six-month certificates of deposit to fund thirty-year fixed-rate mortgages, its assets would reprice each thirty years while its liabilities were repricing each six months. The thrift would be exposed to interest rate risk because the interest and price sensitivities of its assets and liabilities are not matched: an increase in interest rates would reduce the value of the mortgages by more than the certificates of deposit.

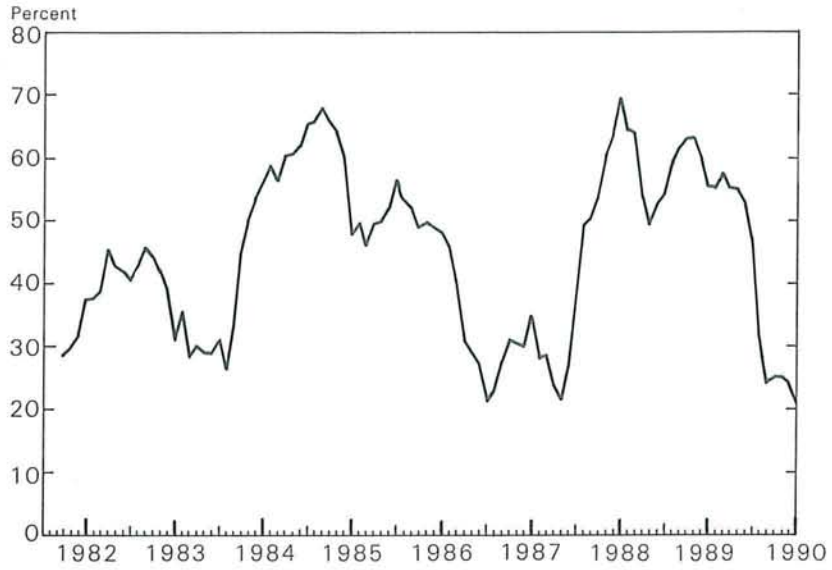
Heavy reliance on the standard fixed-payment, fully amortizing, long-term mortgage in combination with liabilities dominated by short-term, highly liquid deposits subjects thrifts to substantial interest rate risk. The rising and increasingly volatile interest rates of the postwar period (at least until the early 1980s) caused thrifts to suffer increasingly severe liquidity and solvency crises. Because liabilities repriced much more frequently than assets, thrifts' expenses were more responsive to changes in market interest rates than were their receipts. A sharp rise in interest rates would cause a rapid deterioration in thrifts' operating income as the costs of deposits rose more quickly than the returns on their portfolio of long-term loans. Furthermore, the rise in market interest rates would reduce the market value of fixed-income assets such as fixed-rate mortgages (FRMs) so that if the rise in rates were large enough, a thrift's net worth would become negative. Consequently, fluctuating interest rates put thrifts' income and net worth on a roller coaster ride, with their liquidity and net worth hitting low points simultaneously.

The liquidity and solvency risks to which thrifts are subjected present related, but not identical, problems. When making a fixed-rate long-term loan, the thrift attempts to set the interest rate at a level that will cover the average cost of funds (including overhead expenses) over the life of the loan, with the thrift showing positive and negative cash flows over

Thrifts have engaged in three types of intermediation: credit (default), maturity, and interest rate.

Chart 1

ARM Share of Mortgage Originations



Source: Federal Home Loan Bank of Boston, Office of Economic Research.

shorter subperiods while the loan is outstanding. The more serious problem threatening the solvency of thrifts is not interest rate fluctuations per se, but *unexpected* changes in interest rates that prevent a thrift from covering its costs over the life of the loan.

The rise in interest rates in the 1960s and 1970s greatly outstripped any expected rise embedded in the long-term interest rates on the mortgages held in thrift portfolios and therefore contributed importantly to the insolvency problems of thrifts. Had thrifts issued variable-rate rather than fixed-rate loans during this period, loan rates and deposit rates would have risen and fallen in tandem as loans and deposits repriced at roughly the same frequency. With thrifts less engaged in interest rate intermediation, the cycle in thrift earnings would have been mitigated. More important, the insolvency risk associated with unexpected increases in interest rates would have been eliminated. Interest rates on assets would have automatically adjusted with changes in market rates, whether those changes had been forecasted or not.

Thus, the most important benefit to thrifts from issuing adjustable rate mortgages is the shifting of part of the interest rate risk from the lender to the borrower. Traditional long-term, fixed-rate mortgages place all of the interest rate risk on the lender and give borrowers the option to refinance cheaply when interest rates decline. This risk is one-sided: if interest rates rise, lenders lose; if rates fall, borrowers gain (and lenders lose again) by exercising their option to refinance at the lower rates.[4]

A portfolio of ARMs would mitigate the liquidity squeeze on thrifts since as short-term interest rates (and hence the cost of funds) rose, so would revenues. In addition to smoothing the cycle in thrifts' net income, ARMs would also lessen the sensitivity of asset values to fluctuating interest rates. To the extent that the interest rates on outstanding ARMs repriced frequently and fully to market rates, their market values would deviate little from their par (face) values, reducing the solvency risk of a portfolio of long-term mortgages.[5]

The danger for thrifts holding ARMs is that the reduction in interest rate risk may be achieved at the expense of increased default risk. When interest rates rise, borrowers faced with sharp increases in their mortgage payments are more likely to default than those with fixed-rate mortgages and level payments. Perhaps more important, with fully adjusting ARMs thrifts will not be performing an interest rate intermediation service and hence will not be compensated for such a service. Credit and maturity intermediation alone may provide a very limited potential for income that can supplement servicing fees.

II. The Usefulness of ARMs to Borrowers

Some of the same features that make adjustable rate mortgages attractive to lenders make them unattractive to borrowers. In particular, the interest rate risk that lenders avoid is shifted to borrowers. For borrowers to willingly choose ARMs over FRMs, ARMs must provide compensating advantages. First, the average interest rate over the life of the ARM mortgage should be lower than that on the corresponding FRM, since the ARM rate includes a smaller interest rate risk premium (zero, if the interest rate risk is fully shifted to the borrower rather than shared with the lender) and because of the reduced value of the borrower's prepayment option compared to that on an FRM. Second, ARMs allow the borrower to benefit from lower interest rates in the future without incurring the cost of refinancing. Third, ARMs appeal to households that expect their income to be positively correlated with interest rate fluctuations so that their payments and their ability to make those payments would tend to rise and fall together. Fourth, and perhaps most important, ARMs normally have lower initial interest rates than FRMs.

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Because borrowers typically qualify for mortgages based on the ratio of their initial mortgage payment to their current income, lower initial rates are an important advantage for many borrowers. For example, younger households with current income well below future levels are often constrained in their borrowing power, based on a qualification rule that depends on current rather than expected future income. To the extent lenders use similar loan qualification criteria for FRMs and ARMs, the lower initial interest rate, by reducing initial mortgage payments, eases this constraint and allows the household to qualify for a larger mortgage.[6] Thus, some households can avoid delaying their home purchase or purchase a more expensive home more compatible with their longer-run desired housing consumption path, saving the transaction costs associated with trading up to a more expensive home later. Borrowers planning to terminate the mortgage after only a short time, perhaps because they plan to resell the house, also find the low initial ARM rates attractive.

While ARMs provide benefits to borrowers, they also pose problems. An important risk for borrowers with ARMs is payment shock, a sharp upward adjustment in their mortgage payment. For most households, the timing (and magnitude) of payment adjustments will not correspond exactly with changes in income. For example, if a sudden 2 percentage point increase in the expected inflation rate causes the ARM rate to increase from 8 percent to 10, the amount of the mortgage payment would immediately jump by approximately 25 percent, yet the increment to the inflation rate would be expected to make nominal income grow only 2 percent faster than before.

Another drawback of the typical ARM is its complexity, which makes it difficult for many borrowers to fully understand all of the contingencies and to compare one ARM with another or with an FRM. Even so, the basic idea underlying adjustable rate mortgages is relatively straightforward, and financial instruments and contracts with adjustable features are already a familiar aspect of non-mortgage transactions. For example, wages, rents, and pensions are in some instances indexed to the Consumer Price Index, and many business loans and home equity loans adjust with changes in the prime rate.

III. What Exactly Are ARMs?

The relaxation of restrictions on ARMs nationwide in 1981 was followed by a period of experimentation with the various allowable ARM features to find those most acceptable to lenders and borrowers. This led to a proliferation of specific ARM instruments, thought by many to be excessive.[7] The variety of ARM types, and perhaps their novelty, make it difficult for potential borrowers to compare the risks and benefits of various ARM programs with FRMs as well as with each other. This has increased the "shopping" or information costs associated with selecting a mortgage.

While ARMs may appear quite complex to the consumer faced with choosing among a variety of programs, the basic ARM concept is relatively straightforward. The great diversity of ARMs available in the market is created by variations (many only in degree) in a few basic provisions. The next section

describes the basic or "pure" ARM. The following section then discusses the "bells and whistles" commonly attached to the basic ARM form.

The "Pure" Adjustable Rate Mortgage

The adjustable rate mortgage can be thought of as a sequence of short-term mortgages with maturities equal to the adjustment period, based on a single long-term amortization period. The contract interest rate on an ARM is the sum of an index rate and a fixed margin. The variation in the contract rate thus comes from movements in the index rate. The adjustment period is the length of time between changes in the contract rate. At the end of each adjustment period the ARM rate, and usually the mortgage payment (see below), are adjusted in line with the change in the index rate since the previous adjustment. The basic ARM has four key features that are not shared by fixed-rate mortgages: the frequency of adjustment, the index, the method of adjustment, and the margin. Each of these features is discussed in turn below.

The adjustment period. Most ARMs have adjustment periods of between six months and five years, with one-year ARMs currently the most common. The length of the adjustment period affects the extent to which the lender and the borrower share the interest rate risk. The shorter the adjustment period, the more interest rate risk borrowers face and, given the relatively short-term nature of deposits, the less risk faced by lenders. Ideally, lenders would like to match the repricing frequency of their assets to that of their liabilities, in order to minimize their risk exposure. Furthermore, since a longer adjustment period will allow market rates to deviate further from slowly adjusting contract rates, lenders are subjected to more prepayment risk.

The index rate. The index rate is a market-related interest rate not under the direct control of the lender. The most common indexes are interest rates on Treasury securities and cost-of-funds indexes, measures of the average cost to thrifts of their liability portfolios. ARMs with Treasury indexes typically use Treasury securities with maturities matching the length of the adjustment period (one-year ARMs indexed to one-year Treasury rates, three-year ARMs to three-year Treasuries, and so on). Lenders prefer indexes with shorter-term maturities for much the same reason they prefer shorter adjustment periods: short-term rates will be more highly correlated with their cost of funds than the less volatile longer-term rates.

Thrifts minimize their interest rate risk by matching the interest sensitivity of their assets to that of their liabilities. This suggests that portfolio lenders that are attempting to limit their interest rate risk exposure might prefer a cost-of-funds index. If the cost-of-funds index were perfectly correlated with the lender's average cost of funds, the lender could lock in a spread and, with a short adjustment period, essentially assure profitability over the life of the ARM. The problem with this scenario, of course, is that the national or regional measures used as cost-of-funds indexes are not perfectly correlated with the average cost of funds for any specific institution, being affected by differences in the mix of liabilities (for example, core versus brokered deposits) and differences in the interest rates paid on those liabilities across localities. In fact, for some institutions a short-term Treasury index might be more highly correlated with their cost of funds than would be the popular national and Eleventh FHLB District cost-of-funds indexes. Furthermore, such an index reflects the average cost of funds for a prior period rather than the contemporaneous period. Thus movements in such an index would always lag behind current market conditions, subjecting the lender to short-run interest rate risk even with relatively short adjustment periods.

The method of adjustment. The most straightforward way to adjust the mortgage payment at the end of each interest rate adjustment period is to set the payment so that the mortgage fully amortizes at the new contract rate. That is, if the contract interest rate has jumped from 10 percent to 12 percent, the mortgage payment would rise by roughly 20 percent. While this is the most common adjustment method, the mortgage payment can also be adjusted either less frequently than the interest rate or by a smaller amount than that required to fully amortize the mortgage over its remaining term. When the payment adjustment is insufficient to raise the current

The index rate is a market-related interest rate that is not under the direct control of the lender.

payment to that required to fully amortize the mortgage over the current term at the current contract rate, the change in the contract rate must be accommodated by an extension of the maturity of the mortgage, an increase in the outstanding principal of the mortgage (negative amortization), or both.[8]

Selecting an adjustment method involves a trade-off. An increase in the ARM index will typically be accompanied by an increase in the lender's cost of funds that will likely not be matched by a jump in the borrower's income. Compared to FRMs, ARMs with either negative amortization or payment adjustments will reduce the solvency risk of the lender by mitigating the decline in the market value of the mortgage when market interest rates rise. The problem with negative amortization ARMs is that they do not reduce the liquidity risk faced by lenders. If payments do not adjust, the lender's cash inflow will not rise with the increase in its interest payments on deposits as its cost of funds rises.[9] Essentially, the lender is making an additional loan to the borrower equal to the difference between the payment and the interest due on the mortgage principal. At the other extreme, the lender's liquidity risk will be reduced if mortgage payments fully adjust to the increase in the contract rate. In that instance, however, borrowers will face payment shock, with the possibility that the mortgage payment will rise beyond the borrower's ability to pay. Thus, this type of ARM reduces the lender's interest rate risk at the expense of an increase in its default risk that perhaps even exceeds the reduction in interest rate risk.

Payment shock can be reduced by allowing maturity extension or negative amortization to limit the increase in mortgage payments. Such adjustment methods also affect default risk, but in a slightly different way. Switching from payment adjustment to negative amortization would in a sense decrease flow default risk while increasing stock default risk, or perhaps more appropriately, decrease borrower default risk while increasing property default risk. Negative amortization increases the mortgage principal and thus reduces the borrower's equity, other things equal. This increase in the current loan-to-value ratio subjects the lender to increased default risk. The higher this ratio, the more likely a decline in the house price or further negative amortization could push this ratio above unity, giving the borrower a strong incentive to default. If the borrower cannot make the mortgage payment but still has substantial equity in the property, he is unlikely to walk away from the property. But if the borrower's mortgage principal exceeds the property's current value, the borrower might default on the loan even if he or she can afford the payments.

The margin. The fixed margin, which is added to the index rate to obtain the contract rate for an ARM, serves two purposes. First, it compensates the lender for the intermediary services it performs and the risk it faces by making the mortgage loan. The more risk shifted from borrower to lender, the larger the margin. Second, a portion of the margin compensates the lender for its operating costs, including servicing fees (larger for ARMs than for FRMs) and a competitive return to its capital.[10] From the borrower's viewpoint, the margin represents a payment for the intermediary services provided by the lender, in particular, an insurance premium paid in return for allowing the borrower to shift certain risks to the lender.

If the lender were to make ARM loans indexed to its own cost of funds with continuous and contemporaneous adjustment of the mortgage payments to any change in the cost of funds, the required margin would be quite small, needing to cover only operating costs and default risk.[11] However, since ARMs do not adjust continuously and allowable indexes are not perfectly correlated with a particular lender's cost of funds, lenders cannot lock in a guaranteed wedge between their flow of interest receipts and interest expenses. Even if a lender's liability composition and deposit rates exactly mimicked those underlying a particular regional or national cost-of-funds index, the index would adjust with a lag to the lender's current cost of funds since the current period's index is based on the cost of funds calculated for a previous period. The larger the discrepancy between the repricing frequency of the ARM rate and the lender's source of funds, the greater the interest rate risk exposure and thus the larger the required margin.

The fixed margin compensates the lender for the intermediary services it performs, the risk it faces, and its operating costs.

Furthermore, for a given discrepancy, the more volatile are interest rates, the greater the degree of

interest rate risk. If negative amortization were substituted for payment adjustment, the margin would have to reflect the net effect of the associated increases in liquidity risk and property default risk and the reduction in borrower default risk. In general, the more volatile are interest rates, the greater the liquidity risk; the more highly and positively correlated are nominal house prices and nominal interest rates (both being correlated with inflation, for example), the lower the property default risk; and the more highly and positively correlated are personal incomes and interest rates, the lower the borrower default risk. Finally, the longer the adjustment period, the higher the prepayment risk, since the current market rate (and hence new ARM rates) could diverge further from the current contract rate on an existing ARM.

"Impurities" Often Added to ARMs

Two categories of deviations from the pure ARM have been widespread: adjustment restrictions and initial rate discounts (initial rates below contract rates). The adjustment restrictions place limits on one or more of the following: contract rate changes per adjustment (periodic rate cap); contract rate changes over the life of the ARM (lifetime rate cap); payment changes per adjustment; total amount of negative amortization; and lengthening of ARM maturity.

Adjustment restrictions. Periodic and lifetime rate caps limit the amount of interest rate risk ARMs shift from lenders to borrowers. For example, a typical one-year ARM might have a 2 percent periodic rate cap and a 5 or 6 percent lifetime cap, with the caps limiting both upward and downward movements. Over time, rate caps have become increasingly popular. In any case, the Competitive Equality Banking Act of 1987 requires that all one- to four-family residential ARMs originated after December 8, 1987 have lifetime rate caps. Periodic rate caps are measured from the rate in effect during the previous adjustment period, while the lifetime cap is relative to either the initial rate or the value of the fully indexed rate at the time of origination. Borrowers would absorb all of the interest rate risk for moderate interest rate fluctuations as long as the caps did not become binding. The consequences of interest rate movements above that allowed by the caps would be borne entirely by the lender. If one thinks of the lender as providing interest rate insurance in return for a premium, FRMs would correspond to borrowers' coverage with no deductible, capped ARMs to catastrophic insurance, and pure ARMs to no coverage.

Some ARMs cap payments instead of, or in addition to, rates, with the typical cap allowing a payment increase of 7.5 percent per year. If the payment cap limits the adjustment so that the new payment is not sufficient to pay the current interest on the mortgage, the difference is added to the mortgage balance as negative amortization. However, negative amortization is also capped at some level, with the legal maximum being 125 percent of the original appraised value of the property. When this limit is reached, the mortgage would be "recast," that is, the payment would be raised to the point that the mortgage would be fully amortized over its remaining term. Finally, forty years from the date of origination is the upper limit allowed by law for lengthening the maturity of a mortgage, at which time adjustment to further increases in interest rates must occur through negative amortization or payment increases. ARMs with payment caps were prevalent in California, especially in the 1970s. More recently, a movement away from payment caps and negative amortization has occurred.

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Rate caps differ from the other types of caps in that any excess of the index plus margin above the capped rate is lost to the lender. With payment, negative amortization and maturity caps, the interest associated with the contract rate continues to accrue, being recovered by the lender through later, higher payments or payments in addition to those originally scheduled. Thus, rate caps determine *whether* the borrower will be liable for increased interest payments when the index rises, while the other types of

caps determine when the increased interest associated with a rise in the index will be paid. Furthermore, such caps provide only limited protection from payment shock. If the limits are reached so that the mortgage must be recast, the new payment can be substantially larger than the payment prior to recasting.

Initial rate discounts. Initial interest rates on ARMs can be, and often are, lower than the sum of the index at the time of origination and the margin. The discount typically lasts for only a short time, often as little as one adjustment period, before the ARM rate jumps up to its fully adjusted level (index plus margin). The initial rate discount may be a result of a "seller buydown," whereby the seller pays a fee to the lender to compensate the lender for accepting a below-market interest rate during the initial adjustment period(s). The seller then recaptures the cost of the buydown (and perhaps more) since the attractive financing package allows the seller to obtain a higher home price than otherwise. But more commonly, the initial rate discount is a marketing technique used by lenders to induce borrowers to select ARMs rather than FRMs.

Why might borrowers find discounted ARMs so attractive? The most obvious answer is the lower initial mortgage payment, but the benefits go deeper. If the lender uses the low initial rate to qualify the borrower, it would allow the borrower to qualify for a larger loan and thus a more expensive home, or even make the difference as to whether an individual has to defer the purchase entirely. Furthermore, if rate caps are tied to the initial rather than the fully adjusted rate, a lower initial rate translates into a lower lifetime rate cap. However, associated with these benefits to the borrower are some drawbacks. The discounted initial rates may be accompanied by larger loan origination fees and larger margins, and once the discount period ends the borrower could be subjected to severe payment shock as the interest rate returns to its fully adjusted level (although periodic rate caps may slow this process).

IV. The Pricing of Adjustable Rate Mortgages

The size of the margin attached to any particular ARM depends on two sets of factors: (1) the characteristics of the mortgage (for example, adjustment period, index, caps, initial rate discount) and (2) the economic environment (for example, slope of the term structure of interest rates, interest rate volatility). One cannot place an exact value on a particular ARM characteristic without also specifying the economic environment. Much of the research on ARM pricing has used an options-based simulation framework (for example, Asay 1984; Buser, Hendershott, and Sanders 1985) whereby assumptions must be made regarding the drift and volatility of interest rates in order to simulate alternative future interest rate paths. Others rely on data for a particular set of

One cannot place an exact value on a particular ARM characteristic without also specifying the economic environment.

ARM mortgages originated during a specific time period (for example, Lea 1985; Sa-Aadu and Sirmans 1989). In either case the specific values obtained for ARM characteristics would not be applicable in general, although the results would imply relevant qualitative results (for example, margins would tend to rise the tighter are lifetime rate caps, other things equal).[12] In general, the size of the margin depends on, among other things, the length of the adjustment period (larger, the longer the period); periodic and lifetime rate caps (larger, the tighter the caps); the particular index used; the number of points paid at origination (larger, the fewer points); the initial loan-to-value ratio (larger, the larger the ratio); the expected future path of interest rates (larger, the more rates are expected to rise and the more volatile rates are expected to be); and other factors such as prepayment, assumability and conversion clauses (Sa-Aadu and Sirmans 1989).

Since ARM margins reflect risk premiums, the presence or absence of the various caps should affect the size of margins. Payment caps increase a lender's liquidity risk by allowing the borrower to defer payment increases, while negative amortization caps tend to decrease liquidity risk by forcing a recasting of the mortgage payment when the cap is reached. Maturity caps decrease liquidity risk if payments are increased when the cap is reached; they do not affect liquidity risk if, instead, negative amortization occurs

(except to the extent it causes negative amortization caps to be reached earlier). At the same time, these caps affect default risk, with payment caps decreasing borrower default risk and increasing property default risk through negative amortization. Negative amortization caps would have the opposite effects.

Rate caps, on the other hand, affect the solvency risk as well as the liquidity risk of the lender, and represent a trade-off between interest rate risk (which rises for the lender) and default risk (which falls). The margin should be larger, the greater the probability that the rate cap will become binding (presuming that the reduction in default risk is swamped by the increases in the other types of risk). Thus the margin will be larger the tighter the caps, the greater the expected volatility of short-term interest rates, or the more future short-term interest rates are expected to rise relative to current short-term rates (as might be reflected in the slope of the term structure curve).

Rate caps also affect prepayment risk. As rate caps become binding, prepayments would be expected to fall. At the same time, binding rate floors would provide borrowers with an incentive to refinance. Furthermore, with rate caps based on initial rates, even with the same index, margin, and size of caps, ARMs with different initial rates reach their caps at different levels of the index rate. Thus as interest rates fall, a borrower would still have an incentive to refinance into an ARM with the same index and an identical margin if the new ARM has a lower initial rate than the current ARM, because the new ARM would have a lower lifetime rate cap.

When lenders provide an initial rate discount, margins tend to be higher for two reasons (with seller buydowns, only the second reason is relevant). First, the lender must recover the discounted amount over the expected life of the loan in order to obtain the same expected return from discounted and nondiscounted ARMs. Second, because discounted ARMs subject borrowers to more severe payment shock, they are more risky than nondiscounted ARMs and thus should have larger risk premiums embedded in their margins.[13]

Finally, lenders that use higher margins in an attempt to recover the lost interest payments from the rate discount face higher prepayment risk. With periodic rate caps and rising interest rates it can take several adjustment periods before the mortgage rate attains its fully indexed level, but once this occurs the borrower has an incentive to prepay the loan before the lender can recover the initial discount. The borrower could refinance into another ARM with a smaller margin or, if available, into another steeply discounted ARM and repeat the cycle. The dilemma for the lender is that the larger the margin, the higher the probability of prepayment, and the shorter the expected life of the loan, the larger the margin must be to fully recover the discount.

V. From Theory to Practice

Evidence from the 1980s suggests that many lenders have, indeed, heard the call to ARMs and have responded. Borrowers, on the other hand, appear to have been more reluctant participants in the ARM market. In theory a price differential can be set between ARMs and FRMs sufficient to induce borrowers to select an ARM rather than an FRM. In practice the important question becomes whether ARMs remain profitable to lenders at that price. That is, in their efforts to increase the share of ARMs in their portfolios, have lenders resorted to originating ARMs with negative expected profits? If so, rather than saving the thrift industry by promoting profitability and profit stability, ARMs will contribute to reduced profits.

Evidence suggests several important factors that influence the borrower's choice between ARMs and FRMs. Dhillon, Shilling, and Sirmans (1987) show that pricing variables play a dominant role while borrower characteristics are relatively unimportant. Goodman and Luckett (1985) and Brueckner and Follain (1988) find that the general level of FRM interest rates and the FRM–ARM rate differential explain much of the variation in the ARM share. This evidence is consistent with the prior discussion. Because an ARM transfers some of the interest rate risk from lender to borrower, the borrower must be

The ARM margin will be larger the tighter the caps, the greater the expected volatility of short-term interest rates, or the more future short-term rates are expected to rise.

compensated for being exposed to this risk since no such exposure occurs with the FRM. The more averse to this risk is the borrower, the larger the required initial rate advantage on the ARM, other things equal. The level of rates is important, because at relatively high rates many potential borrowers are unable to qualify for the size of mortgage loan they desire. ARMs have a further advantage if borrowers expect these relatively high rates to fall in the future: the mortgage payments will fall as interest rates decline without the trouble and expense of refinancing their mortgage.

Based on the available evidence, a strategy to increase the volume of ARM originations appears both straightforward and potentially dangerous. For an ARM program to be successful, it must do more than attract borrowers. It must also cover the lender's costs. Many observers (for example, Lea 1985; Willax 1988) are concerned that in their rush to restructure their portfolios lenders have focussed more on attracting borrowers than on covering costs. Because of factors such as economies of scale, diversification, specialization, and familiarity with sophisticated financial instruments and techniques, financial institutions are quite likely able to handle risks better than individual borrowers. Thus, concessions to borrowers required to induce a large ARM volume could very well reduce lenders' incomes by more than the value of the risk reduction associated with holding ARMs rather than FRMs. This concern about covering costs has been fueled by episodes of substantial and widespread initial rate discounts on ARMs, even in the presence of fairly tight rate caps. The deterioration in the qualification standards used by many lenders in order to increase their ARM origination volume may have further compromised future profitability.

For an ARM program to be successful, it must do more than attract borrowers. It must also cover the lender's costs.

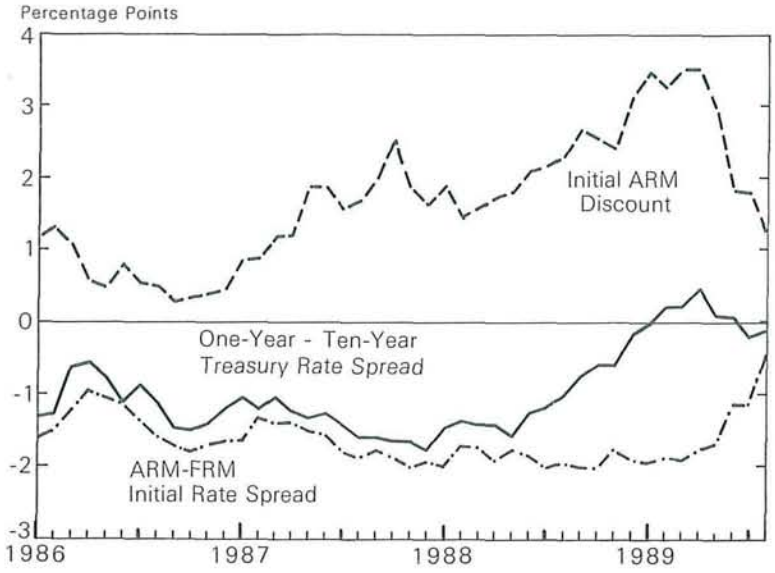
Initial period discounts, commonly known as "teaser" rates, of as much as 3 to 6 percentage points below the fully indexed ARM rates, were offered in 1983 and early 1984 to stimulate ARM originations. Large discounts were much less prevalent in late 1984 and 1985 because of three factors. First, lenders realized that such discounts tended to make the loans unprofitable. Second, lenders feared regulatory reaction to consumer complaints of misleading lending practices. Third, the term structure of interest rates steepened, enabling lenders to offer ARMs with essentially the same initial rate advantage over FRMs without teasers (Goodman and Luckett 1985). Initial period discounts jumped again in early 1987 and rose further during 1988 and early 1989 (Gordon, Luytjes, and Feid 1989). These two episodes of large initial rate discounts correspond roughly to the two high-water marks for ARM originations shown in chart 1, 1984 and late 1987–88.

Consistent with the Goodman and Luckett evidence for 1984–85, Gordon, Luytjes and Feid found that the average discount on one-year Treasury-indexed ARMs was nearly perfectly correlated with the difference between the fully indexed ARM and FRM rates for the period 1986 to early 1989. Chart 2 shows the relationship between the ARM–FRM initial rate spread, the term structure (one-year Treasury bill rate less ten-year Treasury bond rate) and the initial discount on one-year Treasury-indexed ARMs. Clearly, the initial mortgage rate spread has not reflected the fluctuations in the term structure spread.[14] Rather, as the term structure slope flattened in 1988–89, the size of the initial discount on ARMs increased to maintain a roughly stable initial rate advantage for ARMs compared to FRMs. However, with the recent reduction in the size of initial rate discounts the ARM rate advantage has been reduced sharply and, consequently, the ARM share of originations has plummeted as shown in chart 1.

Unless other ARM features are adjusted to compensate for the teaser rate, large initial discounts will lower the expected returns to ARM lenders because of the reduced interest payments in the initial period(s) and the increased credit risk associated with borrowers qualified for loans based on the lower initial payment level. Lea (1985) finds that lenders attempt to compensate for teaser rates through increased margins, but not by charging higher points. Gordon, Luytjes and Feid find that the margins and points charged on their sample of one-year Treasury-indexed ARMs were relatively constant during the 1986 to early 1989 period of rising discounts. However, they do find that the size of the lifetime cap tends to increase with larger discounts. The fact that caps are altered to help compensate for initial rate

Chart 2

Relationship between ARM Discounts and Interest Rate Spreads



Source: J.Douglas Gordon, Office of Thrift Supervision. Data are updated series from Gordon, Luytjes, and Feid (1989).

discounts is particularly important, since the lifetime caps typically are tied to the initial rate rather than the fully indexed rate at the time of origination. Thus, a 6 percent lifetime cap on an ARM with a 2 percentage point discount would have only a 4 percent lifetime cap over the fully indexed rate at the time of origination. This tightening of the effective lifetime cap through teaser rates would limit the extent to which the lender shifts the interest rate risk exposure to the borrower. However, even with the rate caps and the widespread, and at times dramatic, initial rate discounts associated with ARM originations, several recent studies have cast some doubt on the aggressive underpricing hypothesis (for example, Brueckner and Follain 1988; Gordon, Luytjes, and Feid 1989).

The relaxed criteria for loan qualification used in the early 1980s resulted from a combination of lenders' general attempt to increase loan volume (and the associated interest and fee income) in the face of declining housing affordability and to their particular attempt to rapidly increase the share of ARMs in their mortgage portfolios. With fixed underwriting standards, the borrower income level required to qualify for a mortgage rises proportionately with the level of the monthly mortgage payments. As mortgage interest rates rise faster than incomes, fewer households are able to qualify for mortgages. The impact of higher rates on housing affordability in the early 1980s was partially offset, however, by relaxing the standard qualification rule that mortgage and other housing costs should not exceed 25 percent of household income. By 1982, this percentage was approaching 40 percent at some institutions (Jones 1982). Qualification standards for ARMs were further relaxed by qualifying borrowers based on the initial payment of teaser ARMs rather than on the payment associated with the fully indexed rate. In mid-1984, private mortgage insurance companies responded by raising the insurance premiums on ARMs one-third or more above that on FRMs and raised the qualification criteria for ARM borrowers (Goodman and Luckett 1985). In October 1985 the Federal National Mortgage Association adopted more stringent qualification criteria for the low-down-payment mortgages it purchased, requiring that the borrower's payment not exceed 25 percent of income at a time when a 28 percent ratio was standard.

Chart 1 indicated the success of lenders in originating ARMs. But because mortgage originations in any period are small relative to the outstanding stock of mortgages, mortgages are often prepaid and, for individual institutions, mortgages can be resold or purchased in the secondary mortgage market, such a chart cannot indicate the extent to which lending institutions have been able to restructure their mort-

gage portfolios. Conventional ARMs as a share of one- to four-family loans and all mortgage-backed securities in thrift mortgage portfolios rose from 5.6 percent in 1980 to 13.13 percent by 1983 (Mahoney and White 1985, p. 147). The sum of balloon and adjustable rate loans as a share of first mortgage loans and pass-through securities in the portfolios of FSLIC-insured institutions doubled between the first quarter of 1984 and the first quarter of 1987 (from 22.3 percent to 44.1 percent). This share rose above 50 percent in early 1988 and stood at 56 percent by the first quarter of 1989 (Quarterly Thrift Financial Aggregates, Office of Thrift Supervision).

While thrifts have made dramatic progress in restructuring their mortgage portfolios, their profitability and profit stability may not be as insulated from interest rate fluctuations as it appears. First, the "pure" ARM has not been a factor in actual ARM originations. Rather, most ARMs in thrift portfolios have periodic and/or lifetime rate caps and in many instances the caps are based on steeply discounted initial rates. This combination substantially increases the interest rate risk exposure of ARM portfolios. ARM lenders are protected only against small rises in interest rates, since once caps are reached ARMs behave like FRMs as rates rise further. Thus, the features required for borrower acceptance have at the same time weakened the ability of ARMs to reduce the interest rate risk exposure of lenders, the primary motivation for offering ARMs in the first place.

While thrifts have made dramatic progress in restructuring their mortgage portfolios, their profitability and profit stability may not be as insulated from interest rate fluctuations as it appears.

The second factor limiting the benefits of an ARM portfolio is the increased credit risk associated with ARMs having initial rate discounts, particularly when the borrower is qualified based on the teaser rate because he or she could not qualify at the fully indexed rate. The general relaxation of qualification criteria in the early 1980s and ARMs with negative amortization and high loan-to-value ratios, although a dying breed, also contribute to increased credit risk.

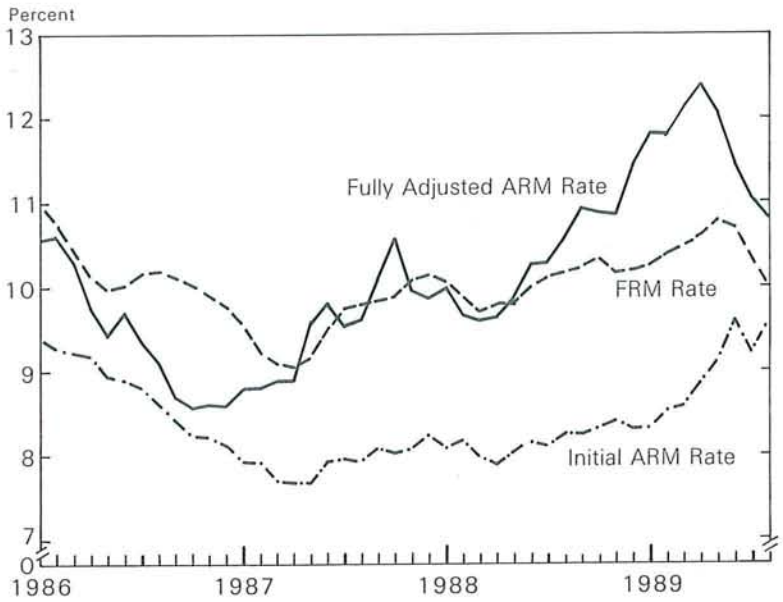
The third factor is the prepayment risk associated with ARMs having an initial rate discount. Lenders' profitability may be seriously reduced if borrowers refinance teaser ARMs, perhaps even into another teaser ARM, before their rates adjust to the higher fully indexed rates enabling lenders to recover their initial losses. A factor that suggests that many ARM borrowers do intend to refinance into an FRM is the return in 1987 of convertible ARMs and their popularity in 1988 and 1989. They accounted for as much as three-quarters of ARM originations in early 1988 (Kling 1988). These ARMs allow a borrower to convert to an FRM at the prevailing FRM rate for a modest fee. Such conversions would be expected to be prevalent when fully indexed ARM rates exceeded FRM rates. Chart 3 indicates that this has been the case for one-year Treasury-indexed ARMs since mid-1988, even though initial ARM rates remained well below FRM rates. In fact, ARM borrowers have had an incentive to refinance into new ARMs since mid-1987. If the popularity of convertible ARMs reflects a reluctance on the part of borrowers to have adjustable rate mortgages, one might expect large-scale conversions as FRM rates decline.

VI. Concluding Comments

Lenders have responded to the call to ARMs in the 1980s. However, they have had to overcome borrower reluctance to take on a loan obligation that was perceived to be complex and risky. Large ARM originations required interest rate caps limiting borrower risk and a substantial initial rate advantage compared to fixed-rate mortgages. But these same factors limited the benefits for lender profitability and profit stability, the primary motivation for offering ARMs in the first place. How will lenders resolve this dilemma? Until recently, lenders were willing to do what it took to restructure their portfolios by originating large numbers of ARMs. But in mid-1989 large initial rate discounts virtually disappeared. With the relatively flat term structure of interest rates and sharply lower initial discounts, the initial rate advantage of ARMs shrank (as can be seen in chart 3). As a consequence, the origination volume of ARMs plummeted, reaching 21 percent by December 1989 (chart 1).

Chart 3

Interest Rates on Fixed and Adjustable Rate Mortgages



Source: See Chart 2.

What is the future for ARMs? The thrift industry has been successful in restructuring mortgage portfolios to dramatically increase the share of ARMs. Although ARM origination volume fell sharply in late 1989, it will likely recover as the term structure of interest rates returns to its more normal upward-sloping shape. This will enlarge the ARM rate advantage, even without a return of the large initial discounts. Even so, the evolution of the ARM market suggests that ARM lenders may have a difficult time maintaining a large ARM portfolio. Although the relaxation of restrictions on ARM features saw a discontinuous jump from fixed-rate mortgages to the other extreme, "pure" ARMs, since that time the ARM market has moved back in the direction of FRMs with the widespread adoption of restrictions on the extent to which ARMs can adjust. Furthermore, the popularity of the convertible ARM suggests that many ARM borrowers view their situation as temporary and are just waiting for the appropriate opportunity to refinance into a fixed-rate mortgage.

[1] See Cassidy (1984) for a detailed account of the historical development of FHLBB ARM regulations.

[2] The discussion of lenders is couched primarily in terms of thrift institutions because they have been the major originators and holders of ARMs. A combination of regulatory restrictions, tax laws, and history accounts for this special role of thrifts among all financial intermediaries in housing finance. Consequently, thrifts have been the largest single direct source of residential mortgage credit, and residential mortgages have been by far the largest component in their portfolio of assets. However, in recent months mortgage originations by commercial banks have exceeded those by thrifts for the first time in nearly two decades. This shift in mortgage originations is associated in part with the new capital requirements that have led to a shrinking of the thrift industry. A similar analysis holds for commercial banks. Other mortgage holders such as pension funds and life insurance companies, which have longer-term liabilities, have been a much less important factor in the demand for ARMs.

[3] If assets and liabilities repriced only at maturity, maturity and interest rate intermediation would be identical. However, loans with variable interest rates can reprice numerous times before they mature. Although one might consider a thirty-year loan that repriced each year as having a one-year maturity, it differs from a one-year loan in that the lender has made a commitment to renew the loan at the end of the year even if lendable funds have become less available (more expensive) to the lender or the creditworthiness of the borrower has deteriorated substantially. Furthermore, if the permitted adjustments to the interest rate on the loan are limited, the loan again differs from a standard one-year instrument.

[4] The losses to lenders and benefits to borrowers may be reduced by prepayment penalties. In addition, closing costs on a new mortgage will limit the net benefits to the borrower of refinancing, so that it will not be profitable for the borrower to refinance unless interest rates decline substantially (2 percentage points being the frequently cited threshold). For lenders, points charged as origination fees can serve as an alternative to an explicit prepayment penalty.

[5] Of course, ARMs are not the only method available to limit interest rate risk. Instruments such as financial futures and options and interest rate swaps can be used to reduce risk exposure (see, for example, Morris and Merfeld 1988). Easing of regulations that restrict thrift asset and liability portfolios also can make an important contribution.

[6] Many households become constrained due to increases in nominal interest rates associated with increases in the expected inflation rate (see, for example, Wilcox 1989). With a level-nominal-payment FRM, the real burden of mortgage payments declines over the life of the mortgage as the general price level rises. This is referred to as the tilt problem. The relatively large initial real mortgage payments decline over the life of the mortgage while at the same time the household's real income (and thus ability to pay) is generally rising. Because ARM payments are based on nominal interest rates, ARMs do not solve this tilt problem, although their lower initial rates do alleviate the problem somewhat. Graduated payment ARMs, which have not accounted for a significant market share, further mitigate the tilt problem. Price-level-adjusted mortgages (PLAMs) that have level real payments have been proposed to address the tilt problem. These problems and alternative mortgage designs are discussed in Lessard and Modigliani (1975), Cohn and Fischer (1975), and Poole (1972).

[7] Guttentag (1984), among others, has emphasized the excessive diversity of ARM types that have found their way into the market, suggesting that 400 to 500 different types would be a conservative estimate as of April 1984, when new types were still appearing. He argued that monopolistic competition in the mortgage market, whereby intermediaries had an incentive to differentiate their product and promote institutional identity, was an important factor in promoting the lack of standardization of ARM instruments. At the same time, liquidity considerations would provide offsetting pressure, since acceptance in the secondary market dictates the need for some degree of standardization. In fact, survey evidence indicates that following the initial experimentation period, some standardization of ARMs has begun to occur.

[8] Maturity extension is a limited option in most instances. When the mortgage term is already relatively long, slight increases in the contract rate can require substantial increases in the mortgage term to prevent an increase in the payment, and the mortgage can quite easily reach the point where the original payment is incapable of covering even the interest portion alone. This limitation is particularly severe when the contract rate is high and in the years immediately following origination, when the mortgage payment is predominantly interest rather than principal repayment.

[9] While the lender receives no additional cash flow with which to make additional interest payments on deposits, the lender does receive an increase in income since a larger proportion of the payment is attributed to interest with a correspondingly smaller principal repayment component. Of course, if the higher deposit interest payments are automatically credited to deposit accounts and not withdrawn, the lender experiences an increase in its liabilities corresponding to the increase in assets rather than a cash flow squeeze.

[10] Technically, it is the difference between the contract rate and the lender's cost of funds rather than the difference between the contract rate and the index (that is, the margin) that is available to compensate the lender. Thus, one would expect the size of the margin on an ARM to reflect, among other things, the particular index used and any systematic difference between that index and the lender's cost of funds.

[11] This analysis is for a portfolio lender. An investor in mortgages, or an originator intending to sell to investors, would care about the correlation of the index with returns on alternative investments, for example, market interest rates.

[12] Quantitative results for the size of margins associated with different ARM characteristics under particular conditions are available (see, for example, Lea 1985; Buser, Hendershott and Sanders 1985; Hendershott and Shilling 1985; Sa-Aadu and Sirmans 1989). However, such estimates are sensitive to the particular assumptions made regarding the values of the key parameters in simulation models and to the particular economic conditions at the time of origination for studies based on actual mortgage data.

[13] For example, if the index plus margin is 12 percent and the initial rate has a 3 percentage point discount to 9 percent, the mortgage rate will jump by one-third (from 9 percent to 12 percent) at the end of the discount period in the absence of caps, even if the index does not rise. The associated default risk is magnified if the borrower has been qualified at the discounted rate, since it is then more likely that the fully adjusted rate will exceed the borrower's ability to pay. Payment caps will lessen payment shock (borrower default risk) but may increase property default risk through the associated negative amortization.

[14] Goodman and Luckett (1985, p. 826) find the same to be true for the 1984–85 period.

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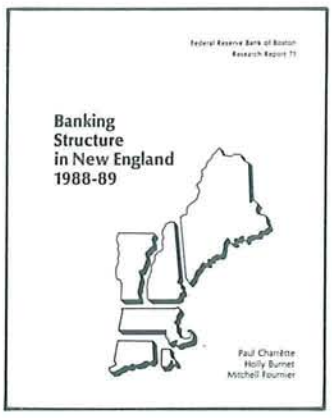
Research Report



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