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Abstract: The document is one of a series of monographs addressing the major factors effecting industrial innovation. The areas of concern addressed in this document include corporate tax policy and innovation, personal income taxation and innovation, and innovation and government regulation of capital markets. Several recommendations are offered that address the stimulation of innovation through tax reform.

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THE IMPACT OF TAX AND FINANCIAL REGULATORY POLICIES ON INDUSTRIAL INNOVATION

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in cooperation with

Committee on
Technology and International Economic and Trade Issues
of the
Assembly of Engineering, National Research Council
and
Office of the Foreign Secretary, National Academy of Engineering

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PREFACE

In August 1976, the National Research Council Committee on Technology and International Economic and Trade Issues examined a number of technological issues and their relationship to the potential entrepreneurial vitality of the U.S. economy. The committee was concerned with:

- Technology and its effect on trade between the United States and the other countries of the Organization for Economic Cooperation and Development (OECD);
- Relationships between technological innovation and U.S. productivity and competitiveness in world trade; impacts of technology and trade on U.S. levels of employment;
- Effects of technology transfer on the development of the less-developed countries (LDCs) and the impact of this transfer on U.S. trade with these nations; and
- Trade and technology exports in relation to U.S. national security.

In its 1978 report, "Technology, Trade, and the U.S. Economy,"* the committee concluded that the state of the nation's competitive position in world trade is a reflection of the health of the domestic economy. The committee stated that, as a consequence, the improvement of our position in international trade depends primarily upon improvement of the domestic economy. The committee further concluded that one of the major factors affecting the health of our domestic economy is the state of industrial innovation. Considerable evidence was presented during the study to indicate that the innovation process in the United States is not as vigorous as it once was. The committee recommended that further work be undertaken to provide a more detailed examination of the U.S. government policies and practices that may bear on technological innovation.

Three areas have been examined in the present phase of the project. The reports of these studies are

- The Impact of Regulation on Industrial Innovation,

* National Research Council, 1978. "Technology, Trade, and the U.S. Economy." Report of a Workshop held at Woods Hole, Massachusetts, August 22-31, 1976. National Academy of Sciences, Washington, D.C.

- The Impact of Tax and Financial Regulatory Policies on Industrial Innovation, and
- The Impact of Antitrust Policies and Practices on Industrial Innovation.

This monograph is the second of this series.

A word is in order about the methodology used in preparing these publications. The committee conducted a workshop to (i) involve additional experts in the field, (ii) obtain views of representatives of various government agencies, and (iii) provide a forum for discussion among the committee members, academic and private industry specialists, government personnel, and the authors. The workshop was held July 20 and 21, 1978, in New York City. In order to give some structure to the workshop, the panel addressed the following questions:

1. What do we know about the influence of federal laws, expenditures, and monetary policies on the availability of funds for long-term investment in R&D and in fixed capital formation?
    a. What do we know about the costs and effectiveness of alternative measures?
    b. What are the effects of different measures on the availability of funds for alternative uses?
2. What are the effects of alternative federal tax, expenditure, monetary and/or credit measures on the rate and characteristics of R&D and fixed capital formation?
    a. What are the effects of alternative measures on distribution of investment actions and R&D among various industries?
    b. What are the effects of alternative measures on investment incentives and returns for corporations of different size?
3. What possibilities exist for modifying or improving existing measures to achieve the objective of increased technological innovation with a minimum of undesired effects on income distribution or taxes?
    a. What are the effects of alternative measures on equity?
4. What are some suggestions for directions of future research?

In addition, four background presentations were made to the workshop participants by authorities in the field. They are

1. "A Survey of Tax Policies for R&D and Technological Innovation," Robert Kaplan, Dean, Carnegie-Mellon Graduate School of Industrial Administration

2. "The Government and Capital Formation: A Survey of Recent Issues," George M. von Furstenberg, Indiana University Economics Department

3. "U.S. Tax Structure and Capital Investment Policies," Bernard Wolfman, Harvard Law School

4. "The Changing Problems of Venture Capital Formation," Charles Lea, Managing Director, New Court Securities Corp.

Following the presentations, each participant from government departments and agencies was invited to present his or her perception of the major issues as viewed from his or her perspective.

While this monograph is the product of the workshop, it does not constitute a workshop proceedings. Instead, the committee commissioned Joseph Cordes of The George Washington University to write this paper based on the discussions at the workshop and augmented by his research. Successive drafts by the author were circulated to the committee for review. Professor Cordes then met with the committee to discuss the criticisms and comments. As a result, this monograph expresses not only the author's views, but also generally reflects the views of the committee.

CONTENTS

1 INTRODUCTION

Public concern has recently been expressed that the climate for industrial innovation has worsened. This apparent decline in innovation has significant implications for the well-being of the U.S. economy, both domestically and internationally. It is therefore important to determine the possible reasons for the decline and to identify public policies that may improve incentives to innovate.

Manifestations of the Problem

Evidence of decline in industrial innovation may be drawn from a number of sources. However, because technological innovation is a total process by which new technology is generated and transformed into commercial products, no single indicator can adequately capture changes in the intensity or pace of that decline.[1]

Quantitative measures of innovation are based either on measures of inputs into the innovation process or on outputs forthcoming from the application of innovations. Examples of input measures are (i) various statistical series based on research and development (R&D) outlays, (ii) data on the employment of R&D personnel, and (iii) data on the flow of funds to small, technology-based firms. Generally, these measures show that comparatively fewer resources have been devoted to industrial innovation in recent years. For example, real R&D spending declined between 1969 and 1972 and has increased only slightly since 1972, while R&D spending as a percentage of GNP has declined fairly steadily since the middle 1960s.[2] The number of scientists and engineers employed in R&D per 10,000 population declined between 1969 and 1972 and has remained virtually constant in recent years.[3] Moreover, in industries that have contributed a majority of important recent innovations, the share of resources devoted to R&D has shown a relative decline.[4] Finally, the formation rate of small, high-technology firms has slumped significantly in the decade since 1969.[5]

Economic series often associated with outputs of innovation application have also performed poorly in recent years.[6] Notably, the rate of productivity growth in the U.S. economy, which averaged 3 percent a year during the 1950s and through much of the 1960s, has declined to less than 2 percent in the last decade.[7] Since a variety of empirical studies have established a strong, positive relationship between investments in R&D and productivity growth, reduced productivity growth may reflect declining investments in industrial innovation.[8] Indeed, a noted analyst of U.S. productivity trends specifically attributes part of the decline in productivity growth to three innovation-related factors: (i) a decline in the stock of knowledge resulting from R&D, (ii) a decline in informal innovation by plant managers and workers, and (iii) a decline in the rate of diffusion of technological advances.[9]

Many informed participants in the innovation process agree that innovative activity has recently declined, on the whole, in the United States.[10] In addition, these observers have expressed concern about what they perceive to be corporate preferences for short-term, low-risk investment in marginal product improvements, rather than long-term, high-risk investment in major technological innovations.

Focus of the Paper

To devote resources to the innovation process is clearly an investment decision. It is likely therefore to be sensitive to (i) the level of aggregate demand, (ii) after-tax rates of return, and (iii) the after-tax cost of capital. Such variables are affected by (i) demand management policies pursued through macroeconomic monetary and fiscal policies, (ii) microeconomic tax and subsidy policies, and (iii) government regulation of capital markets.

This paper considers the relationship between these policies and industrial innovation in the U.S. economy. One objective is to identify federal tax and financial regulatory policies that have a significant effect on the innovation process. Another is to determine whether recent changes in such policies have encouraged or discouraged technological innovation, as well as whether changes in particular policies are likely to increase innovative activity.

Fiscal and regulatory policies affect the innovation process by altering the expectation of profitability. The first section of this paper therefore discusses some pertinent factors that affect the profitability of investments in technological innovation. The following sections discuss how decisions to innovate are affected by demand management, tax, and financial regulatory policies. The final section summarizes the major conclusions and presents recommendations for public policy and for further research.

2 THE INDUSTRIAL INNOVATION PROCESS

Historically, investments in technological innovation have promised potentially high returns in exchange for high risk. Mansfield (1977) has estimated that a sample of 17 innovations earned a median pretax return of 25 percent. This return substantially exceeds the gross return to private investment. However, higher returns at least partially reflect the greater risks associated with decisions to invest in innovation.[11] The ratio of potential reward to potential risk determines whether resources are committed to an innovation. Policies that reduce the potential rewards for innovating, but not the potential risks, discourage innovation. Policies that increase the potential risk of innovating, but not the potential rewards, will have a similar effect.

The Process of Innovation

The potential rewards and risks of innovating are the economic outcomes of a complex process. First, a *technically* feasible concept for a new or improved product must be developed. Then this concept must be rendered *commercially* significant. Resources must be devoted to the design of the product, as well as to design and construction of the facilities necessary to manufacture, test, package, and market the innovation.

Two aspects of the innovation process merit special attention. First, considerable time usually elapses between development of an idea and production of a commercially successful innovation, so the costs of developing a new product are likely to exceed the net revenues from sales of the innovation for a long period -- perhaps as much as 10 to 15 years, depending on the industry.[12] Investments in innovations, therefore, require long-term financial commitments. Government policies, accordingly, will encourage or discourage the adoption of innovations as these policies decrease or increase the uncertainties connected with such long-term commitments.

Second, activities typically associated with R&D represent only the

initial, technical feasibility phase of the innovation process. In many cases, a modest share of the costs of innovating -- say 10 to 20 percent -- is incurred at this initial stage. In other cases, such as pharmaceutical innovations, R&D itself constitutes a major share of the costs of innovation.[13] Consequently, government policies designed to stimulate industrial R&D will elicit different responses from different industries.

Relationship Between Investments in Innovation and Capital Spending in General

The ultimate profitability of an innovation is clearly related to demand for new innovations. The level of investment spending may directly affect the market demand for certain innovations. Schmookler (1966) has shown that movements in capital goods innovations were typically preceded by movements in investment. Government policies that either encourage or discourage capital spending are likely therefore to encourage or discourage innovations in capital goods industries.

Role of Different Industries and Firms of Different Size

Relative to R&D spending, specific industries and types of firms have made disproportionate contributions to the development of technological innovations. For example, six industry categories -- namely, electrical equipment and communication, aircraft and missiles, machinery, motor vehicles and other transportation equipment, chemicals and allied products, and professional and scientific instruments -- accounted for roughly 85 percent of industrial R&D spending in 1974.[14] The same group of industries produced roughly three-fifths of all major innovations during the 1953 to 73 period.[15]

Similarly, certain small enterprises seem to play an important role in the innovation process. Some observers claim that small firms have contributed a disproportionate share of innovations in industries such as instrumentation and electronics. Others have been more cautious in assigning *sole* credit for these innovations to small firms, pointing rather to the involvement of larger firms either at the beginning or end of the innovation process.[16] However, under both views small, technology-based firms have played a vital role at some point in the development of many major innovations.

The application of taxation and regulatory policies is often unequally distributed among different industries and different sized firms. These policies, therefore, will either encourage or discourage the innovation process as the burden falls less or more proportionately on innovative industries and firms.

Financing of Investments in Innovation

Finally, innovative activities are more likely to be financed through equity, either from retained earnings or through sale of stock, than

through the issuance of debt. Several empirical studies have found a significant and positive relationship between R&D expenditures and retained earnings and internally generated cash flows.[17] In addition, a survey of initial public offerings made by small firms between 1970 and 1974 shows that small, technology-based firms were much more dependent on equity as a source of finance than their nontechnological counterparts.[18]

The costs of equity finance are affected by a variety of tax and regulatory policies, as is the availability of retained earnings and internally generated cash flows. The willingness to invest in the generation and development of innovations should therefore be relatively sensitive to changes in such policies.

3 MACROECONOMIC POLICY AND INDUSTRIAL INNOVATION

Concern about the decline in technological innovation is largely based on recent declines in the trends of certain economic variables. These trends are influenced by the business cycle. Accordingly, it is appropriate to examine the cyclical behavior of industrial innovation, particularly because recent declines in innovative activities have occurred while the economy has experienced recurrent recessions and consistent inflation.

Cyclical Sensitivity of Innovative Activities

It is not surprising that, like other investment activities, technological innovation is sensitive to the business cycle. Schmookler (1966) has described how movements in capital goods innovations follow movements in capital spending. Mueller (1967) and Grabowski (1968) have shown that liquidity and profitability significantly affect innovative effort. Because such variables are sensitive to the business cycle, industrial innovation should also be susceptible to cyclical influences. Also, a recent study completed for the U.S. Department of Commerce (Charles River Associates, 1976) reveals that the flow of funds to small, technology-based firms is affected by the business cycle.[19]

Inflation and Innovation

Inflation, *per se,* if fully anticipated, should have no significant effect on the level and distribution of real income and thus on the allocation of resources to innovative activities. However, the assumption that inflation can or will be accurately anticipated is not valid.[20] For example, several empirical studies have shown that inflation becomes more difficult to correctly anticipate as its duration and intensity increase.[21]

The uncertainty involved in making long-term financial commitments runs parallel to the difficulty of anticipating future inflation. Investments in innovation require long-term commitments. Consequently, if *current* inflation increases uncertainty relative to *future*

inflation, then investment in innovation will be discouraged generally, and firms will shift from long-term to short-term projects.

Inflation also discourages private savings. This may have important indirect effects on the innovation process, since private savings are an important source of investment capital for firms. The effect of reduced private savings would be particularly relevant to small, innovation-oriented firms that depend on the sale of equity to private individuals.

Policy Implications

Changes in innovative activity both cause and are caused by shifts in aggregate economic activity. For example, a decline in the level of innovative effort initially caused by recession or inflation, may contribute to further recession or inflation by lowering productivity growth. Thus, it is difficult to assess how much of the recent decline in technological innovation has been caused by the recent performance of the U.S. economy. However, there are plausible reasons for attributing some of the decline to the current business cycle and inflation. This has several implications for public policy: (i) recent trends in innovation should not be attributed exclusively to any single factor such as changes in capital gains taxation or shifts in specific regulatory policies, and (ii) innovative activity will be encouraged by macroeconomic policies that improve the general business climate, thereby enhancing the anticipated profitability of the innovation.

4 CORPORATE TAX POLICY AND INNOVATION

Both corporate and personal income taxes affect the amount of resources devoted to the innovation process. This section considers the relationship between innovation and the corporate income tax. The discussion initially centers on broad ways in which corporate taxation influences investment decisions. This analysis forms the basis for identifying features of the corporate income tax that are of particular significance for innovation decisions. An effort is also made to assess the actual impact of recent changes in tax policies on these innovation decisions, as well as the possible effect of various changes in existing policies.

The conclusions that follow are subject to two qualifications. First, it should be recognized that tax policies that stimulate innovation entail, at least initially, some revenue loss to the U.S. treasury. Consequently, the final effect of tax incentives in promoting innovative activity depends on (i) the magnitude of revenue loss, and (ii) the manner in which the revenue loss is financed. Considerable controversy exists concerning how to estimate the true revenue losses resulting from tax cuts. There are many alternative ways in which revenue losses, however estimated, may be offset. These are complex issues that have yet to be resolved and are outside the scope of this paper. However, they should be confronted when specific tax incentives are considered for legislative action.

Moreover, it is assumed in this analysis that the burden of the tax is borne by corporations and their stockholders in the short run and is not shifted to consumers or workers.[22] This is an arguable assumption in that tax scholars disagree about the incidence of this tax.[23] Although the debate continues over who bears the burden, there is no conclusive evidence that the tax is fully shifted from stockholders to other parties.[24]

Nonintegration of Corporate and Personal Income Taxes

Income earned from investments in the corporate sector is subject to both corporate and personal income taxes. Under the current federal tax system, taxes must first be paid on the earnings of corporations. Dividend payments to stockholders and retained earnings are therefore financed out of after-tax corporate profits. However, the income accruing to stockholders, either immediate (through dividends) or future (through increases in the value of the firm resulting from reinvested retained earnings) is also subject to the federal personal income tax.[25] Dividends are taxed as ordinary income, while increases in the firm's value are taxed as capital gains. This differs from the tax treatment of income from investments in the unincorporated sector, where such income is subject only to personal income taxation.

Though income from corporate investments is subject to both corporation and personal income taxes, the computation of personal income taxes owed by stockholders does not take this into account. As a result, income from corporate equity is taxed more heavily than income from other, noncorporate equity. In both the legal and economic literature on taxation, this is referred to as "double taxation" of dividends.

Double taxation of corporate income influences the flow of resources between the corporate and noncorporate sectors.[26] Experienced investors might reasonably divide their funds between corporate and noncorporate activities, so that their after-tax returns are equal in both sectors. If after-tax returns were equal in the absence of a double tax on corporate income, such a tax would initially drive the after-tax return to corporate capital below that earned by noncorporate capital. In response, capital would flow out of the corporate sector. Such capital flows would stop when after-tax returns were equalized. Thus, more capital is invested in noncorporate activities than would be if the returns to corporate and noncorporate equity were taxed in a uniform manner.

Lack of integration between corporate and personal income taxes also encourages firms to retain after-tax earnings rather than pay those earnings as shareholder dividends. If net corporate earnings are paid as dividends, individual stockholders face tax liabilities based on rates applied to ordinary income. If earnings are retained and reinvested, stockholders can expect to pay capital gains taxes if the value of the firm is increased by such actions. Taxes on capital gains may be deferred until the gains are realized as actual income. Moreover, realized capital gains are taxed at lower rates than ordinary income. Thus, the effective double tax would be less under earnings retention than under dividend payout.

If investors believed that retention of earnings would increase the

price of their stock, they would have an incentive to hold shares in corporations with relatively high retention ratios. The incentive increases with the marginal tax rate and, hence, the income of the taxpayer. Corporate investment activities that rely heavily on internal financing are therefore favored relative to other activities. Moreover, companies that finance their investments through retained earnings face a lower after-tax cost of capital than firms that are more dependent on external sources of finance.

Taxing corporate and personal income in an unintegrated manner has offsetting effects on decisions to innovate. Lack of integration between the corporate and personal income tax discriminates in favor of investments in the noncorporate sector. The evidence indicates that technological innovations tend to originate in the corporate rather than the noncorporate sector. However, it is possible there would be more such innovation if double taxation did not discourage investment in corporate ventures.

Double taxation of dividends from corporate stock combined with preferential treatment of capital gains favors earnings retention rather than dividend payout. This would encourage technological innovation if corporate liquidity were an important determinant of decisions to innovate. However, this feature of the tax system tends to benefit established companies that have the ability to generate savings and investment internally, rather than new companies that rely significantly on external financing.

In view of these considerations, it is difficult to determine whether reducing double taxation of dividends would stimulate innovative activities.

Definition of Taxable Corporate Income: Equity vs Debt Finance

In determining taxable income, firms are allowed to deduct interest payments on corporate debt. However, deductions are not allowed for the costs (i.e., dilution of existing stockholders' interests) of financing investments through sale of equity. Consequently, the after-tax cost of equity capital exceeds the after-tax cost of debt capital.[27]

By denying deductibility for the costs of equity finance, firms may simply be induced to finance investment projects through debt rather than equity.[28] If firms prefer to finance certain investments through equity, the corporate income tax would discriminate against these investments.[29]

Definition of Taxable Corporate Income: Depreciation

Depreciation of capital may be deducted as an allowable business expense for tax purposes. The firm would prefer to take such deductions as rapidly as possible. For example, if an asset worth $K must be depreciated over ten years, it is advantageous for the firm to deduct

more than half of the $K during the first five years. Of course, the firm would prefer to depreciate the entire asset over a shorter time period, say five years rather than ten.

Allowing firms to take rapid depreciation lowers the after-tax cost of capital. Each unit of capital purchased entitles the firm to a stream of tax deductions. For example, if $K is the present value of depreciation deductions allowed per each $1 of investment, t is the corporate tax rate, and $q is the purchase price of a new unit of capital, the value to the firm of the depreciation deductions from $q of investment equals $tZq. Hence, the after-tax cost of capital goods to the firm would not be $q, but rather ($q−$tZq). Accelerated depreciation lowers the after-tax cost of capital by increasing Z. In addition, accelerated depreciation increases liquidity because cash flow is directly affected by the value of depreciation deductions permitted for tax purposes.[30]

Investment decisions of firms are also affected by investment-tax credits. In recent years, firms have been allowed to take a certain percentage, k, of new investment purchases as a credit against their tax liabilities. The value of this credit to the firm is equal to $kq, where q is the cost of capital. Tax credits, therefore, lower the after-tax cost of a new unit of capital by $kq. Changing the size of investment tax credits (changing k) would have similar effects on the firm as changing allowable depreciation deductions. Allowing firms to take more rapid depreciation for tax purposes and/or liberalizing investment tax credits are likely to stimulate investment spending. Allowing depreciation to be taken less rapidly and/or restricting tax credits would have the reverse effect.

Accelerated depreciation, reductions in useful life of an asset for tax purposes, and investment tax credits all tend to stimulate capital spending by industry. According to Schmookler's hypothesis, this should stimulate innovative activity in capital goods industries. The strength of this effect would depend partly on the sensitivity of capital spending to fiscal stimulus measures of this sort. Empirical studies of the impact of investment tax incentives enacted in the 1960s found that such measures did increase corporate investment spending. However, estimates differ as to the magnitude of the increase.[31]

Cash flow -- defined as the sum of depreciation allowance and profits net of taxes, and possibly also net of dividends -- is directly and significantly increased by accelerated depreciation, reductions in useful life of an asset, and investment tax credits. If the level of innovative activity responds positively to corporate tax flow, general investment tax incentives would also encourage decisions to innovate by increasing corporate cash flow.[32]

The effect of existing tax incentives on capital spending has been reduced, however, by inflation. Conventional accounting methods produce biased estimates of true net income during periods of serious

inflation. Depreciation must be taken on the basis of original or historical costs, rather than current replacement costs. This accounting practice understates true capital costs during periods of substantial inflation. The extent of consequences caused by failing to adjust the depreciable base for inflation depends on the expected rate of inflation and the life of the asset to be depreciated. Recent calculations by Gramlich (1976) show that the potential consequences may be quite significant.

Assuming the life of an asset as 20 years (roughly the average for producers investment) and an inflation rate of 5 percent, Gramlich estimates that failure to adjust the depreciable base for inflation reduces the real present value of depreciation deduction by roughly 23 to 25 percent. With an inflation rate of 10 percent, the estimated decline in the real present value of depreciation would be roughly 38 to 41 percent.

These effects would be partially offset during inflation because the gain from declining real value of corporate indebtedness is not taxable income. However, Davidson and Weil (1976) have estimated that the over-statement of true taxable income caused by historical cost depreciation exceeds the understatement of true taxable income due to omitting the declining real value of corporate debt from the corporate tax base. Failure to adjust the corporate income tax for inflation may have increased the effective tax rate faced by many corporations.

Tax Treatment of Research and Development Outlays

Section 174 of the Internal Revenue Code permits firms to fully deduct outlays for research and development in the year the expenditures are incurred. This provision is one of the most widely cited tax incentives for innovative activities. R&D is an investment, yielding output in more than one income period. Immediate expensing of R&D expenditures is therefore equivalent to granting instantaneous depreciation to this form of investment. One would expect this to stimulate investment in R&D for the same reasons that accelerated depreciation is likely to stimulate investment spending in general. This tax provision does not, however, apply to expenditures for capital assets used in R&D nor to costs incurred by purchasing patents or processes. Depreciation for such items is governed by the same guidelines that apply to other investments of the firm.

One possible way of encouraging innovative activities is to expand existing tax preferences for corporate R&D,[33] either by extending immediate expensing to include plant, equipment, patents, and processes used in R&D or by granting explicit tax credits to R&D. The ultimate effect of such tax incentives on the level of corporate innovation depends on (i) their impact on the after-tax cost of research and development and (ii) the proportion of the total costs of the innovation process attributable to R&D. Such measures would have the greatest

effect on any industry, such as pharmaceuticals, where research and development costs are a significant portion of the total costs of innovating. On the other hand, if uncertainty about future profitability is a major impediment to the decision to innovate, the prospect of receiving tax savings through tax incentives for R&D may not offer much encouragement for innovating.

Taxation of U.S. Multinational Corporations

Defining the corporate income tax base of multinational firms is both a complex and controversial problem.[34] Two major elements of U.S. tax policy aimed at multinational corporations are income deferral and the foreign tax credit. Subject to various qualifications, income from a foreign subsidiary of a U.S. multinational is deferred from taxation until formally repatriated to the U.S. parent.[35] In addition, the U.S. parent corporation may claim a credit against U.S. taxes based on its foreign tax liabilities.

The impact of taxation on multinational investment decisions depends crucially on whether the firm has a surplus or deficit of tax credits. Current provisions limit allowable tax credits to the amount of U.S. taxes that would have been paid on income from a foreign source had it been earned at home. U.S. firms with subsidiaries located in countries with effective tax rates below U.S. rates receive less than the maximum allowable credit. They have a deficit of tax credits because the tax credit is not sufficient to shelter foreign income from U.S. taxation. Conversely, firms with subsidiaries located in countries with effective tax rates higher than U.S. rates have foreign tax liabilities exceeding the maximum allowable credit. Such firms have a surplus of tax credits because the tax credit is more than enough to shelter foreign source income from U.S. taxation. Thus, current tax policies increase the tax burden on income largely earned in low-tax countries, while reducing the burden on income largely earned in high-tax countries.[36]

Deferral encourages the U.S. parent corporation to finance new foreign investments through equity participation in foreign subsidiaries rather than through loans from the parent to the subsidiary companies.[37] Deferral also encourages multinationals to invest abroad whenever the U.S. income tax rate exceeds the foreign tax rate[38]

A recent U.S. Treasury regulation (1.861-8) requires multinationals to allocate some of their domestic R&D expenditures against foreign source income. This reduces foreign source income for U.S. tax purposes. However, unless foreign governments allow tax deductions for R&D expenditures incurred in the United States, this procedure would not reduce taxable income for foreign tax purposes. Because the foreign tax credit is based on the Treasury's definition of foreign source income, this guideline reduces the credit that multinationals may take against U.S. taxes without reducing their actual foreign tax liability. As

a result, multinationals have a tax incentive, it is argued, to move their R&D activities overseas.

Whether Regulation 861 will seriously discourage industrial innovation in the United States has not yet been determined. Horst (1977) has claimed that multinationals can partially offset the effect of this regulation through internal accounting changes. It is also not certain whether multinationals will judge the potential tax differential from the regulation sufficient to encourage substantial relocation of R&D facilities. Finally, even if R&D facilities were relocated, it is only the first phase of the innovation process that would be shifted from the United States, and it is uncertain this would decrease innovation. Additional study of this matter is needed to resolve the issues. If it is determined that Regulation 861 has substantially reduced innovative activities in the United States, modification of this provision would appear to be one way to encourage technological innovation.

Tax Treatment of Firms of Different Size

Corporate investment decisions are also affected by the tax treatment of different firms. The ability to take advantage of allowable deductions differs among firms and industries because certain features of the corporate tax structure explicitly favor certain categories of firms and industries.

Of particular interest is the tax treatment of small corporations as it differs from other corporations.[39] Among the most important special provisions are (i) reduced taxation of initial levels of corporate earnings, (ii) exemption from corporate taxation of dividends paid to shareholders of regulated investment companies, (iii) treatment of corporations with 15 or less shareholders as partnerships for tax purposes, and (iv) various provisions that permit individual investors to deduct from ordinary income losses from investments in small business.

On balance, such special provisions favor small business.[40] The first provision does so directly, while provisions (ii) and (iii) either reduce or eliminate double taxation of corporate earnings. The provisions described under (iv) provide more generous deductions for capital losses to investors in small firms than are provided to investors in large firms. This reduces the after-tax risk of investing in small enterprises.

Because, as stated earlier, small firms appear to play a special role in the innovation process, such provisions may be viewed as promoting technological innovation. Of particular relevance is the tax treatment of regulated investment companies and small business investment companies. Regulated investment companies, which include venture capital companies, are characterized as domestic firms earning at least 90 percent of their gross income from investments in a diversified portfolio of other enterprises. Such firms are currently not taxed on dividends that they distribute to shareholders. In effect, this permits such companies

to distribute all their income to shareholders without paying corporate tax. Small business investment companies, licensed and operated under the Small Business Investment Act of 1958, provide equity capital to small business concerns by purchasing convertible debentures.[41] Relatively liberal loss offsets are granted to such enterprises. It has been estimated that venture capitalists and small business investment companies concentrate roughly 70 and 60 percent, respectively, of their investment funds in technology-based firms.[42] Hence, preferential tax treatment for these firms clearly seems to be favorable to technological innovation.

Other features of the corporate income tax, however, may unintentionally discriminate against small firms, particularly new firms. Loss offsets, depreciation deductions, and investment tax credits are not of immediate value to new, initially unprofitable firms because they face little or no corporate tax liability anyway. How much this discriminates against such firms depends on the adequacy of carry-forward and carry-back provisions for unused operating losses. Ensuring that unestablished firms are able to make full use of accelerated depreciation allowances, tax credits, and loss offsets may be one way of assuring a high level of innovative activity in small firms.

Corporate Tax Changes in the Revenue Act of 1978

Several features of the 1978 Tax Reform Act are aimed at reducing the burden of the corporation income tax. These include (i) reduction in the statutory corporate income tax rate from 48 to 46 percent, (ii) permanent enactment of the existing 10 percent investment tax credit, (iii) broadening the tax credit to permit corporations to use the credit to offset 90 percent of their other taxes instead of 50 percent, and (iv) allowing corporations a full write-off of expenditures for pollution control equipment.

Whether such changes will provide significant stimulus to increase investments in innovative activities depends largely on the effect of these on total corporate capital spending. There are reasons to expect this impact to be relatively modest. A number of empirical studies offer evidence that reductions in statutory tax rates are a relatively ineffective means of stimulating corporate investment, particularly in comparison with investment tax credits.[43] Moreover, Gramlich's calculations indicate that for an inflation rate as low as 5 percent, the corporate tax rate would have to be cut from 48 percent to 40 percent to offset the effect of inflation on the real value of historic-cost depreciation.[44] Hence it is unlikely that the tax cut by itself is sufficient to counter inflationary distortions present in the corporation income tax.

The effect of the decision to make the tax credit permanent is difficult to quantify. If firms expected the 10 percent tax credit to be permanent and behaved accordingly in their previous investment

decisions, granting legal status to this expected permanence is likely to have no measurable effect. However, if firms behaved as if the tax credit were temporary, making it permanent will most likely affect investment spending. The investment stimulus of a permanent investment tax credit may actually be less than that of a tax credit that was perceived as being temporary.[45]

Expanding the coverage of the existing tax credit to 90 percent of the firm's tax liability benefits mainly those firms for which the previous coverage limit of 50 percent was too low. In particular, this change should benefit small or newly established firms with relatively large expenditures for capital equipment and relatively low total tax payments.

Finally, allowing full write-off of the cost of pollution control equipment should stimulate investment in projects unrelated to pollution control as well by increasing the amount of after-tax profits available for financing such activities. This will not affect all firms equally because the provision should have the most direct impact in industries making relatively heavy outlays for pollution abatement measures.

In summary, recent changes in the corporation income tax provide some stimulus to capital spending and, hence, industrial innovation. But the impact of these changes may be rather modest. In particular, the changes do not adequately deal with inflationary distortions in the corporate income tax base. Consideration should be given to measures that would further offset such inflationary distortions. Examples of such measures are (i) allowing depreciation deductions to be based on replacement rather than historic cost, (ii) further reductions in the corporate income tax rate, and (iii) appropriate adjustments to the useful lives of assets and/or investment tax credits.

5 PERSONAL INCOME TAXATION AND INNOVATION

The personal income tax affects both how much individuals and families save and how they allocate their savings among different investments. Since personal savings are an important source of investment capital, the income tax can indirectly affect both the amount and the composition of private investment. Three aspects of the personal income tax are likely to affect private capital formation: (i) taxation of income from savings, (ii) taxation of capital gains and high-risk investments, and (iii) preferential tax treatment of investments other than capital gains.

Personal Income Taxation and the Incentive to Save

All taxes reduce the ability of individuals and families to save by reducing their after-tax income. However, the personal income tax further reduces the incentive to save any after-tax income because returns (interest) on those savings are also taxed. Since the taxation of savings income reduces the reward for savings, people are likely to save less. How much private savings actually fall is a function of the elasticity or sensitivity of private savings to the net return earned on those savings. Recent empirical work by Boskin (1978) indicates that private savings may be fairly sensitive to the after-tax rate of return.

Taxation of Capital Gains and High-Risk Investment

Realized long-term capital gains are taxed at substantially lower rates than other income. Accrued or paper capital gains and losses are not taxed until they are realized as income. Many taxpayers obviously benefit from the lower tax rate on long-term capital gains. Moreover, investors with accrued gains are able to earn income on taxes that are deferred until realization. Investors also have the option of achieving gains in years when their marginal tax rates are low and realizing losses when their marginal tax rates are high.[46]

Other things being equal, economic activities that pay income in the form of capital gains are favored under the current personal income tax. Corporate stock and land are the two main types of assets for which capital gains are a significant part of the expected return. Other forms of capital gains include income from the cutting of timber, from coal and iron ore royalties, from certain livestock operations, and from the sale of patents. In addition, certain occupations provide a greater share of total compensation in the form of capital gains through, for example, stock option plans.

Those favoring preferential treatment of capital gains maintain that risk-taking would be discouraged if capital gains were to be taxed like other income. Theoretical analyses of the relationship between capital gains taxation and risk-taking are inconclusive. However, such analyses are useful in highlighting the relation between risk-taking, taxation, and adequate deductibility of capital losses. Taxing capital gains permits the government to share in the returns of an investment if it is successful. Full deductibility of capital losses requires the government to share in the losses from an unsuccessful investment.

In evaluating a high-risk investment, one should consider both the after-tax return to be earned if it is successful and the after-tax loss to be suffered if it is not. Increasing the capital gains tax would reduce potential after-tax returns, while limiting the deductibility of capital losses would increase potential after-tax losses. Thus, both actions discourage investment in high-risk activities. Conversely, reducing the capital gains tax and increasing allowable loss-offsets would encourage such investment. However, reductions in capital gains tax rates encourage all investments that qualify as capital gains, regardless of risk. That is less likely to occur if capital gains tax relief is provided by liberalizing the deductibility of capital losses, because more tax relief per dollar of capital loss would be extended to those making high-risk investments.[47]

One undesirable impact of current capital gains taxation is the "lock-in effect." Capital gains are taxed only when realized as income, and in many cases this benefit may be passed on to heirs virtually tax free.[48] Consequently, investors have an incentive to postpone sales of assets. Bailey (1969) and Feldstein and Yitzhaki (1978) present evidence that the lock-in incentive may be quite strong. This effect may discourage investors from efficiently allocating capital in response to new investment opportunities.

The lock-in problem is not caused by taxation of capital gains *per se*, but rather by taxation on a realization basis and failure to tax capital gains upon death. This effect could be eliminated by taxing accrued as well as realized capital gains and by taxing capital gains left to heirs. In the absence of such changes, however, the lock-in incentive increases with the capital gains tax rate.

A recent study has shown that high income individuals are encouraged to seek capital gains in preference to ordinary income because of capital gains tax treatment.[49] This tax advantage encourages investment in high-risk investments that are also innovative. Similarly, the prospects of capital gains from stock option plans and ownership of equity may encourage employees to leave larger firms for small, technology-based firms. Indeed, there is some evidence that the favorable tax treatment of equity ownership has played an important role in the formation of small, technology-based enterprises.[50]

Until recently, effective taxes on capital gains had been rising with changes in tax laws and inflation. Prior to 1969, the maximum effective tax on capital gains was 25 percent. However, the Tax Reform Acts of 1969 and 1976 increased the maximum rate to 49.1 percent. In addition, inflation has distorted the computation of capital gains. Capital gains taxes are currently paid on the difference between the selling price of an asset and its original cost, even if the entire appreciation in price is due to inflation. This taxation of nominal gains increases the effective tax rate on real capital gains during periods of inflation. Feldstein and Slemrod (1978) have estimated that failure to adjust capital gains taxes for recent inflation has increased the effective tax on real capital gains from corporate stock by roughly 70 percent.

The trend toward escalating taxation of capital gains was reversed by changes enacted in the Revenue Act of 1978. The changes include (i) an increase in the proportion of tax-exempt capital gains from 50 to 60 percent and (ii) a reduction in the minimum tax on wealthy investors. The changes lower the maximum capital gains tax from 49.1 percent to 28 percent, virtually restoring the wealthiest investors to their pre-1969 tax position. Moreover, capital gains taxes were lowered for all investors, regardless of their income tax bracket. Such tax measures should encourage investors to accept greater risks in the hope of capital gains. This change is particularly important for small, technology-based firms that are heavily dependent on external equity finance.

Tax Preferences for Other Investments

Certain forms of investment income other than capital gains are also favored under the personal income tax. These are (i) investments in home ownership, (ii) investments in state and local bonds, and (iii) investments in retirement and pension plans. Homeowners are allowed to deduct mortgage interest and property taxes from other income in determining their income tax liability, but are not required to include as part of income the value of the rent their home would command on the market. Homeowners over the age of 55 have also been granted a one-time exemption from capital gains taxes on the sale of their home up to a maximum capital gain of $100,000.[51] Investors who purchase state and local bonds may exclude the interest earned on such

investments from taxable income. Finally, a variety of income tax provisions encourage employer and employee participation in retirement savings plans.

These preferential tax treatments therefore bias the application of private saving in favor of certain economic activities. Money flows into residential construction because of favorable tax treatment of homeownership. State and local public investments increase as a result of the tax exempt status of interest from state and municipal securities. There is no inherent reason why tax deferments for retirements savings should make certain investments more attractive than others because such savings are channeled through financial institutions. However, often tax preferred savings in Individual Retirement Accounts (IRAs) flow through savings and loan companies which invest heavily in residential construction. Other retirement savings are placed in private pension funds that are subject to government regulation of the investment portfolios.

Thus, personal and family tax savings from favorable tax treatment of investment in homeownership and state and local securities tend to benefit residential construction and government programs or operations. Neither the housing industry nor the state and local sectors are known to support high levels of technological innovation. These tax preferences therefore shift investment resources from more innovative to less innovative sectors of the economy.

Tax preferences given to pension plans inadvertently divert capital from innovative investment because of restrictions in the Employee Retirement Income Security Act of 1974 (ERISA). ERISA's initial definitions of "prudent" behavior, as well as the penalties established for imprudent behavior, have discouraged pension fund managers from making high-risk investments. Recent changes in ERISA guidelines establish standards of accountability that are based on portfolio diversification. Under this approach, investments in high-risk ventures, if part of a balanced portfolio, are viewed as prudent. Such changes should make pension fund managers less reluctant to commit some of their assets to investment in technological innovations.

6 INNOVATION AND GOVERNMENT REGULATION OF CAPITAL MARKETS

Following the 1929 stock market crash, the Congress passed the Securities Act of 1933 and the Securities Exchange Act of 1934. The 1933 Act calls for disclosure of information in connection with the initial offering and sale of securities. The 1934 Act established the Securities and Exchange Commission (SEC) and designed a system of continuous disclosure of financial information by corporations whose securities are sold and traded publicly.

Policymakers have begun to consider whether various government regulations can be modified to achieve the objectives of the Congress more effectively and at lower cost. In the case of SEC regulation, the question is whether changes may be made that provide the same level of investor protection at lower cost to firms complying with the securities rules.

Concern has recently been expressed about the extra burden of SEC regulations on small firms in general and small, technology-based firms in particular. This concern has been directed at three SEC regulations that are of particular importance to small firms: Regulation A, Rule 144, and Rule 146.

Regulation A

Because the costs of SEC registration can be large in relation to the proceeds of small securities offerings, Regulation A exempts offerings below a certain amount from full SEC registration requirements. Small companies issuing securities under Regulation A are still required to provide information in the form of an offering circular. However, the offering circular need not be filed or used in connection with an offering of securities.

The limit below which a company offering is exempt by SEC Regulation A has been changed several times since 1933. Most

recently, the limit was raised to $1.5 million from $500,000, and it has been proposed that this limit be further increased to $2 million or $2.5 million.

SEC Rules 144 and 146

The SEC also determines when securities are exempt from registration. Rules 144 and 146, enacted in 1972 and 1974 respectively, both deal with nonpublic offerings or restricted securities that are exempt from registration requirements.

Rule 146 establishes standards for determining when a new security is a nonpublic offering. Under this rule an offer or sale of securities is not a public offering if all the conditions of the rule are met. These conditions limit the manner of offering, the nature of the offerees, access to or furnishing of information about the issue, the number of purchasers, and the subsequent disposition of securities acquired.

Rule 144 regulates the distribution or resale of restricted securities after the initial sale. Before Rule 144 there was no clear way to determine if the exemption from registration held when a restricted security was resold. Because of this uncertainty, the SEC staff was constantly asked to issue written advice to shareholders, stating whether enforcement action would be recommended if such securities were resold without registration.

Rule 144 was ostensibly designed to reduce these uncertainties by providing objective standards for maintaining exemption from registration upon resale of a previously unregistered security. Under Rule 144, exemption from registration may be maintained provided certain requirements are met pertaining to (i) the length of holding period, (ii) limitations on the amount of securities sold, and (iii) the manner of sale and the availability of information.

The holding period requirement calls for the securities to be owned by the seller for at least two years prior to resale. There is also a limitation on the amount of securities that may be sold in any three-month period. If the securities are traded on a registered national securities exchange, the amount sold may be the greater of (i) the average weekly volume on all exchanges for the four weeks prior to the sell order or (ii) 1 percent of the outstanding shares or units of the class as most recently published. if the securities are not traded on an exchange, the amount sold must not exceed 1 percent of the outstanding units in its class.

Rule 144 also provides that adequate current public information about the issuer of the securities must be available. Furthermore, the securities must be sold in brokers' transactions, and the person selling the securities must not solicit or arrange for the solicitation of buy orders.

Impact of Rules 144 and 146

Rules 144 and 146 were initially designed to ease the burden of SEC regulations by making it easier to issue unregistered securities. However, the costs of complying with Rules 144 and 146 deter some small firms from seeking private placement exemptions. In particular, restrictions on the resale of unregistered securities reduce their liquidity. The cost savings from reductions in SEC registration requirements are therefore partially offset by higher interest premiums that are needed to compensate purchasers for the reduced liquidity of restricted securities. Moreover, if unregistered securities decline in value after the initial purchase, buyers may sue for recovery of the initial investments simply because the securities are unregistered. The expected costs of such legal actions are partially borne by the issuer.

Smith (1973) has argued that the incidence of Rules 144 and 146 has not been neutral across all firms. The most useful information about technological innovation is often not easily provided in financial statements or prospectuses. This may make it difficult for venture capitalists to satisfy the equivalent information requirement for exemption under Rule 146. Moreover, the arm's length requirement of Rule 144 makes it difficult for venture capitalists to provide important qualitative information about the innovation being financed through new issues. Finally, Rule 144's volume restriction on resales requires that each partner in a venture keep track of the sales of every other partner. When the number of partners is large, this requirement may impose large enough transactions costs to offset the savings from the exemption.

Thus, though Rules 144 and 146 make it easier for some new issues to qualify for exemption, they may make it more difficult for others. Specifically, the rules may make it harder to obtain exemptions for new securities issued by small, technology-based firms.

7 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Technological innovation has contributed significantly to economic growth and productivity. There is reason for concern, therefore, when fewer resources are now committed to innovative activity than in the past. Expectations about future profits ultimately determine whether firms are willing to invest in the process of innovation. This paper has identified government fiscal and financial regulatory policies that affect these profit expectations. Several conclusions emerge from the analysis.

1. An unstable and stagnant economy, which is influenced by macroeconomic policy, discourages technological innovation for several reasons. Recessions reduce the demand for capital goods innovations by depressing investment spending. This is significant because demand-pull is an important motivation for innovating. Small, technology-based firms find it difficult to obtain needed funds during recessions. Finally, high rates of inflation increase the uncertainties of making long-term resource commitments. Consequently, any macroeconomic policies that improve the stability and promote the rational growth of the aggregate economy will also encourage the innovation process.
2. Empirical studies have shown that the level of capital spending by industry affects the level of innovative activity. It also appears that corporate liquidity has a positive effect on R&D efforts and on technological innovation. Finally, since much of innovation application is in new capital equipment, measures that stimulate new investment speed the rate at which the benefits of adopting innovations spread throughout the economy. Recent corporate tax changes should increase corporate investments and liquidity and, therefore, provide some stimulus to innovation. However, the effect of these recent changes is likely to be modest. In particular, the changes do not address

the serious problem raised by inflation. Failure to adjust the corporate tax base for the impact of inflation has significantly reduced the real value to the firm of depreciation deductions and will continue to do so in the future. This failure has increased the effective income tax paid by corporations. Therefore, consideration should be given to enabling firms to take depreciation on the basis of replacement rather than historical costs. Permitting more rapid depreciation of investments mandated by environmental and health regulations also would provide additional resources for innovation-related investments.

3. There is considerable interest among policymakers in providing general stimuli to investment and saving through the tax code. Such tax incentives need to be structured to encourage investments in technological innovations as well as in capital formation in general.
4. Small, technology-based firms play an important role in the innovation process. Such firms are particularly dependent upon equity as a source of finance. Consequently, policies that encourage investors to purchase the equity offerings of small, technological firms will help create a favorable climate for innovating. Examples of such policies are (i) reducing capital gains tax rates, (ii) liberalizing deductions for capital losses, (iii) allowing investors to roll over, on a tax-free basis, equity investments in small, technology-based firms, provided such gains are reinvested in similar enterprises, (iv) modifying SEC regulations that restrict the rate at which investors may resell securities, (v) adjusting the Regulation A registration limit to reflect inflation, and (vi) ensuring that ERISA guidelines do not unduly discourage pension fund managers from investing in new, potentially high-risk technology ventures.
5. Firms are currently allowed to deduct their expenditures for research and development in the year these are incurred. However, this provision does not apply to expenses for capital assets used in R&D nor to expenses incurred to purchase patents or process. Allowing firms to write off these expenses immediately would provide a specific and significant tax incentive to industries in which R&D is a major cost of the innovation process. Providing extended carry-forward for tax purposes of R&D costs incurred by young firms also would encourage investment in technological innovation.
6. Whenever possible, tax policy should not add to the uncertainties in decisions to innovate. For example, the initiation of tax incentives may have a modest impact if taxpayers are uncertain about precise interpretation by the IRS. Consequently, the time lag between the enactment of legislation and its interpretation

by the IRS needs to be minimized so that such changes may be taken into account in the future plans of those affected.

7. It has been argued, though it has yet to be determined, that U.S. Treasury Regulation 861 will seriously discourage innovative activities. Further research should be devoted to this matter. Regulation 861 should be revised if such research determines that small additional revenues are obtained at the expense of significant reductions in technological innovation by U.S. multinationals.
8. Further research is needed on the ways in which other countries use tax policies to encourage technological innovation. Such research is unlikely to explain why the level of innovation has declined in the United States, but it should offer insights as to the foreign tax policies that are most successful in stimulating the innovation effort.
9. Considerable research has been done on the relationship between U.S. tax policy and general investment spending. By comparison, relatively little research has been devoted to the relationship between the U.S. tax system and specific investments in innovative activities. Such research would provide valuable information and insights for policymakers.

It is the committee's opinion that the conclusions and recommendations that are consistent with other tax policy objectives should be given serious consideration. While recognizing that different industries and firms of varying size are apt to have divergent views about the importance of various policy options, the committee considers the order of the recommendations to be reflective of, in its considered judgment, the approximate ranking of importance of each measure.

FOOTNOTES

1. See National Research Council, 1978, pp. 11-17.
2. National Science Foundation, 1977, p. 5 and p. 2.
3. *Ibid.*, p. 2.
4. *Ibid.*, pp. 106-107.
5. U.S. Department of Commerce, 1976, p. 15.
6. Statistical series sometimes cited, but not discussed in the text, are patent data. Recent declines in the number of patents awarded to U.S. residents have been interpreted by some as further evidence of a decline in industrial innovation. However, serious conceptual difficulties exist in relating movements in patent data to changes in the output of innovations. For a discussion of patent data as a measure of innovation, see National Science Foundation, 1977, p. 108.
7. For a general discussion of the relationship between technological change, productivity, and economic growth, see National Science Foundation, 1978.
8. See National Science Foundation, 1977, p. 37, and Aho and Carney, 1978.
9. See J. Kendrick, in Walton, 1979, p. 195.
10. See Hannay, 1978, and Landau, 1978.
11. However, neither Mansfield nor other researchers present "formal" measures of risk based on the variability of returns.
12. This figure is based on conversations with N. Bruce Hannay, Chairman of the Committee on Technology and International Economic and Trade Issues, National Academy of Engineering.

13. *Ibid.*

14. See National Science Foundation, 1977, p. 92.

15. *Ibid.*

16. For discussions of the role of small firms in the innovation process, see Charles River Associates, 1976, Jewkes, 1969, and National Research Council, 1978.

17. For the economic determinants of investments in R&D and industrial innovation, see Kamien and Schwartz, 1976. For studies that find a significant relationship between R&D expenditures and liquidity variables, see Mueller, 1967, and Grabowski, 1968. Though Kamien and Schwartz do not believe that the case of liquidity as a determinant of R&D activity is conclusive, they concede that "liquidity and profitability may be 'threshold factors' necessary in some degree for R&D activity, but not linearly related to the amount of R&D activity". 1976, p. 26.

18. See Charles River Associates, 1976, p. 2. Specifically, small technology-based firms relied on equity for 48 percent of their financing, while the corresponding figure for small nontechnological firms was 14 percent.

19. For a discussion of the role of small businesses in the innovation process, see Jewkes et al., 1969, and the U.S. Department of Commerce, 1976.

20. Three excellent discussions of this topic may be found in Ackley, 1978, Okun, 1978, and Weintraub, 1978.

21. More specifically, Klein, 1976, Logue and Willet, 1976, and Okun, 1975, have shown that the variability of the inflation rate increases with its average duration. Vining and Elwertowski, 1976, also show that the dispersion of inflation rates for particular goods and services varies positively with the general inflation rate.

22. The "short-run" refers to a period of time that is sufficiently short so as to prevent investors from responding to taxes by reallocating their holdings of capital. As discussed in the text, a long-run impact of taxation may be to cause capital to shift from the "more heavily taxed" corporate sector to the "less heavily taxed" noncorporate sector. This would have the effect of shifting part of the corporate tax burden from corporate shareholders to owners of property and capital, in general.

23. For a general discussion of these issues, see Break, 1974, pp. 138-154; Due and Friedlander, 1977, pp. 306-315; Musgrave and Musgrave, 1976.

24. For example, among the four econometric studies cited by Break, 1974, three support the hypothesis of no shifting of the tax in the short-run, while a fourth supports the opposite hypothesis of 100 percent shifting. In a related vein, Break, 1974, p. 139, argues that "the true corporate tax incidence probably contains a mixture, in unknown proportions, of all the plausible group burdens."

25. The imposition of a separate tax on corporate income has been justified by some on the grounds that society confers special privileges on firms organized as corporations. Proponents of this view find the presence of a "double-tax" less troublesome than those who do not. However, this view is not widely held by tax scholars. For a discussion of this issue, see Musgrave and Musgrave, pp. 293-294.

26. See Harberger, 1962.

27. See L. Tambini in Harberger and Bailey, 1969.

28. For a theoretical discussion of these issues, see Stiglitz, 1973.

29. See A. Harberger in Harberger and Bailey, 1969, p. 2.

30. See R. M. Coen in Fromm, 1971, pp. 134-135.

31. A number of empirical studies of the impact of investment tax incentives on corporate investment behavior may be found in Fromm, 1971. Among these studies, that of Hall and Jorgenson is the most optimistic in its assessment of the impact of investment tax incentives, while Coen, and Klein and Taubman find a considerably more modest impact of tax than Hall and Jorgenson.

32. See references cited in footnotes 17.

33. Some illustrative calculations of the impact of tax preferences for R&D are presented in Kaplan, 1976, p. 8.

34. For a discussion of the technical and economic issues of income definition, see Horst, 1977, 1978. For a discussion of some of the political controversy surrounding tax treatment of multinationals, see National Research Council, 1978, pp. 71-75.

35. For a discussion of the various restrictions placed on the tax deferral of foreign source income, see Horst, 1978.

36. The reduction is due to the fact that "unused" tax credits in high-tax countries effectively offset the deficit of tax credits in low-tax rate countries. This results from the fact that the credit is computed by applying the effective U.S. tax rate to total foreign source income (i.e., from both low- and high-tax countries). For a more complete discussion of these issues, see Horst, 1978, pp. 7-8.

37. The economic rationale for this behavior is discussed fully in Horst, 1977. An intuitive explanation for this behavior is readily offered, however, as intrafirm firm loans between the U.S. parent and its subsidiary would "automatically" generate a flow of repatriated income through interest payments, whereas equity participation would not.

38. Horst, 1977, p. 381.

39. For a survey of the various special tax provisions applied to small firms, see Kaplan, 1976.

40. In light of recent declines in the formation of entrepreneurial small businesses, it would appear that these tax incentives were not strong enough to overcome the reluctance of investors to finance small enterprises.

41. For a more detailed discussion of the special tax treatment given to small firms, see Kaplan, 1976.

42. See Charles River Associates, 1976.

43. See, especially, the studies by Hall and Jorgenson and Bischoff in Fromm, 1971.

44. See Gramlich, 1976, p. 284.

45. See Lucas, 1976, pp. 172-175.

46. See Wetzler, 1977.

47. See David, 1978, and Musgrave, 1978.

48. Section 1023 of the Internal Revenue Code, enacted as part of the Tax Reform Act of 1976, restricts the ability to avoid capital gains upon death and inheritance. However, the implementation of this provision was delayed until January 1, 1979, and its present status is uncertain.

49. For an empirical analysis of the impact of personal taxation on the composition of household portfolios, see Feldstein, 1976.

50. For example, in a detailed study of executive behavior, Holland, 1970, found a number of engineers and scientists who had been induced, at least in part, by the capital gains tax to shift from salaried employment to management of their own firms. Similarly, Baty, 1964, found that the possibility of obtaining preferentially taxed capital gains was an important stimulus to individuals who provided equity to technology-based firms in New England.

51. Homeowners, regardless of age, are also not subject to capital gains taxes on the sale of a personal residence if they purchase a new personal residence within certain statutory guidelines.

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