Public Pension Funding and U.S. Capital Formation: A Medium-Run View

Benjamin M. Friedman*

Questions about capital formation and the implications of a potentially increasing scarcity of financial capital in the United States have recently emerged as important public issues, not just as a matter of long-range planning but as an object of concern in the medium run, too. There are reasons for expecting both the overall scarcity of investment capital and, perhaps more importantly, the relative scarcity of long-term capital to increase during the coming five to ten years. As a result, private businesses may have to postpone or abandon plans for new physical investment undertakings, thereby further reducing the prospects for meeting medium-run national goals dependent on capital formation. Many individuals and some institutions have therefore called for public policy initiatives to bolster physical capital formation against the pressures of financial capital scarcity.

Not surprisingly, proposals for change in the funding of pensions have figured prominently in these discussions. As of the end of 1975, the pension funds of private businesses and state and local governments had financial assets of $255 billion, of which $224 billion represented equity interests in or debt liabilities of U.S. corporate businesses.[1] Including the roughly $40 billion of government securities in the Social Security Trust Fund, the total financial assets of pension funds amounted to some 20 percent of the combined equity and outstanding debt of the U.S. nonfinancial corporate business sector. Even with no changes in their current structure, therefore, pension funds already represent a substantial pool of financial capital invested in American industry. Furthermore, this pool is also growing rapidly. In 1975 the pension funds of private businesses and state and local governments purchased, net of sales and retirements, $24

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[1]Data are from the Federal Reserve System's Flow of Funds accounts.

billion of additional financial assets. By comparison, the economy's total personal saving (including pensions) in 1975 was $84 billion, and the entire net external funds requirement of the nonfinancial business sector was only $37 billion.[2]

While both this $255 billion asset stock and the corresponding $24 billion annual saving flow already render pensions a major consideration in any assessment of the prospects for financing U.S. capital formation, several pension experts have proposed plans for increasing pensions' saving flows — and therefore pensions' accumulation of asset stocks — to magnitudes which would dwarf the Nation's prior experience. Alicia Munnell and Ann Connolly [31], for example, have estimated that the liabilities of state and local government pension funds now exceed these funds' assets by some $270 billion and that the growth of their liabilities is continuing to outpace the growth of their assets. Their analysis has indicated that simply funding the new liabilities which accrued during 1975 would have required an additional $5 billion of asset accumulation by these funds, and that making one year's start toward a relatively slow (40-year) amortization of the currently unfunded liabilities would have required yet an additional $8 billion. Even these magnitudes, which pertain only to the 13 percent of the civilian labor force who worked for state and local governments during 1975, are potentially of substantial consequence for the Nation's capital formation. With $4 trillion in unfunded liabilities of the Social Security system, then, as Martin Feldstein [15] has shown, the stock and flow magnitudes implied by various Social Security funding proposals can easily reach vast proportions, with correspondingly far-reaching potential consequences for capital formation.

The object of this paper is to address two apparent vacuums in the existing literature relating pension funds to financial capital markets and, via these markets, to physical capital formation.

First, analyses of the potential macroeconomic impacts of pension funding proposals usually focus on a time horizon which is quite long by the standards of policy-oriented macroeconomics. Exploiting the comforting reliability of mortality tables in comparison with less firmly grounded macroeconomic relationships, such studies usually take the reader at least into the twenty-first century if not half way through it. In contrast, the concern of this paper is the medium run of the next half-decade to decade — say, for example, about the length of two Presidential administrations. It is within this relatively shorter time period that arguments about an increasing scarcity of financial capital, with negative implications for physical capital formation, seem to have substantial validity.[3] The U.S. financial markets' proven capacity for innovation effectively

[2]Businesses' external funds needs were unusually small in 1975; the 1970-74 annual average was $58 billion. The point remains, however, that net saving via pensions is a large share of this total even in normal years.

[3]It is relatively easy, but not particularly instructive, to refute many of these arguments by transplanting them into a long-run equilibrium time frame; see Section I below.

precludes having confidence in an extrapolation of this medium-run financial scarcity much beyond the next decade.

Secondly, to date most analyses of this subject have dealt exclusively with the overall scarcity of (by implication, homogeneous) financial capital and have largely neglected the more specific problem of the increasing relative scarcity of long-term capital. This capital homogeneity assumption is particularly inappropriate for purposes of studying the economic effects of funding proposals for pensions, since pension funds (for very sound reasons) do not behave like typical investors. Furthermore, the specific characteristics of pension funds' portfolio behavior turns out to be of crucial importance in the context of prospects for an increasing relative scarcity of long-term financial capital in U.S. markets during the medium-run future. This paper therefore looks at pension funds in a framework which recognizes two essential forms of heterogeneity. First, different financial instruments are not perfect substitutes. The distinctions among different assets and liabilities — in particular, between long-term and short-term maturities — do matter and are important. Secondly, different market participants do not share identical portfolio preferences and behavior. The distinctions among different categories of borrowers and lenders — in particular, between pension funds and individual savers — also matter and also are important.

Section I briefly indicates why capital formation is important for achieving a number of the Nation's medium-run economic goals and discusses the implications in this context of focusing on a medium-run time frame rather than on a long-run equilibrium. Section II reviews the reasons why both the overall scarcity of financial capital and the relative scarcity of long-term capital may be important factors causing medium-run U.S. capital formation to be inadequate. Sections III and IV examine the capital market implications of Munnell's and Connolly's proposals for Federal civil service, military, and state and local government pensions, and Feldstein's proposals for the Social Security system. Section III uses my earlier [18] set of estimates as a framework for analyzing these proposals from the viewpoint of the overall scarcity of financial capital. Section IV then adopts a partial equilibrium approach to facilitate analyzing these proposals from the viewpoint of the relative scarcity of long-term capital; part of this analysis relies on the structural model of the determination on long-term interest rates which I have developed in previous work [21, 22]. Section V briefly summarizes the paper's principal conclusions.

I. Capital Formation and National Economic Goals in the Medium Run

At the outset it is useful to review the reasons why the U.S. economy's rate of capital formation during the next five to ten years has become a major object of public policy concern. Put the other way around, the relevant question is why many disinterested observers are reluctant to

accept that rate of capital formation which they expect the U.S. economy to generate during this period in the absence of public-policy initiatives.

The predominant answer is that, as the economy recovers from the severe 1973-75 downturn in business activity and the focus of attention shifts accordingly from the problems associated with the depths of the recession onto the economy's needs for the remainder of the 1970s and on into the 1980s, it is becoming clear that new fixed-capital formation will be essential for achieving many of the Nation's economic objectives for these years. New plants not only will provide jobs for re-employing those who are out of work and employing new labor force entrants but will also provide added production capacity for avoiding specific inflationary shortages as the economy expands. Modern equipment will increase the economy's productivity, thereby permitting a rising standard of living through wage increases which do not raise unit labor costs, as well as helping the United States to compete vigorously with foreign producers who have been quick to take advantage of newly evolving technologies. New equipment will also enable American industry to meet higher standards of worker and product safety and environmental protection. New and remodeled power generation facilities will enable businesses to shift their energy consumption patterns so as to economize on increasingly expensive and scarce fuels. New investment in energy exploration, production and development will reduce American dependence on uncertain foreign energy sources.

To prevent misunderstanding, it is important to emphasize that this set of rather widely accepted national goals represents a set of medium-run economic objectives. Some may still be important objects of concern a decade hence, but of course both the relevant underlying economic situations and the public's preferences may change in important ways between now and then. For the five to ten years immediately ahead, however, these objectives rank high on the Nation's economic agenda.

The medium-run nature of these goals is significant in the context of policies for promoting capital formation because, as Feldstein [16] has demonstrated in a paper which does not take account of the medium-run context of much of the current discussion, the link between some of these goals and capital formation would not be valid in a long-run equilibrium context. In the long run, for example, the substitutability of capital and labor in the production process would indeed absorb any unemployed workers, regardless of the size of the capital stock. The shift of production technology which such substitution would require, however, seems of limited relevance for the next five or ten years, much less for the objective of significantly reducing the economy's unemployment rate between now and the end of the 1970s. Similarly, in the long run any increased productivity consequent upon greater capital formation would simply lead to higher real wages without bearing any necessary implications for either the economy's rate of price inflation, which under familiar assumptions will de-

pend on the rate of growth of the money stock,[4] or its international competitiveness. By contrast, in the short- and medium-run context of both limited wage flexibility and oligopolistic pricing behavior which determines prices according to normal average cost up to a mark-up reflecting competitive entry-preventive considerations, it is difficult to apply this argument to the coming few years which may be crucial to the rekindling or subsidence of price inflation as the economy moves closer to its full potential growth path. Again in the context of avoiding a resurgence of price inflation in the medium run, arguments structured in a long-run equilibrium mode necessarily assume intersectoral supply-demand balances and therefore ignore the possibility of inflation-generating shortages in particular key industries.[5]

Perhaps even more importantly, discussions of capital formation in terms of long-run equilibrium also ignore the implications of two current sources of capital formation requirements which have arisen quite suddenly and which are likely to be of significant magnitude during the next half decade or more.

First, in addition to whatever merits "energy independence" may have as a public good, both the sudden escalation of the cost of fossilized energy sources and the increasingly uncertain outlook for availability of particular sources such as natural gas will lead businesses in the United States to undertake a substantial amount of fixed investment which has no direct parallel in the economy's post-World War II experience. Some parts of this energy-related investment will provide the equipment and manpower to undertake costly searches for new energy sources such as offshore oil and gas deposits. Others, such as the multibillion dollar pipeline projects now under construction in Alaska and under consideration for northwest Canada, will transport fuels from newly developed but not readily accessible sources to their U.S. users. Still others will reflect the adjustments in production methodology and product design which a broad range of industries must now make because of the shifting structure of relative energy costs and availabilities.

Secondly, the increased public emphasis on environmental preservation and improvement, as well as on worker health and safety, will continue to require U.S. businesses to undertake some additional fixed investment. As is the case for much of the investment devoted to energy development, pollution-control equipment represents an additional investment input to the production process; but, since neither clean air nor

[4]The long-run relationship between the money stock and the price level is less straightforward than often supposed, however. No one knows how an electronic funds transfer system, for example, or the payment of interest on demand deposits, will influence monetary velocity.

[5]See Bosworth [6], for example, for a discussion of the prospects for shortages in several important U.S. industries.

clean water has economic value in the gross national product (or brings a direct economic return to those companies abating their pollution), it does not add to the amount of output being produced.

In both cases, the basic point is that new fixed capital is required for reasons not directly associated with the production of economic output as conventionally defined in the National Income and Product Accounts. Since measured gross national product includes neither the advantages of energy independence nor environmental and health benefits,[6] these two considerations imply (with all other factors held equal) an increase in the economy's measured capital-output ratio.

In the long run, the U.S. economy will presumably adjust fully to both of these additional sources of demand for capital formation — that is, if both persist in the long run — so that the rate of return on the marginal dollar devoted to capital formation will just balance the public's preferences between consumption today and consumption tomorrow.

For the medium run which is the immediate cause of public policy concern, however, the way in which the economy will adjust is less certain. Will the total capital formation rate remain fixed, so that the new investment devoted to energy independence and to the environment and to worker and product safety will simply replace the more traditional investment which would have created new jobs and expanded conventionally defined production capacity? If businesses seek to increase the total capital formation rate, so as to undertake this new investment without sacrificing the more traditional investment, at what yield will the financial markets accommodate the increased demand for investment capital? Apart from the question of the required yield on investment, will the financial markets (or some other element of the decentralized economy) impose effective quantity constraints on investment by certain businesses?[7]

These are the concerns which have motivated the debate about the medium-run prospects for U.S. capital formation.

II. Physical Capital Formation and Financial Capital Markets.[8]

Since World War II, investment in plant and equipment in the United States has averaged only about one-tenth of the Nation's total output — somewhat less in the 1950s and early 1960s, and somewhat more in the late 1960s and early 1970s. This capital formation rate has been very low in comparison with that of other industrialized countries around the

[6]Measured gross national product could even decline in response to the implementation of health and safety regulations which would reduce the consumption of medical services.

[7]Given the complex institutional and regulatory character of the existing financial markets, interior solutions need not occur for all variables, especially in the short or medium run.

[8]This section draws on some of my previous work; see especially Friedman [18, 19, 20].

world; in some Western European countries and in Japan, for example, business fixed investment as a percentage of gross national product has typically been between one-fifth and one-quarter. Furthermore, as a result of the deepest business recession since the 1930s, in 1975 the share of U.S. output devoted to plant and equipment expenditures dropped once again below the 10 percent mark. This decline, however, has almost certainly been a temporary cyclical phenomenon. For all of the reasons discussed in Section I, U.S. businesses in the coming decade are likely to seek to apply toward investment in plant and equipment significantly more than the recent average 10 1/2 percent of gross national product. Especially if the current cyclical recovery develops into a sustained business expansion, a major force in the U.S. economy during the next five and more years will be the attempt to increase the fraction of the gross national product devoted to fixed investment.

Investment, however, must be financed. At the level of the individual company or individual project, capital appropriations are restrained by the ability to generate funds internally, through undistributed after-tax profits and depreciation allowances, and/or to raise external funds in the credit markets. At the level of the overall economy, total investment must equal total saving.

During the next five years in the United States, financial considerations may, to an unusually great extent, act as effective constraints limiting the amount of fixed investment in plant and equipment which the economy in aggregate is able to do. Such restricted availability of financial capital would, in the absence of offsetting public-policy initiatives, limit the economy's ability to achieve those objectives which depend upon formation of new physical capital.

This restraining role of the financial markets would, in turn, result from two closely related kinds of developing scarcity reflecting two forms of balance which are essential aspects of the functioning of a market economy. First, the economy's overall investment total must equal the overall total of the economy's saving. Secondly, since specific kinds of investment typically rely on particular respective methods of financing, and since savers are not indifferent among alternative financial vehicles, the respective supplies of and demands for specific heterogeneous financial instruments must also be equal.

The Overall Scarcity of Financial Capital.[9] An important key to understanding the functioning of any economy is the truism that, on an ex post basis, the economy's saving must equal its investment. Since it is unlikely in a decentralized market economy that *ex ante* plans for saving

[9]As the following paragraphs indicate, the familiar allegation that the concerns about capital formation from a financial viewpoint reflect a failure to recognize that markets do clear (see, for example, Eisner [13] and Feldstein [16]) is simply false.

and investment will precisely balance one another, the market mechanism must influence the decisions of businesses and consumers so as to change these inconsistent *ex ante* plans into consistent *ex post* actions. Financial markets play a large role in this mechanism, generating adjustments in the real yield which the market pays to savers as suppliers of funds and in the cost and availability factors which confront those who demand funds to invest in plant and equipment, office buildings, inventories, and residential construction. If plans to supply funds exceed plans to demand funds, the market excess leads to increased availability and a decline in yields. If plans to supply funds fall short of plans to demand funds, the market shortage leads to reduced availability and higher yields. The result is that, *ex post,* saving equals investment.

No independent increase in the U.S. economy's private saving seems likely, during the next five to ten years, to mirror businesses' efforts to raise funds to finance an increase of their investment in plant and equipment from the recent pre-recession level of about 10 1/2 percent of U.S. gross national product. Capital would therefore become more scarce as the financial markets created incentives, in the form of increased real yields on and reduced availability of financial capital, for individuals to save more and for businesses to invest less.

This prospect of increasing capital scarcity bears significant implications both for individual firms' business decisions and for public policy.

First, for most individual companies, the problem would appear as a rise in the inflation-adjusted market cost of capital.[10] This increasing after-inflation cost factor would be the major fulcrum of the process which will inevitably result in supply equaling demand in the market. The specific mechanism equating supply and demand could involve many proposed projects which businessmen in a wide variety of industries are discussing today and which seem potentially profitable when evaluated at the cost of capital which has prevailed on average over the past decade. By contrast, five years from now, when evaluated at the then-prevailing cost of capital, many of these same projects could seem unprofitable, even though the respective underlying operating considerations may have remained unchanged.[11] If businesses then decided to defer or abandon such projects, the economy would forego whatever benefit they would have provided.

In addition, for companies perceived to be of less than top-quality credit-worthiness, the problem would also appear as an intensified lack of

[10]It is important not to associate this phenomenon with a statement about observed market interest rates except in the context of some specific assumption about expectations of future price inflation.

[11]Brainard and Tobin [8], relying on measurements of the market value of the Nation's capital stock to its replacement cost, have argued that the "real" cost of capital began to rise significantly as early as 1973-74.

market availability of capital. As capital became more scarce on an overall basis, the availability of capital to these particular borrowers could become even more restricted. A company of less than top-quality credit standing would find that it is willing to pay a modest premium over the price of capital which it sees more stable or established companies paying, but that capital is nevertheless unavailable to such a company, and investment opportunities would effectively be limited to only a part of the U.S. business sector.[12]

From the standpoint of public policy, the problem of increasing capital scarcity would appear as an insufficient amount of financial capital being raised in the markets — insufficient in comparison with goals for physical capital formation for jobs, price stability, increasing capacity and productivity, environmental improvement, health and safety enhancement, international competitiveness, and energy conservation and independence. As Section III below shows, innovations in funding public pensions can make a significant difference for this developing overall scarcity of financial capital.

The Relative Scarcity of Long-Term Capital. The second form of balance which is essential to a market economy with several heterogeneous forms of capital — equality of the respective supplies of and demands for specific financial instruments — could lead in coming years to a further important development in the form of a shifting of relative scarcities within the overall U.S. capital market. In particular, while capital of any sort will become increasingly scarce, the scarcity of long-term capital is likely to increase even more.

Since all forms of financial instruments are not equally suitable for financing business fixed investment, it is important to any analysis of the prospects for capital formation to ask how U.S. businesses will seek to meet the enormous and growing needs for funds which will result from their increasing investment expenditures. The liquidity position of the nonfinancial corporate business sector of the U.S. economy — measured by any of a number of familiar ratios — deteriorated substantially and almost continuously from the end of World War II until a year or so ago. Some of this decline, especially in the early postwar years, presumably represented only a descent from the economy's abnormally high overall liquidity position caused by the wartime government financing. More recently, however, the trend has continued significantly further, greatly increasing the financial risk exposure of many businesses.[13] Businesses' willingness to continue to increase their risk exposure during the latter half of the postwar period in part reflected the then-prevalent attitude that the business cycle was a phenomenon of the past and that the U.S. economy would thenceforth expand continuously and indefinitely.

[12]The access to the public debt and equity markets of corporations rated less than A has been very limited for the past several years.

[13]Wallich [36], for example, has advanced this view of the trends in business liquidity during the postwar period.

The business recessions of 1970-71 and 1973-75 have probably arrested this trend toward increasing financial risk exposure. The bankruptcies of Penn Central and Grant's — and the widely publicized near misses of one after another major corporation, not to mention public sector borrowers — have carried an important message both to corporate borrowers and to investors. After observing the difficulties associated with short-term indebtedness, which many companies have experienced in the recent years of turbulent economic situations in general and financial markets in particular, many businesses will probably seek to reduce their financial exposure. Furthermore, the allocation of debt funds through the credit markets has already made clear that investors have taken on an increased sensitivity to borrowers' risk exposure. Highly exposed would-be borrowers will find financing increasingly unavailable.

Even apart from any question of restructuring the nonfinancial corporate business sector's $611 billion *stock* of currently outstanding liabilities, however, the relevant question here is how this sector of the U.S. economy will meet the *flow* of new external funds requirements associated with its collective effort to increase the economy's capital formation rate. Traditional business prudence usually indicates that, in financing physical facilities with long expected life, the liabilities behind those assets should also be of long duration. After the bankruptcies, threatened defaults and other financial distresses of the past two business recessions, this simple maxim probably has more appeal today than it has had for many years. U.S. businesses will therefore increasingly attempt to finance their investment expenditures at long term. Furthermore, if the fixed investment share of the gross national product is to rise, businesses seeking to finance investment expenditures will account for an increasing share of the funds raised in the U.S. credit markets. A primary feature of these markets during the next five to ten years, therefore, will be a shift in the structure of borrowers' demands for funds toward a preference for long-term liabilities.

If investors were wholly indifferent among alternative assets, this likely shift of borrowers' preferences would matter little for the credit markets. Since in fact investors are not indifferent among alternative saving vehicles, however, it is important to ask whether the asset preferences of both individual and insitutional savers are likely to be shifting toward longer-term form so as readily to balance the probable shift in borrowers' liability preferences.

One quite unsurprising effect of the recent experience of rapid and highly variable price inflation in the United States has been to frighten many individual savers away from long-term debt commitments at fixed terms, and market performance during this period has increasingly cast doubt on the role of equities as a hedge against inflation.[14] Individuals' direct saving has therefore emphasized short-term instruments, including interest-bearing deposits of all forms. Until adequate price stability in the

[14]See, for example, Bodie [4] and Lintner [26].

economy has reassured investors that inflation will not erode the real value of their savings, direct savers are unlikely to shift their portfolio preferences to accommodate businesses' demands for long-term funds.

Direct saving is only one means of transferring funds from their ultimate sources to their ultimate users. In an advanced economy with highly developed financial markets, financial intermediaries take advantage of risk diversification and economies of scale to be able to purchase one kind of asset from borrowers and sell (i.e., issue) a different kind of liability to savers. Most such intermediary institutions have specific dominant preferences with respect to their asset portfolios, dictated in large part by the nature of the liabilities which they offer and reinforced by closely related government regulations. In the context of financing the burgeoning long-term funds requirements of U.S. businesses during the coming years, pension funds and insurance companies are of special importance. Because of the long-term nature of their liabilities, these intermediaries are the only major institutional lending groups in the United States which prefer to hold asset portfolios consisting largely of general long-term corporate capital obligations.

For the past decade, however, the corporate nonfinancial business sector of the U.S. economy has been increasing its net external funds requirements more rapidly than the insurance-pension sector has been increasing its net acquisitions of financial assets. During the next five to ten years, the volume of credit which insurance companies and pension funds extend will probably continue to grow steadily, and the new Federal pension legislation (ERISA) will probably lead to some acceleration in the growth of pension funds. Nevertheless, as has already been the case to some degree during the past decade, in the absence of some further innovation the insurance-pension sector's net lending is likely to grow significantly less rapidly than will nonfinancial businesses' demands for funds to finance fixed investment.

In sum, neither direct savers nor financial intermediaries appear likely to shift during coming years toward a preference for long-term assets. On the contrary, in the absence of public-policy initiatives or financial innovation which would make long-term instruments more attractive, direct saving will probably continue to emphasize short-term instruments, and those intermediaries which prefer general long-term corporate capital obligations will account for a decreasing share of the funds advanced in the U.S. credit markets. The resulting "mismatch" caused by the market confrontation of increasing borrowers' preferences for long-term liabilities and increasing lenders' preferences for short-term assets may result in a shift of relative scarcities within the different maturity sectors of the overall capital market which will only compound the more familiar problems associated with the economy's saving-instrument balance.[15] As Section IV

[15]While it is too early to judge with confidence, the unusally large market yield spreads between long- and short-term debt instruments in the past several years may already have begun to indicate this shift of relative scarcities.

below shows, innovations in funding public pensions can also make a significant difference for this increasing relative scarcity of long-term capital.

III. Public Pension Funding and the Overall Scarcity of Financial Capital

Munnell's and Connolly's proposals for funding civil service, military and state and local government pensions and Feldstein's proposals for funding the Social Security system represent substantial increases in the economy's institutionalized saving. To the extent that this additional institutional saving in turn corresponds to a greater saving rate for the economy as a whole, then these proposals could potentially offset some or all of the increasing scarcity of financial capital discussed in Section II.

A Quantitative Perspective for the Next Five Years. Table 1 provides a quantitative framework within which to assess the implications of some of the magnitudes involved in the Munnell-Connolly and Feldstein proposals. In an earlier paper [18] from which this table is adapted, I worked through a conditional forecast of the likely balance of saving and investment in the U.S. economy during 1977-81 — a period which I chose in large part so as to avoid dealing with the early stages of the recovery from the severe 1973-75 business recession. Among the key policy assumptions underlying this forecast were, first, that the Federal Government would undertake only modest new spending programs during 1977-81, thereby maintaining the goods-and-services purchases component of Federal expenditures at the recent 9 percent share of gross national product; secondly, that Federal taxes and transfers would increase in respective proportions which would yield a balanced Federal budget, on a national income accounts basis, on average during 1977-81; and, thirdly, that the Federal Reserve System would pursue a relatively tight monetary policy during most of this period. A balanced Federal budget on average during 1977-81 is probably an unlikely prospect, as it was when I prepared this forecast, but it serves nevertheless as a convenient benchmark for purposes of comparisons; alternative budget assumptions, of course, yield alternative conditional forecasts. The broad macroeconomic features of this forecast include 3.7 percent per annum growth of real output and 5.0 percent per annum inflation of prices (as measured by the overall gross national product price deflator) on average for 1977-81.[16]

Table 1 reproduces the relevant aspects of the economy's overall balance of saving and investment from this conditional forecast, together with corresponding historical data for three earlier five-year periods. The first half of the table expresses the various average annual flows as percentages of the associated gross national product, while the second half

[16]For further details and explanations, see Friedman [18]. It now appears that the gross national product total assumed for 1976 in preparing this forecast was probably too small by a slight margin; correcting for this error would raise all of the dollar magnitudes in the lower half of Table 1, as well as in Table 4 below, by perhaps about 1 percent.

expresses the same flows in billions of current dollars. The thrust of the strong demands for business fixed investment discussed in Section I, damped somewhat by the two increasing financial scarcities discussed in Section II, is sufficient to increase the investment in plant and equipment from the recent 10 1/2 percent share of gross national product to 11 1/2 percent. Even with some decline in the residential construction share, gross private domestic investment rises to nearly 16 percent of gross national product. On the assumption of some further development of foreign-source investment in the United States, gross investment to be financed is therefore 15 1/2 percent of gross national product — a share which the ecomomy finances according to the saving breakdown shown, including the assistance of zero negative saving (i.e., zero budget deficit) for the Federal Government. Especially in the context of the pension funding proposals to be considered below, it is worth pointing out explicitly that the "Federal Government" line in Table 1 includes not only the U.S. Treasury as strictly defined but also the federally administered trust funds.

The projected saving flows shown in Table 1 — which together represent a point on the economy's saving schedule — provide a useful frame of reference for considering the Munnell-Connolly and Feldstein proposals. These flows indicate total gross private saving averaging $342 billion per annum during 1977-81, with over half of this amount attributed to (mostly corporate) depreciation allowances. Of the remaining $155 billion per annum during 1977-81, $107 billion represents personal saving and $48 billion corporate saving (net of adjustment for the accounting profits associated with inventory price increases). In the first instance, these are the magnitudes which the Munnell-Connolly and Feldstein pension funding proposals would affect.

Issues and Assumptions. Evaluating the implications of pension funding proposals for the economy's saving behavior is far from straightforward for at least two reasons. First, to the extent that either state and local governments or the Federal Government is involved, it is necessary to anticipate the government's policy response to the expenditure requirements associated with incremental contributions. Will the relevant governmental unit finance these contributions by borrowing or by raising taxes? If the latter, then which taxes? Secondly, the relevant responses of private economic agents — including individuals in their role as consumers, individuals in their role as workers, and businesses — are matters to be determined by positive investigation of economic behavior rather than by policy assumption. Some of these issues are important to the economy's overall saving, which is the subject of this section, and some to the composition of saving which is the subject of Section IV below.

The case of Federal civil service and military workers perhaps presents the minimum number of relevant complexities. For a given proposal specifying additional percentage contribution increases for the employee and for the employing Federal agency, at least six important issues — including five sets of economic behavioral questions and one set of policy assumptions — are relevant to assessing the impact of such a proposal

on the economy's overall saving schedule:[17] (1) The first is the familiar question of the incidence of the payroll tax, which depends on the relative elasticities of the demand for and supply of labor.[18] If workers facing liquidity constraints or capital market imperfections regard their nonvoluntary pension contributions as a less-than-perfect substitute for take-home pay, to what extent will wages rise so as to restore their prior level exclusive of the forced contributions? Alternatively, if workers perceive a value of the additional employer contributions which outweighs the impact of their own required contributions, to what extent will wages fall? (2) Will the Federal Government increase taxes to finance its increased contributions (including the nominal contribution percentage assigned to it in the proposal plus the induced percentage rise or fall in the wage rate)? If so, will it increase personal income taxes or corporate profit taxes or both? (3) If corporate profit taxes rise, how much of this increase can corporations shift forward to consumers? How much can they shift backward to private sector workers?[19] (4) How will corporations divide, between smaller dividends and smaller retained earnings, that part of the added profit taxes which they cannot shift?[20] (5) If the marginal rates of personal income tax rise, what is the resulting impact on the supply of labor? What is the resulting impact on wages?[21] (6) Finally, given the ultimate net decrement of disposable personal income, how much will come out of saving and how much out of consumption?

The case of state and local government employees raises all of these same issues, with one further complication. In particular, while it is conventional in many analytical economic contexts to assume that the Federal Government can raise funds in whatever way it chooses — that is by

[17]Given the interdependence of the economic system, it is clear that considerations other than these six could also matter; the following list is not necessarily exhaustive. The partial equilibrium device of focusing on the shift in the economy's saving schedule, rather than on the ex post amount of saving, avoids the further complexity associated with estimating any corresponding induced shift in the economy's investment schedule and assessing the net results for the intersection of the two. In a general equilibrium growth model context, it would also be necessary to take account of the implications of this intersection for the growth of the economy's capital stock, and thence for the growth of output and real wages.

[18]See, for example, Musgrave [32].

[19]See Brown [9] for a survey of recent work on the shifting of the corporate income tax.

[20]In a world of perfect capital markets, no differential tax treatment between ordinary income and capital gains, and corporate managers whose sole objective is to maximuze the market values of their respective firms, this question would not arise. Under more realistic assumptions, not only is this question relevant but also it is in principle necessary to consider the market's downward revaluation of corporations' shares and the impact of the consequent wealth loss on the saving behavior of shareholders.

[21]Once again, in principle it is necessary to consider the impact of shifting labor supply not only on wages but also on employment and output.

borrowing or by increasing any of its various taxes — this assumption is less appropriate for state and local governments. Since these governmental units do not have the power to create money, their borrowing is dependent on investors' assessments of their creditworthiness, much as if they were private sector borrowers. Similarly, the power of state and local governments to raise taxes must, in the final analysis, depend at least in part on the elasticity of their respective constituents' demand for public services.

In the case of the Social Security system, the questions asked about the responses of the private business sector move from a contingent concern, which is relevant primarily if the government chooses to increase corporate profit taxes, to a major focus of attention following directly from the incremental employer contributions. Since contributions for Social Security are traditionally divided evenly between employee and employer, the immediate drain on the business sector's before-tax internal funds generation under any such proposal is equal to that of households.

Following the assumptions made (sometimes implicitly) by Munnell and Connolly and by Feldstein in putting forth their respective proposals, the discussion in this section resolves these various issues by making the following simplifying assumptions for purposes of medium-run analysis: (1) The incidence of the incremental employee and employer contributions is not shifted. There is no effect on labor supply, labor demand, output, prices or wages.[22] (2) Both the Federal Government and state and local governments will finance their incremental contributions by raising personal income taxes. (3) Corporations cannot shift their incremental contributions to Social Security. (4) The consequent reduction of after-tax corporate internal funds generation reduces dividend payouts, leaving retained earnings unchanged.[23] (5) The higher marginal rates of personal income taxation have no effect on labor supply or wages.[24]

Finally, the issue of the consumption response to increased employee pension contributions merits some specific comment. To date the professional economics literature has typically addressed this issue on the assumption that incremental pension contributions corresponded to incremental benefit prospects, so that the natural question to analyze has been whether or not the nonvoluntary saving simply replaced saving

[22]This somewhat unrealistic assumption is made implicitly both by Munnell and Connolly and by Feldstein; they assume (see Table 2 below and the associated discussion) implementation of pension funding proposals. It is necessary to adopt this assumption here also, in order to use as inputs the Munnell-Connolly and Feldstein estimates of funding requirements.

[23]Since this assumption in particular seems at best highly speculative, parts of the analysis presented below reverse it to assume that the after-tax reduction in internal funds generation reduces retentions while not affecting dividends.

[24]See again footnote 22.

which workers would have done anyway on a voluntary basis. Early empirical work by Cagan [10] and Katona [25] suggested that such substitution was small at best. By contrast, more recent work by Feldstein [14], Munnell [29, 30] which attempts to control for the effect of pensions on retirement timing decisions, argues that workers do reduce their direct saving so as to offset a large fraction of nonvoluntary pension contribtutions.

The funding proposals by Feldstein and by Munnell and Connolly, which this paper seeks to analyze, are quite different. In particular, they assume no change in pension benefits associated with the incremental pension contributions.[25] The issue at hand, therefore, is simply that of the extent of funding of the fixed benefits already committed to workers — that is, whether to pay for them now or later. In this sense the incremental pension contributions do not differ, from the standpoint of the associated consumption response, from any other nonvoluntary payment such as personal taxes. Personal disposable income falls, and the marginal propensity to consume out of personal disposable income indicates the consumption response.[26] Given assumptions (1)-(5) above, this equivalence between nonvoluntary pension contributions and personal tax payments yields in turn the result that the net addition to the economy's total saving due to incremental contributions to public sector (civil service, military, and state and local government) pensions is independent of these contributions' division between employer and employee.

Net Shifts in the Economy's Saving Schedule. Table 2 shows the net additions to the economy's total saving, measured as average per annum flows for 1977-81, associated with Munnell's and Connolly's and with Feldstein's various pension funding proposals. For each of the civil service, military and state and local government categories, the table indicates the effect of the Munnell and Connolly proposal to increase permanently the total contribution percentage by the amount necessary to fund the new flow of currently accruing liabilities and to amortize over 40 years the existing stock of unfunded liabilities previously accrued. For Social Security the table indicates the respective effects of the five different

[25]In the background of any discussion of pension funding, of course, lies the question of whether pension systems will be able -- in a political sense -- to meet their unfunded future liabilities if they continue to rely on the intergenerational transfers inherent in pay-as-you-go financing. In addition, the various Social Security proposals analyzed by Feldstein do involve two alternative benefit adjustment assumptions; this paper follows Feldstein, however, in not considering the impact on total saving of the choice between the two.

[26]Since in this context more nonvoluntary payments today mean fewer nonvoluntary payments in the future, the intergenerational transfer issue still remains. In a world of great knowledge on the part of economic agents and no effective credit market constraints on consumption, such that today's workers have already determined their saving behavior so as to achieve whatever intergenerational wealth distribution they desire, today's workers would presumably simply decrease their saving in response to the incremental contributions; see, for example, Barro [2]. Since the assumptions required for this argument to obtain are so restrictive, however, the analysis below disregards it.

proposals analyzed by Feldstein, all involving a permanent increase in the contribution percentage to a new fixed level, and all on the assumption of his "medium" case of a 6 percent "return-reinvestment rule":[27] The first two of these proposals assume that the contribution precentage rises only enough to see the Social Security system through the coming demographic bulge in benefits ("bulge only"), assuming that benefits adjust for inflation according to, first, the "wage indexing" plan and, secondly, the "price indexing" plan.[28] The next two proposals assume that the contribution percentage rises further so as to enable the Social Security system to develop a fund approximately equal in size to the gross national product by the middle of the twenty-first century ("GNP fund"), again assuming first, "wage indexing" and then, "price indexing" of benefits. The final proposal assumes that the contribution percentage rises yet further so as to enable the Social Security system to develop a fund large enough to endow all future benefits by early in the twenty-first century ("endowment fund"), assuming "price indexing" of benefits only.[29]

The first column of Table 2 indicates the pertinent average annual covered payroll for 1977-81, for each of the four categories of pensions, as assumed by Munnell and Connolly and by Feldstein. Once again, these authors' assumption that both wage rates and employment would be invariant to the different pension funding proposals, thereby leaving the payroll totals invariant, is strong but perhaps not overly inaccurate for the immediate purpose here of medium-run analysis. For the very long time periods studied by these authors in their own papers, however, the fixed payroll assumption seems highly questionable.

The second column of Table 2 indicates the increase in the percentage contribution rate, in comparison with the average for 1977-81 implied under current arrangements, required by each proposal. The third column indicates the net addition to the economy's total saving — that is, the shift in the saving schedule — which would result from each proposal under the assumptions specified above, including the partial offset from a 7 percent saving rate out of personal disposable income. Since assumption (4) above — that incremental employer contributions to Social Security come entirely out of dividends — represents one extreme, the numbers in parentheses for the five Social Security proposals indicate the correspondingly small net additions to total saving which would result, at the

[27]See Feldstein [15] for an explanation of the assumptions involved in the "return-reinvestment rule." See also the discussion in Section IV below.

[28]The "wage indexing" plan is the current Administration's proposal [35]. The less expensive "price indexing" plan is the Consultant Panel's proposal [11].

[29]Perhaps because of the magnitude by which the contribution percentage would have to increase, Feldstein did not analyze the "wage indexing" equivalent of this proposal.

other extreme, if incremental employer contributions were to come entirely out of retained earnings; the truth presumably lies somewhere between the two estimates.[30]

A comparison of the average per annum net additions to saving shown in Table 2 and the saving flows forecast for 1977-81 in Table 1 shows that the Munnell-Connolly and Feldstein pension funding proposals, if implemented, would be of great potential importance for the U.S. economy's medium-run balance of saving and investment.

The sum of the net saving additions shown in Table 2 for civil service, military and state and local governments, plus the *smallest* net saving addition shown under any of Feldstein's five Social Security proposals, is $30 billion per annum — almost 1 1/2 percent of the average 1977-81 gross national product assumed in Table 1. One interpretation of this magnitude is that, if these four proposals were implemented and all other assumptions underlying the 1977-81 forecast remained unchanged, then the average share of gross national product devoted to investment in plant and equipment during these years would be somewhere in the 11 1/2-13 percent range, instead of 11 1/2 percent as shown in Table 1. As long as both the economy's saving schedule and its investment schedule were neither perfectly elastic nor perfectly inelastic, the $30 billion outward shift of the saving schedule would lead not only to a decline in (inflation-adjusted) interest rates but also to a less-than-$30 billion per annum increase in the average ex post outcome for investment. The respective magnitudes of the interest rate decline and the investment increase would depend in turn on the elasticities of the saving and investment schedules. Perhaps a reasonable estimate, based on the factors discussed in Section I, is that the average outcome for investment would be in the neighborhood of 12 1/4-12 1/2 percent of gross national product.[31]

A different way to interpret this $30 billion per annum sum of the net saving addition for each of the four pension categories is to focus instead on the assumptions underlying the 1977-81 forecast summarized in Table 1. One of these assumptions, for example, is that the Federal Government (inclusive of the proposed increments to the several pension trusts) will run a balanced budget on average during this period. If these proposals for increased pension funding were to shift the private economy's saving schedule by an average of $30 billion per annum, then, other factors held equal, the Federal Government could on average run a budget deficit well

[30]This alternative calculation assumes that all Social Security employers are corporations taxable at 48 percent. It therefore slightly overstates the differences between the two assumptions about dividend behavior.

[31]In a full general equilibrium calculation, this additional investment would in turn presumably lead to an increase in gross national product with subsequent implications for greater income and saving totals, etc. The conditional 3.7 percent real growth forecast for 1977-81, which underlies the saving and investment flows indicated in Table 1, is as much a conclusion of the analysis in Friedman [18] as it is an assumption.

in excess of the 1970-74 average 1 percent of gross national product without interfering with the economy's ability to devote 11 1/2 percent of gross national product to private fixed investment.

Hence the positive implications of these pension funding proposals, for financing investment in plant and equipment, are of substantial magnitude even for the smallest of Feldstein's Social Security proposals. At the opposite end of the scale, including the largest of Feldstein's proposals, the sum of the net saving additions for each of the four categories is $66 billion per annum — nearly 3 percent of the average 1977-81 gross national product assumed in Table 1. This sum, which is almost two-thirds of the average personal saving flow shown in Table 1, is simply too astoundingly large to be politically feasible without a major rethinking of the form in which U.S. citizens will hold the Nation's wealth.

Over half of this $66 billion, for example, would represent added saving through Social Security for purposes of eventually accumulating a fund of securities which would exceed one year's total economic output. Feldstein introduced his proposals for such a Social Security fund by suggesting that the fund would invest only in existing government securities, but, unless the government embarks on an unprecedented era of sustained deficit financing, not enough government securities would exist to satisfy the fund's requirements. The $552 billion of U.S. Government securities (including obligations of the sponsored credit agencies) which were outstanding at the end of 1975 amounted to just over one-third of 1975 gross national product, and an annual deficit in the future equal to one-third of the annual increase of gross national product — according to the assumptions of Table 1, an average annual deficit of $65 billion during 1977-81 — would merely hold this ratio fixed. Furthermore, as Table 3 shows, at yearend 1975 ratios for other securities it would be impossible to assemble a fund of securities equal to a year's gross national product without having the fund hold most of the equity interest in the Nation's private-sector businesses. Proposals of this magnitude therefore seem far removed from reality except in the context of a broader conception of "pension fund socialism,"[32] in which case much of the analytical apparatus used in this paper could well be of little relevance anyway.

In sum, Munnell's and Connolly's proposals and the *smallest* of Feldstein's proposals for increased public pension funding add up to a magnitude which would be highly significant from the standpoint of U.S. capital formation in the medium-run future, and Feldstein's largest proposal would more than double this amount. Implementation of these proposals would alleviate substantially, if not overcome entirely, the likely overall scarcity of financial capital during the next half decade.

[32]See Lundberg [27] for a thoughtful analysis of an evolution along these lines which is now taking place, by design, in Sweden. Drucker [12], among others, has raised similar questions about the United States. See also Soldofsky [33].

IV. Public Pension Funding and the Relative Scarcity of Long-Term Capital

Wholly apart from their effect on the economy's aggregate saving schedule, the Munnell-Connolly and Feldstein proposals, if implemented, could also have a substantial impact on U.S. capital formation by changing the *composition* of the economy's saving. In particular as Section II explains, the increasing relative scarcity of long-term capital during the medium-run future is, in the absence of an unanticipated change in some underlying determinant of financial market behavior, likely to retard business fixed investment as much as or more than the overall scarcity of financial capital will. By changing the form in which the economy saves, these pension funding proposals could also shift the aggregate asset-preference characteristics of the U.S. financial markets toward a greater preference for long-term assets, thereby alleviating or eliminating this tendency toward increasing relative scarcity of long-term capital.

A Quantitative Perspective. In my earlier paper [18] I estimated that the balance of saving and investment shown in Table 1 for 1977-81 would be consistent with an average per annum total of $325 billion of net funds raised in the U.S. credit markets during this period. Of this $325 billion annual flow, $271 billion would represent net funds raised by all nonfinancial sectors of the economy, including $115 billion raised by nonfinancial corporate businesses.[33] Table 4, also drawn from that paper, indicates the corresponding amounts of net funds likely to be advanced by the various investing sectors of the U.S. credit markets on average during 1977-81. It is a reflection of the great extent of intermediation in the U.S. financial markets that, of the average $325 billion per annum total net acquisition of credit market instruments, fully $263 billion is likely to represent the credit market lending of financial institutions. To facilitate comparisons Table 4 also provides historical data, again for five-year periods and again excluding 1975-76.

For the purposes of this discussion, the insurance-pension sector — including life and other insurance companies, as well as the pension funds of both private businesses and state and local governments — is of key importance. As Table 4 indicates, the net volume of credit which these institutions extend will indeed continue to grow. Nevertheless, as has already been the case to some extent during the early 1970s, total net credit extensions by these four groups of institutional investors are likely to increase less rapidly during 1977-81 (64 percent above the 1970-74 per annum average) than will the net funds raised by nonfinancial business corporations (102 percent above the 1970-74 per annum average). Furthermore, the magnitudes indicated in Table 4 are conditional forecasts for the intersections of the relevant supply and demand schedules, so that they already reflect some effect, especially on corporations' external fund raising, of both increasing overall capital scarcity and increasing relative scarcity of long-term capital.

[33]See Friedman [18], Table 3.

The contrast between the $56 billion per annum total net acquisition of credit market instruments by the insurance-pension sector during 1977-81 and the corresponding $17 billion per annum for the household sector reflects individuals' preferences for holding depositary assets which Table 4, following the Federal Reserve System's Flow of Funds accounts, does not include as "credit market instruments."[34] Table 5 emphasizes this key contrast in asset preferences by showing the average net financial asset accumulations of households and of state and local government pension funds during the past ten years.[35] While households have invested only about one-tenth of their net financial asset accumulation in long-term credit instruments, state and local government pension funds have invested in virtually nothing else.

Because of this stark difference in asset preferences between pension funds and households, it is clear that implementation of the Munnell-Connolly and Feldstein proposals for increased pension contributions would have important effects even if (contrary to the assumptions in Section III) these extra contributions were ultimately to come entirely out of voluntary personal saving. The proposals' net effect in that case would be to increase the net asset accumulations of all pension funds and to reduce by an equal amount the net asset accumulation of the household sector (and, for the Social Security proposals as analyzed in Section III, to increase the borrowing of businesses). Given the different portfolio preferences between short- and long-term maturities shown in Table 5, this shift of saving form would increase the supply of long-term capital to the credit markets.

Table 6 shows the 1976 and 1981 yearend financial asset holdings of the four categories of public pension funds expected under current legislative arrangements, together with the average per annum accumulations (flows) implied for 1977-81.[36] Table 7 shows the corresponding 1981 yearend financial asset holdings and the implied 1977-81 average per annum

[34]Even so, a record $17 billion per annum average net acquisition of credit market instruments by households would represent a substantial shift away from deposits. Note that individuals constitute only about 85 percent of the household sector; non-profit organizations and bank-managed personal trusts account for the other 15 percent.

[35]Households' accumulation of financial assets here excludes life insurance and pension fund reserves.

[36]The civil service, military, and state and local government estimates are Munnell's and Connolly's. The Social Security estimate is the "medium assumption" estimate in Board of Trustees [3]; the alternative estimates for yearend 1981 under "optimistic" and "pessimistic" assumptions, are $30.3 billion and -$1.4 billion, respectively. It is worth noting that Munnell's and Connolly's $15.1 billion per annum estimate for the total financial asset accumulation of state and local government pension funds (including deposits) is not dissimilar to my own prior estimate of $13.5 billion per annum for these funds' net acquisitions of credit market instruments (excluding deposits) as shown in Table 4.

accumulations indicated by the provisions of the various Munnell-Connolly and Feldstein proposals.[37] Table 7 also shows the difference which each proposal would make for the annual accumulation flows, in comparison with those expected under current legislation.[38]

As a comparison with Table 4 indicates, the incremental pension fund asset accumulations shown in Table 7 are sizable in comparison with current prospects for the U.S. credit markets. Again including only the *smallest* of Feldstein's five Social Security proposals, the sum of these differences for the four categories of public pensions is $36 billion. If state and local government pension funds were to invest their $20 billion per annum accumulation according to their asset preferences of the past ten years as shown in Table 5, and if the other three categories of public pension funds were to exhibit similar portfolio behavior, most of this $36 billion annual flow would constitute additional net acquisitions of credit market instruments — especially long-term instruments. This $36 billion per annum would increase by almost two-thirds the net credit market lending of the combined insurance-pension sector.

On the extreme assumption that reduced accumulation of financial assets by households would fully match this $36 billion per annum added accumulation by pension funds, the primary initial effect would be to reduce households' accumulation of deposits (especially time deposits).[39] The further result would be to reduce thrift institutions' net extensions of mortgage credit and the growth of commercial bank credit, including both bank loans and short-term securities holdings.[40] Except for the effect on mortgage lending — which the federally sponsored credit agencies could presumably offset — the net effect of these shifts would be to increase the supply of long-term credit market funds to corporate businesses, and to reduce the supplies of other kinds of funds. This shift in the *composition* of the economy's preferred asset accumulation would therefore act to reduce the relative scarcity of long-term investment capital.

A Simulation Model. By how much would such a shift due to increased pension funding lower the cost of long-term investment capital to corporate businesses?

[37]Because Munnell and Connolly performed their calculations on the assumption of implementation of their proposals as of the beginning of 1975, the 1975 yearend asset totals underlying the accumulation flows shown in Table 7 for civil service, military and state and local governments are all slightly greater than the corresponding totals shown in Table 6.

[38]These differences are not equivalent to the net saving additions shown in Table 2, since they include interest and dividends earned on accumulated assets, and (in the case of military and Social Security) they exclude payments which the Federal Government would be contributing to make up any year's deficiency from benefits to be paid.

[39]As of yearend 1975, households' time deposits were nearly five times greater than their combined demand deposits and currency.

[40]The ultimate effect on bank credit of the shift in households' demand schedule for commercial bank deposits would depend not only upon the increasing business deposit demand associated with increased investment but also upon the particular monetary policy assumption made.

The familiar term-structure approach to modeling long-run interest rate determination is not capable of addressing this question. According to the conventional term-structure model, the (nominal) yield on a long-term security differs from the (nominal) yield on a closely substitutable short-term security according to expectations of the future short-term yield and, perhaps, some "liquidity premium" reflecting the less-than-perfect substitutability between the two assets. Once the current and expected future values of the short-term interest rate are given, the usual term-structure model admits little variation of the long-term interest rate. Since it assumes that different securities are highly substitutable — that is, that financial capital is virtually homogeneous — the term-structure model is not well equipped to deal with the notion of shifting relative scarcities within the overall capital market.

The prevailing empirical methodology of the term-structure approach is a model consisting of a single *unrestricted* reduced-form equation with the nominal long-term interest rate as the dependent variable. One assumption implied by the use of this methodology is that the way in which participants in the market for long-term securities, either individually or in the aggregate, adjust their actions in that market in response to any or all of the determinants of portfolio behavior does not matter for the ex post outcome for the long-term interest rate. In particular, this assumption implies that the quantities of long-term securities bought or sold, either by individual transactors or for the market in aggregate, do not influence the ex post outcome for the long-term interest rate. A few researchers have suggested relaxing this assumption somewhat by incorporating exogenous supplies of long-term securities directly as a determinant of the long/short spread, but they have done so within the familiar unrestricted reduced-form methodology of the term-structure approach, and their empirical findings along these lines have been modest at best.[41] Similarly, the strong asset-substitutability assumptions of the term-structure model leave little room for even a sizable shift of asset accumulations, from investors with one "preferred habitat" to investors with different asset preferences, to influence the long-term interest rate for a given short-term interest rate.

In a series of previous papers [17, 21, 22] I have developed a structural model of long-term interest rate determination which drops this restrictive asset-substitutability (capital-homogeneity) assumption and focuses directly on the demand for and supply of long-term bonds. In particular, this model specifies equations directly representing the portfolio behavior of bond market participants, including both bond issuers and bond investors. The addition of a market-clearing constraint, equating the

[41]See especially Modigliani and Sutch [28]. "Preferred habitats," which are the essence of the argument outlined both here and in Modigliani's and Sutch's descriptive analysis, are not successfully captured in their empirical work which relies entirely on unrestircted reduced-form estimation. In this context it is interesting to note Ando's and Modigliani's [1] subsequent rejection of unrestricted reduced-form methods.

sum of the demands of long-term debt securities to the sum of the supplies of long-term debt securities, enables the structural model to determine the long-term interest rate (i.e., the own-rate) which appears as a right-hand-side variable in each structural demand or supply equation for long-term bonds. (Since the long-term interest rate is clearly a jointly determined variable in this model, along with the demand and supply variables, it is necessary to use estimation techniques which avoid inconsistencies to which ordinary least-squares procedures would be subject because of the nature of the model's simultaneity.)

The complete structural model, including the market-clearing constraint, therefore constitutes an alternative to the single unrestricted reduced-form term-structure equation. The structural model's implied expression for the long-term bond yield is (except for the model's nonlinearity) a reduced-form equation which is equivalent to the conventional term-structure equation except that it is *restricted* by the underlying structural supply and demand equations.

Hence the key methodological difference between the structural approach and the more familiar term-structure approach to long-term interest rate determination is essentially equivalent to the distinction between *restricted* and *unrestricted* estimation. The two corrollary advantages of the structural approach are its ability to use the theory of portfolio behavior to constrain the implied equation for the long-term interest rate, and the facility which it provides for directly investigating hypotheses about portfolio behavior. In return, the structural approach imposes upon the researcher the discipline of explicitly acknowledging that, since bond yields (i.e., bond prices) are proximately determined in a market in which bonds are bought and sold,[42] any factor hypothesized to influence the bond yield must do so by influencing some issuer's supply of bonds or some investor's demand for bonds (or both). To the extent that expectations of future short-term yields are relevant via substitution effects which enforce the term-structure relationship, to the extent that less-than-infinite elasticities of substitution create "preferred habitats" which render quantity variables relevant, to the extent that less-than-infinite adjustment speeds render quantity flow variables relevant as well as quantity stock variables — in the structural model all of these factors affect the determination of long-term interest rates by (and only by) influencing the portfolio behavior of borrowers and lenders.

The structural approach also largely avoids the problem of spurious correlations inherent in unrestricted estimation of interest rate relationships. This point is especially relevant in the case of flexible distribution lags on past interest rates, which are typically the heart of term-structure equations and which are also arguments of the individual bond supply and demand equations in the structural model.

[42]The concept of the bond yield's being "proximately determined" in the bond market is not inconsistent with the principle of general equilibrium in the asset markets (see, for example, Tobin [34]) or for the economy as a whole (see, for example, Grossman [23]).

The demand side of this structural model of the bond market consists of six equations representing the net purchases of corporate bonds by life insurance companies, other insurance companies, private pension funds, state and local government pension funds, mutual savings banks and households. The specification of each of these six demand-for-bonds equations combines a model of the selection of equilibrium, as developed in an earlier paper [21]. The motivation for the optimal marginal adjustment model is to distinguish the reallocation of existing assets from the allocation of new wealth flows, because of the differential pecuniary and non-pecuniary costs associated with these two kinds of transactions. Since transactions costs leading to less-than-infinite adjustment speeds are at the heart of the distinction between flow-equilibrium "loanable funds" models and stock-equilibrium "liquidity preference" models of asset markets, the effort to deal as explicitly as possible with these differential adjustment speeds seems essential to the use of a flow-equilibrium model of interest rate determination. In addition, it enables the model to focus directly on the effects of proposals, such as those suggested by Munnell and Connolly and by Feldstein, which change patterns of financial flows and wealth accumulation.[43]

The supply side of the bond market model consists of two equations representing the net new issues of corporate bonds by domestic nonfinancial business corporations and finance companies. The specification of these two supply-of-bonds equations is analogous to that of the model's demand-for-bonds equations, combining the selection of equilibrium liabilities and the optimal marginal adjustment model.[44]

The model's ninth equation is a flow-equilibrium market-clearing identity which determines the nominal long-term interest rate. By construction of least-squares estimators, it follows that the unrestricted reduced-form equation estimated directly, as in the term-structure approach, will always "fit" historical interest rate data at least as well as the restricted expression estimated implicitly via the structural model. Hence it is possible that the structural approach may buy its key associated advantages — its ability to test explicit behavioral hypotheses and to investigate structural changes such as those suggested by Munnell-Connolly and Feldstein — at great cost in terms of performance as measured by historical fit. As the results presented in two earlier papers [21, 22] indicate, however, the sacrifice of empirical performance required by the structural approach is extremely minor. In a dynamic simulation of the model, based on U.S. quarterly data for 1960:I - 1973:IV, the root-mean-square simulation error for the particular long-term interest rate determined in this model (the Aa utility new-issue yield) is only 0.21 percent or 21 basis points — a result which compares favorably with the historical

[43]For reference on the demand side of this model, see in particular Friedman [21].

[44]The results for the two estimated supply equations corroborate the liability-preference arguments in Section II. For reference on the supply side of the model, see Friedman [22].

fit achieved by other researchers who have estimated unrestricted reduced-form term-structure equations to track less volatile long-term yield series over less volatile sample periods.

For several reasons, therefore, this structural model of the bond market is a useful tool for partial equilibrium analysis of the potential implications for the relative scarcity of long-term capital of implementing the Munnell-Connolly and Feldstein proposals for increased pension funding. First, the structural approach to long-term interest rate determination explicitly acknowledges the relevant heterogeneity of capital. Secondly, the model's level of disaggregation focuses explicitly on the different respective "preferred habitats" of households and pension funds. Thirdly, the specification of the equations describing these investor groups' demands for bonds incorporates an explicit role for the financial flow variables which the Munnell-Connolly and Feldstein proposals would alter in the first instance. Finally, the model's empirical performance in dynamic simulation tests has shown that it is at least capable of tracking closely the past history of long-term interest rate movements, despite its explicit avoidance of the potentially spurious correlations inherent in term-structure equations.[45]

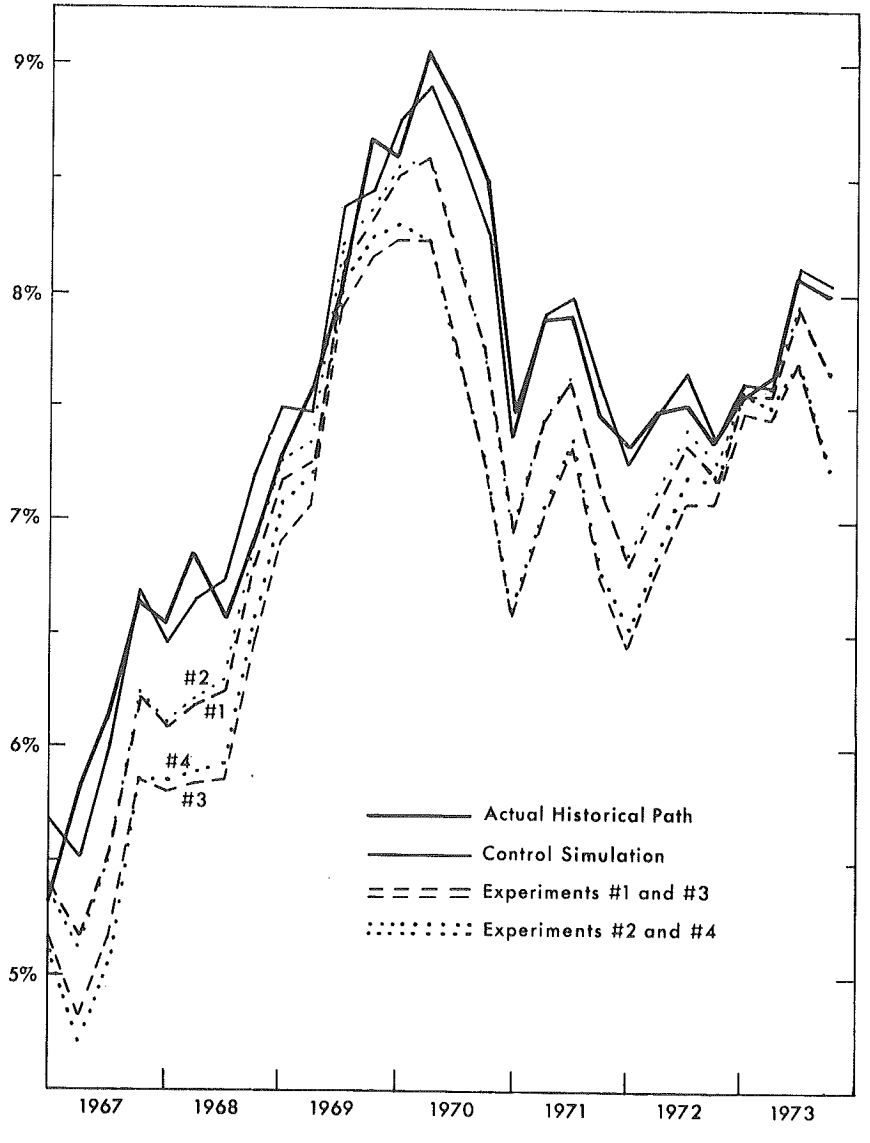
Simulations for 1967-73. Figure 1 and Table 8 summarize several simulations of the structural model of the bond market designed to investigate, albeit in a somewhat limited partial equilibrium context, the effects of the Munnell-Connolly and Feldstein proposals. The heavy solid line in Figure 1 plots the observed historical values of of the Aa new-issue long-term utility bond yield, and the light solid line plots the simulated values of this yield from the dynamic simulation reported in my earlier paper [22], based on historical values for all exogenous variables. The first two lines of Table 8 indicate that the mean simulated value of 7.48 percent during 1967-73 is virtually identical to the mean actual value during this period.

The first simulation experiment attempts to capture the effects which would have followed from introducing the Munnell-Connolly proposal for increased contributions to state and local government pension funds, on the assumption that household financial asset accumulation would *not* have offset the added asset accumulation of the pension funds. The assumption, therefore, is that the proposal not only would have altered the *composition* of the economy's saving but would have increased *total* saving as well. Implementation of this experiment consists of rerunning the

[45] A comprehensive flow-of-funds model, such as that developed by Bosworth and Duesenberry [7] and Hendershott and Lemmon [24], would in principle be a better vehicle for evaluating these proposals, since such a model would at least admit a general equilibrium treatment of all asset markets. See Friedman [21, 22], however, for criticisms of these models. As the discussion below indicates, a full general equilibrium model, incorporating the nonfinancial economy as well as all asset markets, would be necessary to undertake a complete analysis of these proposals' implications for capital formation.

Figure 1

DYNAMIC SIMULATION RESULTS
FOR Aa UTILITY NEW ISSUE YIELD, 1967-73



historical simulation for 1960-73, but with the net accumulation of financial assets by state and local government pension funds increased by an extra $2.1 billion in each quarter beginning with 1967:I. This $2.1 billion per quarter (or $8.4 billion per annum) addition is 1.3 times state and local government pension funds' actual historical average $6.5 billion per annum financial asset accumulation during 1967-73, just as the $19.8 billion per annum additional accumulation by these funds implied by Munnell's proposal for 1977-81 (see again Table 7) is 1.3 times the corresponding $15.1 billion per annum accumulation expected for 1977-81 under current legislation. The simulation experiment assumes that all other variables influencing the long-term bond yield — including, for example, short-term yields and business investment in plant and equipment — remain unchanged at their historical values.

The broken line marked No. 1 in Figure 1 plots the values of the long-term interest rate which result from this simulation experiment. The additional demand for bonds by state and local government retirement funds immediately drives the simulated bond yield below the corresponding actual historical path and keeps it below the historical path through the end of the simulation. As the third line of Table 8 indicates, the average simulated reduction of the bond yield during 1967-73 is 0.34 percent. Since this partial equilibrium experiment analyzes the level of the long-term interest rate for a given value of the short-term interest rate, it is most useful to regard this result as a reduction in the average slope of the yield curve (the term-structure of interest rates) by 0.34 percent.

The second simulation experiment again focuses only on the Munnell-Connolly proposal for state and local government pension funds but, in contrast to the first experiment, assumes that reduced financial asset accumulation by households would have matched exactly the increased asset accumulation by these funds. Hence the assumption underlying this experiment is that implementation of this proposal would have altered only the *composition* of the economy's saving, *without* having increased the *total.* In addition to increasing state and local government pension funds' asset accumulation by $2.1 billion per quarter above the actual historical values, therefore, implementation of this experiment also involves reducing households' asset accumulation by $2.1 billion per quarter below the actual historical values.

As the dotted line marked No. 2 in Figure 1 and the fourth line of Table 8 indicate, nearly all of the long-term interest rate reduction associated with Munnell's and Connolly's proposal in the first experiment (0.31 percent out of 0.34 percent) remains in the second, despite the assumption of no increase in the economy's total saving. The shift in the composition of saving among investors with different "preferred habitats," which is responsible for *all* of the long-term interest rate reduction in the second experiment, apparently accounts for *almost all* of the corresponding reduction in the first experiment. Once again, it is important to recall the assumption of unchanged short-term interest rates underlying

this partial equilibrium analysis of the bond market. In this second experiment, in which households' net asset accumulation declines, the reduced demand for deposits and other short-term assets would, in a more general equilibrium analysis of the asset markets, cause short-term interest rates to rise. What remains almost unchanged from the first experiment, therefore, is not the impact on the level of the long-term interest rate but rather the impact on the yield "spread" between the long and short ends of the maturity spectrum.

The third and fourth simulation experiments are analogous to the first and second, respectively, except that the financial asset accumulation adjustment is $3.9 billion per quarter instead of $2.1 billion per quarter. This greater adjustment reflects the 1967-73 equivalent of implementing Munnell's and Connolly's proposals for civil service, military, and state and local government retirement funds, and the *smallest* of Feldstein's five proposals for Social Security, on the assumption that the portfolio behavior of the civil service, military and Social Security funds — two of which would have grown rapidly under the respective proposals — would have been the same as that observed historically for state and local government retirement funds.[46] The results of these two experiments, as indicated by Figure 1 and Table 8, are roughly similar to the first two sets of results, only greater in magnitude as is to be expected. Again, from the standpoint of the slope of the yield curve, the major substantive result is that the "preferred habitat" effect is what matters most, with only minimal effects depending on the increase in total financial asset accumulation. Since the level of short-term interest rates would presumably differ between the two experiments, however, the absolute level of the long-term interest rate would depend also on the increase in total asset accumulation.

There are at least two important biases — one upward and one downward — inherent in these partial equilibrium experiments' simulated values of the long-term bond yield.[47] The upward bias, which is present especially in experiments No. 1 and No. 3, is that these simulations hold fixed, at the historical values, the yields not just on short-term assets but on all competing financial instruments. Since an increase in the economy's total saving would presumably lower all yeilds, and a shift in the composition of saving toward investors preferring long-term assets would presumably lower the yields on those assets which are most closely substitutable with corporate bonds, these simulations probably overstate the

[46]It is worth noting explicitly that this assumption contradicts not only the limited historical experience thus far with management of Federal pension trusts but also Feldstein's declared intention of having the Social Security fund invest only in government securities -- hence the motivation for examining the state and local government pension proposals separately, as in experiments No. 1 and No. 2. Nevertheless, it is not altogether implausible that, once confronted with asset accumulations of the magnitudes proposed by Munnell and Connolly and by Feldstein, Federal pension trust managers would adopt investment policies more comparable to those historically followed by state and local governments.

[47]See again footnote 45.

effect of the various proposals in inducing investors to substitute other assets for bonds. This collective bias in the individual supply-of-bonds and demand-for-bonds equations — which stems from the use of a partial equilibrium analysis of the bond market, rather than a general equilibrium analysis of all asset markets together — in turn results in an upward bias for the simulated path of the bond yield. The corresponding downward bias — which stems from not using a general equilibrium model of the nonfinancial economy, as well as all asset markets — follows from holding fixed, at the historical values, nonfinancial corporations' investment in plant and equipment. If nonfinancial corporations responded to the induced interest rate reduction by undertaking more investment in plant and equipment, then not only would their net external deficit be greater (thereby increasing their supply of bonds) but also, according to the relevant supply equation in the model, the fraction of any given external deficit which they would seek to finance by issuing bonds would be greater. Furthermore, going on to allow for the effects of greater investment in stimulating economic activity would presumably uncover yet a further related source of downward bias in the absence of an assumption about monetary policy accommodating the resulting additional demand for money.

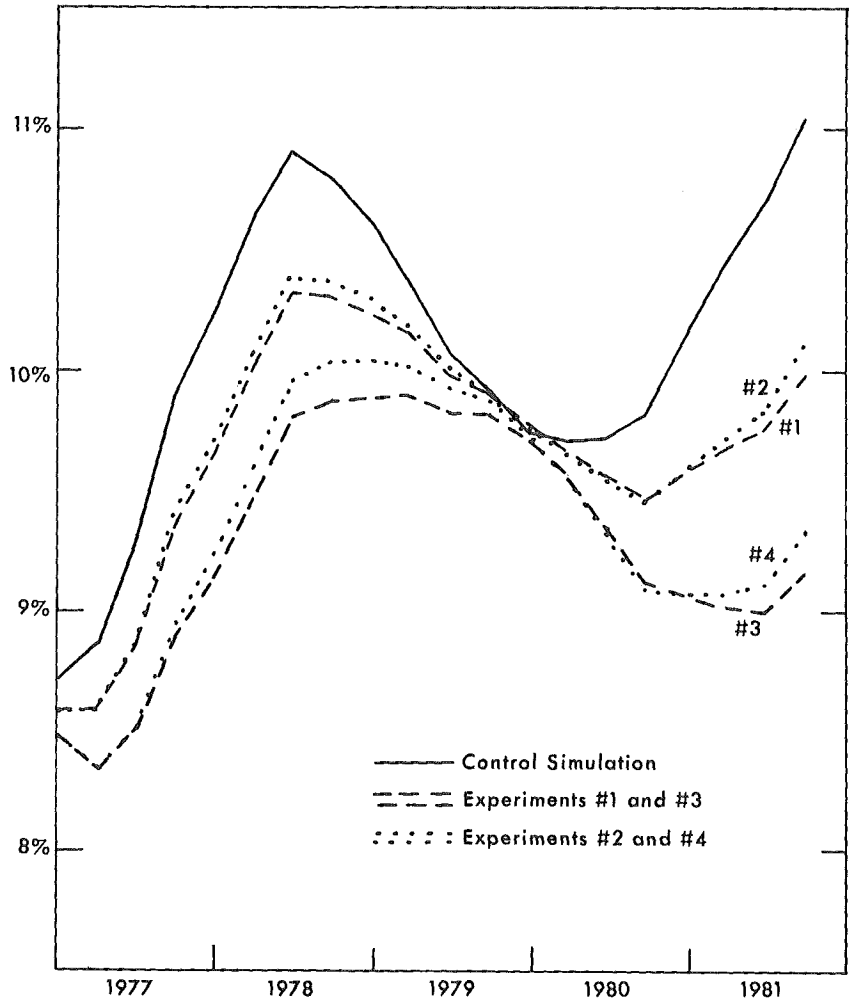
To what extent these two sets of biases are offsetting, and to what extent other biases also exist in these simulation experiments, probably constitute unanswerable questions. Considerable caution is appropriate, therefore, in evaluating the numerical results of these experiments. Even without attribution of undue precision to them, however, these experiments do indicate that the Munnell-Connolly and Feldstein proposals, had they been implemented in the past, would have had a substantial impact on the relative scarcity of long-term capital — that is, on the term-structure of interest rates — primarily because of their effect in shifting asset accumulations from households with their short-term "preferred habitat" to pension funds with their long-term "preferred habitat."

Simulations for 1977-81. Figure 2 and Table 9 summarize several simulation experiments designed to investigate the implications of the Munnell-Connolly and Feldstein proposals directly within the context of the 1977-81 period. As far as possible, these experiments use directly the credit market and national income flow quantities indicated for 1977-81 in the tables in my earlier paper [18].[48] The structural model of the bond market also uses as exogenous variables a number of yields on alternative financial instruments, and these experiments simply assume that these yields remain constant at their recent (1976:II) levels throughout 1977-81. The solid line in Figure 2 plots the values of the long-term bond yield generated by a "control" simulation based on these assumptions.

[48]The net acquisitions of financial assets by households and life insurance companies are somewhat different; see Friedman [21].

Figure 2

DYNAMIC SIMULATION RESULTS
FOR Aa UTILITY NEW ISSUE YIELD, 1977-81



The control simulation's 10.08 percent average for the bond yield during the entire 1977-81 period is relatively high, given the assumed continuation of the recent low level of short-term interest rates, and the steepness of the implied yield curve reflects the relative scarcity of long-term capital discussed in Section II. Nevertheless, it is essential to emphasize that the object of this control simulation is *not* to imply a forecast of the bond yield. Its purpose is, instead, to provide a base for comparisons, so as to facilitate performing in the 1977-81 context the dynamic simulation experiments described above for 1967-73. The proper focus of attention is therefore the bond yield *difference* between each simulation experiment and the corresponding control — not the particular path of the bond yield in the control simulation per se.

The first and second 1977-81 simulation experiments are analogous to those for 1967-73 as described above. In particular, they assume the implementation, as of the beginning of 1977, of Munnell's and Connolly's proposal for increased contributions to state and local government pension funds, first under the assumption of no offsetting fall in households' financial asset accumulation and then under the assumption of *full* offset. The appropriate asset accumulation adjustment in these two experiments is $5.0 billion per quarter (one-fourth of the $19.8 billion per annum shown in Table 7).

The third and fourth 1977-81 simulation experiments are again analogous to those described above for 1967-73. They assume the implementation, as of the beginning of 1977, of all three of the Munnell-Connolly proposals and of the *smallest* of Feldstein's five proposals, again under the same two alternative assumptions about households' financial asset accumulation. The appropriate asset accumulation adjustment in these two experiments is $9.0 billion per quarter (one-fourth of the $36.0 billion per annum total from Table 7).

The results of these four experiments — which are conditional on the same underlying assumptions and are therefore subject to the same biases discussed above in the context of the 1967-73 experiments (and presumably, because of their future orientation, to many more errors besides) — again suggest that implementing the Munnell-Connolly and Feldstein pension funding proposals would substantially offset, if not entirely eliminate, the increase in the relative scarcity of long-term financial capital described in Section II. Once again, while the effect on the absolute level of the long-term interest rate would presumably depend on the increase in total financial asset accumulation, it is the shift among different investors with different "preferred habitats" which produces almost all of the reduction in the slope of the yield curve.

V. Summary and Conclusions

The background underlying this paper is the concern that, in the absence of public-policy initiatives, financial scarcities during the next five to

ten years may impair the U.S. economy's ability to achieve a capital formation rate adequate for the purposes of a number of widely recognized economic objectives. One source of this problem, if it in fact materializes, is likely to be an increasing overall scarcity of financial capital. A second source of this problem — perhaps a more important one — is likely to be an increasing relative scarcity of long-term capital.

This paper's analysis of Munnell's and Connolly's proposals for increased funding of civil service, military and state and local government pensions and Feldstein's proposals for increased funding of the Social Security system yields two primary conclusions in this context:

First, implementation of Munnell's and Connolly's three proposals, together with even the smallest of Feldstein's proposals, would substantially increase the economy's total saving. This outward shift of the economy's saving schedule would probably be of a magnitude sufficient to offset much or all of the anticipated increasing overall scarcity of financial capital. A good estimate is that it would add about an extra 1 percent to the share of U.S. gross national product devoted to fixed investment in plant and equipment in the medium run.

Secondly, wholly apart from any effect of increasing the economy's total saving, implementation of these proposals would also substantially alter the asset preference characteristics of the investor side of the U.S. credit markets. In particular, by shifting asset accumulations from households to pension funds, implementation of these proposals would increase the economy's total demand for long-term assets, thereby offsetting much or all of the increasing relative scarcity of long-term capital. A good estimate is that this shift of asset preferences would reduce the average yield-curve "spread" between long-term and short-term financial instruments by about 0.50 percent or 50 basis points. This resulting reduced scarcity of long-term capital would further facilitate U.S. physical capital formation in the medium run.

Table 1

GROSS SAVING AND INVESTMENT: HISTORICAL AND CONDITIONAL FORECAST

Average Annual Flows (Percent of GNP)	1960-64	1965-69	1970-74	1977-81
Gross Private Saving	15.4%	15.9%	15.8%	15.7%
Personal Saving	3.8	4.5	5.5	4.9
Undistributed Corporate Profits	2.8	3.1	2.8	3.1
Inventory Valuation Adjustment	— 0.0	— 0.3	— 1.2	— 0.9
Capital Consumption Allowances	8.8	8.7	8.7	8.6
U.S. Government Surplus	— 0.2	— 0.2	— 1.1	0.0
State & Local Government Surplus	0.1	0.0	0.5	— 0.1
Statistical Discrepancy	— 0.1	— 0.3	— 0.3	— 0.1
Gross Investment	15.2	15.4	14.9	15.5
Gross Private Domestic Investment	14.6	15.2	15.1	15.8
Plant and Equipment	9.3	10.5	10.3	11.5
Residential Construction	4.5	3.5	3.9	3.5
Inventory Accumulation	0.8	1.2	0.8	0.8
Net Foreign Investment	0.6	0.2	— 0.2	— 0.3
Average Annual Flows (billions of current dollars)	**1960-64**	**1965-69**	**1970-74**	**1977-81**
Gross Private Saving	$ 86.5	$ 128.1	$ 185.5	$ 341.9
Personal Saving	21.2	35.9	64.1	106.7
Undistributed Corporate Profits	16.0	25.2	32.5	67.5
Inventory Valuation Adjustment	— 0.1	— 2.6	— 14.0	— 19.6
Capital Consumption Allowances	49.5	69.7	102.8	187.3
U.S. Government Surplus	— 1.3	— 1.9	— 13.0	0.0
State & Local Government Surplus	0.7	0.2	5.7	— 2.2
Statistical Discrepancy	— 0.6	— 2.7	— 3.4	— 2.2
Gross Investment	85.4	123.7	174.7	337.5
Gross Private Domestic Investment	82.1	122.2	177.6	344.1
Plant and Equipment	52.5	84.7	121.7	250.4
Residential Construction	25.0	28.0	46.5	76.2
Inventory Accumulation	4.7	9.5	9.4	17.4
Net Foreign Investment	3.2	1.5	— 2.9	— 6.5

Notes: Figures through 1974 are data from U.S. Department of Commerce.
Figures for 1977-81 are projections based on assumptions about growth of the economy, price inflation, Federal tax and expenditure policy, monetary policy, and other factors as explained in Friedman (18).
Detail may not add to totals because of rounding.

Table 2

SAVING SCHEDULE SHIFTS FOR PUBLIC PENSION FUNDING PROPOSALS

	1977-81 Average Payroll (billions)	Increase in Contribution Percentage	1977-81 Average Net Addition In Saving (billions)
Civil Service	$ 53.8	5.4%	$ 2.7
Military	18.7	34.3	6.0
State & Local Governments	159.0	10.6	15.7
Social Security			
Bulge Only, Wage Indexing	1,004.4	2.8	26.2 (19.8)
Bulge Only, Price Indexing	1,004.4	0.55	5.1 (3.9)
GNP Fund, Wage Indexing	1,004.4	3.25	30.4 (23.0)
GNP, Price Indexing	1,004.4	1.0	9.3 (7.1)
Endowment Fund, Price Indexing	1,004.4	4.4	41.1 (31.2)

Note: $21.8 billion = 1 percent of 1977-81 average gross national product assumed in Table 1.

Table 3

SIZE OF SEVERAL KEY SECURITIES MARKETS

	1975 Yearend Outstandings (billions)	Percentage of 1975 GNP
U.S. Government Securities	$ 551.7	36.4%
State & Local Government Securities	230.5	15.2
Corporate Bonds	317.4	20.9
Corporate Equities	816.4	53.8
Total	1,916.0	126.4

Table 4

TOTAL NET ACQUISITIONS OF CREDIT MARKET INSTRUMENTS, BY LENDING SECTOR: HISTORICAL AND CONDITIONAL FORECAST

Average Annual Flows (billions of current dollars)	1960-64	1965-69	1970-74	1977-81
Total Net Acquisitions	$ 59.7	$ 97.0	$ 185.8	$ 325.0
By Domestic Financial Sectors	52.5	77.1	157.3	263.0
Life Insurance Companies	6.3	8.4	13.2	22.0
Other Insurance Companies	1.1	2.0	5.4	8.5
Private Pension Funds	4.1	5.7	7.3	12.0
State & Local Government Pension Funds	2.5	4.3	8.2	13.5
Mutual Savings Banks	2.8	3.7	6.7	10.0
Savings & Loan Associations	10.3	8.6	25.1	34.0
Federal Credit Agencies	1.2	3.9	12.9	24.5
Commercial Banks	16.6	26.3	57.7	104.5
Federal Reserve System	2.1	4.0	5.9	9.0
Finance Companies	3.0	4.3	5.9	13.5
Other Financial Institutions	2.4	5.7	9.0	11.5
By Nonfinancial Sectors	7.1	19.8	28.5	62.0
U.S. Government	1.8	4.0	3.5	6.5
State & Local Governments	0.5	2.7	1.2	2.0
Households	2.8	10.2	5.6	17.0
Corporate Nonfinancial Business	0.6	1.6	4.1	9.5
Other Nonfinancial Business	0.3	0.5	1.0	1.5
Foreign	1.0	0.8	13.1	25.5

Notes: Figures through 1974 are data from Board of Governors of the Federal Reserve System.
Figures for 1977-81 are projections based on assumptions about growth of the economy, price inflation, Federal tax and expenditure policy, monetary policy, and other factors as explained in Friedman (18).
Detail may not add to totals because of rounding.

Table 5

AVERAGE ANNUAL NET FINANCIAL ASSET ACCUMULATIONS OF HOUSEHOLDS AND OF STATE AND LOCAL GOVERNMENT PENSION FUNDS, 1965-75

	Households		Pension Funds	
	Amount (billions)	Percent	Amount (billions)	Percent
Deposits and Currency	$ 57.1	78.4%	$ 0.1	1.4%
Short-Term Credit Market Instruments	5.1	7.0	— 0.1	— 1.4
U.S. Government Securities	3.7	5.1	— 0.1	— 1.4
Other	1.4	1.9	0.0	0.0
Long-Term Credit Market Instruments	8.4	11.5	7.0	98.6
Equities	— 3.5	— 4.8	2.2	31.0
Corporate Bonds	5.2	7.1	4.3	60.6
Municipal Bonds	3.8	5.2	0.0	0.0
Mortgages	3.1	4.3	0.5	7.0
U.S. Government Securities	— 0.2	0.3	0.0	0.0
Other	2.4	3.3	0.0	0.0
Total	72.8	100.0	7.1	100.0

Note: Detail may not add to total because of rounding.

Table 6

PROJECTED PENSION FUND ASSET ACCUMULATIONS
UNDER CURRENT LEGISLATION
(Billions of Dollars)

	1976 Yearend Assets	1981 Yearend Assets	1977-81 Average Accumulation
Civil Service	$ 43.0	$ 77.6	$ 6.9
Military	0.0	0.0	0.0
State and Local Governments	110.3	186.0	15.1
Social Security	40.0	17.9	— 4.4

Table 7

PROJECTED PENSION FUND ASSET ACCUMULATIONS UNDER VARIOUS PROPOSALS
(Billions of Dollars)

	1981 Yearend Assets	1977-81 Average Accumulation	Difference from Current Legislation
Civil Service	$ 100.1	$ 10.6	$ 3.7
Military	44.8	7.7	7.7
State & Local Governments	299.0	34.9	19.8
Social Security			
Bulge Only, Wage Indexing	149.1	21.8	26.2
Bulge Only, Price Indexing	42.1	0.4	4.8
GNP Fund, Wage Indexing	171.2	26.2	30.6
GNP Fund, Price Indexing	64.2	4.8	9.2
Endowment Fund, Price Indexing	231.5	38.3	42.7

Note: $21.8 billion = 1 percent of 1977-81 average gross national product assumed in Table 1.

Table 8

LONG-TERM INTEREST RATE SIMULATIONS
FOR 1967-73

	1967-73 Average Yield	Difference from Control
Actual	7.46%	0.02%
Control Simulation	7.48	—
Experiment 1	7.14	0.34
Experiment 2	7.17	0.31
Experiment 3	6.84	0.64
Experiment 4	6.89	0.59

Table 9

LONG-TERM INTEREST RATE SIMULATIONS FOR 1977-81

	1977-81 Average Yield	Difference from Control
Control Simulation	10.08%	—
Experiment 1	9.67	0.41%
Experiment 2	9.70	0.38
Experiment 3	9.30	0.78
Experiment 4	9.36	0.72

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Discussion

Franco Modigliani*

This has been for me an exciting conference in that I have never heard the word life cycle mentioned so frequently and life-cycle concepts used so frequently as in this conference. To be sure, many of the people here, and notably Feldstein and Tobin, have much improved on my original contribution. In fact, Tobin sometimes accuses me of not really understanding what the life-cycle model is about, and Feldstein is too young and polite to quite do that, but I can see it in his eyes. I am not less pleased by the fact that the model underlying Friedman's paper is the most ambitious attempt so far at giving empirical embodiment to the "habitat" theory of the term structure of interest rates — and I do not really mind that he, too, feels he understands that theory far better than I.

Tobin has dealt extensively with the question of the effect of additional funding on national saving, and I do not really have very much to add to this issue. I think he has made some quite interesting additions to the list of reasons why additional funding of Social Security would not have its full effect in raising saving or, conversely, why a Social Security System not funded would not reduce the saving by the full amount of the promised retirement benefits.

The role of the liquidity constraints to which he referred could be of some importance, though it should be understood, in the context of the life-cycle model, that this liquidity constraint could merely have the effect of changing the pattern of consumption over the earning span. Specifically suppose that in the absence of Social Security, a household would have chosen not to save at the beginning of its life, postponing the saving until a later time when its income was expected to be higher. If a Social Security tax is now levied on his income, and because of capital market imperfections he is not able to borrow against future income, then, as Tobin points out, he will be forced to consume less, and total consumption will thereby be reduced. However, he will now be able to consume more than he would have otherwise later in life, when his income is higher. In steady state, these effects will tend to cancel out, as is clear from the consideration that, with a pay-as-you-go system, in which people rely entirely on Social Security for their retirement, the net accumulation will be zero, no matter what the age pattern of consumption.

*Institute Professor and Professor of Economics and Finance, Massachusetts Institute of Technology.

Before I move on to the impact of funding on financial markets, I would also like to raise an issue, that our discussion so far has failed to clarify, about why we should favor funding Federal Government retirement programs like military pensions. I can see a case for funding the liabilities accruing hereafter in order not to impose a burden on "future generations," but I can see no grounds for funding the accumulated liabilities any more than I can see merits in the proposition that it behooves the government to repay the national debt. To be sure, there might be circumstances when we might deem it appropriate to raise national saving through a budget surplus, but surely to do so we do not need the excuse that we should repay the outstanding debt!

Let me then come to some aspects of Friedman's results. It seems to me that two main things need to be discussed. One is to review briefly some of the assumptions he makes in trying to assess the implications of the various levies on various participants in society — the question of incidence. The other and more important item is to discuss his analysis of the effect of these additional flows from the funding of pensions on interest rates and financial markets. On the first point, I find myself in some disagreement with several of the assumptions he makes. He assumes that if there is an addition to the Social Security levy, it would all come out of corporate profits. Yet the evidence I have seen seems to suggest that these taxes are fully shifted onto real wages through the mechanism of prices being determined by a stable markup over direct costs. In other words, though half of Social Security taxes is levied on the employer, there is reason to believe that eventually even the half that is paid by the employer tends to be shifted onto higher prices, and therefore finally into lower real wages.

Because of this view, I perhaps need not spend much time on the next question, namely: Supposing it falls on profits, does it make a difference whether it is then absorbed into a reduction of dividends or a reduction of corporate savings? Ben seems to assume that if the reduction of profits falls on dividends, saving would be affected much less than if it fell on retained earnings. This is the traditional wisdom, but it ignores the effect of corporate saving on private saving. The purest life-cycle model suggests that, aside from differential tax treatment, changes in corporate savings are eventually totally offset by opposite changes in private saving. While this conclusion may not hold precisely, there is considerable evidence of at least a partial and substantial offset.

Now let me come to his model. I think that to understand his paper, we have to be aware of the fact that he had a model in his pocket, and was eagerly looking for some place where he could make good use of it. The paper for this conference gave him that opportunity, and he has made good use of it. To avoid the possibility that the reader might misinterpret the implications of his simulation, however, I want to reemphasize that his results must relate to the effect of funding, not on the level of long-term interest rates but instead on the slope of the yield curve.

Friedman is particularly impressed and pleased by his finding that the effect of funding on long-term rates is very nearly the same whether the additional flows accruing to pension funds are totally offset by a reduction in household saving — leaving the total saving rate unchanged — or whether, instead, they represent a net addition to total saving. In the latter case, interest rates do fall a little more, but only a little.

In my view, this rather striking conclusion must be taken with a good deal of skepticism simply because his partial equilibrium model is unsuited to provide a reliable estimate of the magnitude of the differential effect. Indeed, in his simulations he explicitly assumes that the aggregate investment of the corporate sector, and hence the aggregate amount of liabilities issued by this sector, is the same whether total saving rises or is instead unchanged and only rechannelled. This is obviously an untenable assumption for the problem on hand. If there is more saving, presumably some of it must end up as additional investment in the corporate sector; indeed, this is presumably the purpose of increased funding.

The above considerations are not meant to suggest, however, that Friedman's exercise and results are of little value. His model is really designed to analyze the effect of changes in the flows of savings on the term structure of interest rates, and notably on the spread between short- and long-term rates. His result, under the assumption of no change in aggregate saving, must, therefore, be understood as providing an indication of the effect, on the term structure, of reducing the flow of saving directly invested by households and increasing the flow of saving going through the pension funds. This effect, he concludes, is that of producing a very substantial decline in the spread, even though, for reasons suggested above, nothing much can be inferred about the level of either the short or the long rate. His second experiment, in which the total flow of saving is increased, would suggest that the effect on the spread would not be very different even though, presumably, in this case the downward effect at least on the long rate should be significant.

In this more limited context, his procedure and his results seem reasonable, though I can think of a few sources of bias in his procedure, which should be taken into account in evaluating the results. Consider first the case in which there is no change in saving. Because in his model he takes as exogenously given the flows of saving into all financial institutions other than pension funds themselves, the only effect of the reduction in household saving that he is able to take into consideration is the reduced direct purchases of long-term bonds and short-term instruments by households. Since households tend to invest very little directly in bonds, their reduction in bond purchases does rather little to offset the additional demand by pension funds. It is partly for this reason that he finds that a very large decrease in the spread is required in order to induce the other financial intermediaries to reduce their demand for long-term bonds, and financial corporations to increase their supply to the extent needed to satisfy the new pension funds' demand. However, if households save less and do not reduce very much their purchase of

bonds, then they must be reducing to a substantial extent their claims on insurance companies and mutual savings banks, who in turn are demanders of long-term instruments. If we took into account this decreased demand offsetting the increased demand by pension funds, then presumably the yield spread would be reduced less.

A further effect which is somewhat more complicated is that when mutual savings banks receive less deposits from households because households have less to invest, they may have less money to put into the mortgage market, even after allowing for their reduced acquisition of bonds. If that is the case, then the mortgage rate must rise, and that has a feedback on the bond rate. Part of the feedback, I believe, would be that the investment of the corporate sector would have to rise and therefore the level of the corporate rate would have to fall. This is because with the higher mortgage rate, there must be a reduction in investment in houses and since the total amount of investment is fixed, there must be more corporate investments.

Though I have certainly not exhausted the list of omitted channels, I would conjecture that the final result is something like: If there were a complete offset of the incremental technological flows, there would be a rise in the mortgage rate, and a reduction in housing, because those intermediaries that finance housing receive a smaller inflow. There would be some decline in the corporate bond rate to produce more absorption into corporate investment, and there would be a rise in the short term because of the reduced spread, though that reduction would be probably less than the 50-60 basis points suggested by Friedman's simulations.

When one comes to the second case in which there is also an increase in aggregate saving, the problem gets really quite complicated and risky to handle without the crutch of a complete model. But, clearly, if you start from this initial model and let the household have additional funds to invest, quite clearly a major effect of the whole operation must be a significant reduction of the corporate bond rate. There will also be a reduction of the mortgage rate since now the intermediaries have lost nothing and they are investing less in bonds to satisfy the additional demand of pension funds. So there must be more funds going both in the corporate sector and in housing, and one must end up with a lower long-term bond rate, and the effect on the spread will presumably also be smaller than in the first case. However, it is unclear whether, in the end, the short rate would rise or fall. It would tend to rise insofar as the spread is reduced, but it would tend to fall insofar as the long-term bond rate is declining, and Tobin's calculations suggest that you would have a very large decline in the bond rate.

However, I would like to raise some objections to Tobin's calculations in the sense that Tobin is assuming that we have the additional investment under conditions in which the underlying production function hasn't shifted. Some of what Friedman has been telling us is that there are reasons to believe that there has been a shift in the sense that somehow we are moving toward more capital-intensive investment and have created some additional demands which weren't there before. To this extent it could just be

— and I think that is what he has in mind — that this new capital coming to the market would prevent what would otherwise be a very large rise in interest rates. In other words, the depressing effect of additional saving on interest rates, suggested by the analysis of the previous paragraph, may just prevent them from rising as much as they would otherwise have risen.

Discussion

James Tobin*

I'd like to do three things in this discussion: first, I will offer some remarks about Ben Friedman's paper and his simulations. Second, I would like to discuss the part of the story Ben's paper doesn't deal with, what it would take to get the additional saving into additional investment. Third, I have some general comments which bear both on Ben's paper and on the background papers of which his is, in a sense, a continuation.

I think the great merit of the way Ben has put the problem before us is that it calls attention in a very concrete and quantitative manner to the magnitudes of annual additions to potential saving in the economy which would follow from the proposals we heard yesterday. What Friedman does is to estimate the change in long-term corporate bond rates which follow from putting more investable funds into pension fund portfolios. This is done, as Ben pointed out both in his paper and orally, on the assumption that other rates of interest and asset yields are unchanged. It is explicitly a partial analysis and a partial calculation. Ben has a very fine model of the corporate bond market. He doesn't have it plugged into a larger model. Lacking a complete model, he can't tell us what the full effects of throwing $38 or $78 billion of additional saving into the economy would be.

His main point is that pension funds are by nature big holders and buyers of long-term corporate bonds. Giving them more savings to invest is good for the price of those bonds. I am sure that's true.

He also assumes, rather mysteriously, that the funding or partial funding of the U.S. Social Security obligations and of civil service and military pensions would have the same effects on the demand for assets as placing additional funds at the disposal of state and local retirement funds. I didn't understand that because I thought the Federal funds would just acquire more U.S. Treasury securities. The effect on financial markets would be that correspondingly fewer Treasury issues would be outstanding. So I would have thought that the exogenous change for that experiment was a decline in the supply of Federal bonds. Now, it could be assumed — at least for the purpose of the exercise — that the reduced supply is at the long end of the Federal debt. That would have qualitatively the desirable impact that Ben is talking about, for presumably long bonds are the closest Treasury substitutes for corporate bonds.

*Sterling Professor of Economics, Yale University

However, there is no guarantee that when the Treasury has the opportunity to place more of its debt with the pension funds and the Social Security funds, the debt managers will take advantage of that opportunity by issuing the public a smaller number of long-term bonds. They might issue a smaller number of short-term bills or notes, so that Friedman's twist operation would be frustrated. Presumably, there is a telephone between the Treasury and the rest of the government, and they could in principle arrange things to come out the way that Marty Feldstein picturesquely suggested the other day, namely that the funds simply buy back already existing bonds and no other Treasury debt operations are affected.

I am rather sensitive to this point. In the Kennedy years we persuaded the Federal Reserve to do a rather modest amount of buying back of long-term bonds from the public. But the Treasury proceeded to issue even more long-term bonds than they had before.

Anyway, maybe the Treasury operations would have the same effect as the behavior Friedman assumed when he did the experiments and estimates *as if* all the new saving, Federal, state and local, went into the hands of managers who have portfolio preferences for state and local retirement funds.

Friedman's presumption is that there is a particular shortage of long-term fixed-money-value finance, a scarcity of corporate bond finance. I'm not sure. I think there is also an equity finance problem that may be even more acute. In the hypothetical 1977-1981 era, Friedman takes us by assumption out of the present morass. So presumably equity markets are not as bad as they have been. Given the already rather large amount of long-term bond debt with which corporations have saddled themselves, I would expect them to turn more to equity. This could be done either by direct issues in equity markets or indirectly by retention of earnings, possibly just by raising dividends less rapidly. It is not clear in Ben's simulations what is really happening to the true market cost of capital relevant for investment decisions. He is talking only about part of that cost, namely the bond rate. The cost of capital has another component, the equity yield implicit in the stock market. I take it that in Ben's calculations this has been held fixed along with the yields on other assets that compete with long-term bonds. I'm not sure that his conclusion that funding lowers the long-term bond rate by 50 basis points means that we would get a 50 basis point reduction in the cost of financing capital investment.

Now I'm sure Franco will say more about Ben's models, so I will proceed to the second part of my discussion. What Friedman is talking about here is a concrete near-term implementation of these pension funding proposals, which would raise the ratio of fixed non-residential investment to GNP from a projected 11.5 percent to — well, Ben said 12.5 percent, but I think that the magnitudes in the paper suggest it is really somewhat larger than that, say 13 percent. Roughly, that would be a rise in the share of *net* investment (of this type) to GNP from 7 to 8.5 percent. That is the macro-economic consequence of implementing a combination of the Munnell and Feldstein proposals.

What I would like to explore with you in a very rough way is what this requires of monetary policy. A careless reader or listener to Ben Friedman — I say careless because Ben would not be guilty of wishing to give the wrong impression — might think the extra 1.5 points of national saving means that you would get automatically the additional capital formation that is required to use it. If you were *very* careless, you might think the .5 point reduction in the corporate bond rate, with other rates constant, is going to do that. Well, Ben didn't mean that, and I am just reminding you that he didn't mean that and didn't say it. I am going to say something about what is involved.

I start with the long-run implications of a higher rate of national saving. Here standard practice is to assume full employment all the time, and to take the aggregate Cobb-Douglas production function that everyone falls back on in a crunch. Feldstein mentioned this in his footnotes, and so it has his stamp of approval. The function has an output elasticity of 2/3 with respect to labor and of 1/3 with respect to capital. Now assume that we have an exogenous natural rate of growth of the economy of 3.5 percent, let's say 1.5 percent or somewhat less of labor force and 2 points of productivity. Assume that we are in growth equilibrium now — you'll have to excuse all these strong assumptions — or anyway that we would be in equilibrium if we were at full employment. Then take the net investment ratio of 7 percent, divide it by the growth rate of 3.5 percent, and you have a capital-output ratio of 2. So the average product of capital is 1/2, and the marginal product is a third of that, 1/6. But that is the gross marginal product, and we've got to subtract from it the depreciation rate in order to get the net marginal product. I assume depreciation of .045. I already used that figure in going from gross to net in calculating the investment rate, so it is the appropriate one to use again. That has the nice property of getting us to the number 12 percent. Yesterday Marty told us that the pre-tax marginal product of capital is 12 percent. So I was relieved when I did these calculations that they came out right. The 12 percent might be thought to be equivalent to something like 7 percent after tax. That is the rate that savers and private investors can gain by accumulating capital, even though the marginal product for the society as a whole includes the government's share and is 12 percent under the assumptions.

Now suppose that we do increase the saving going into investment in this form by 1.5 percent of GNP. Starting now, instead of a net investment rate of 7 percent, we have 8.5 percent. We can compute what the equilibrium capital-output ratio is for that higher rate of saving. That will be, as before, the net investment rate divided by the growth rate (.085 divided by .035), and my trusty HP pocket calculator says that's 2.43. The ultimate capital-output ratio, as a result of the increased saving potential, if it were realized in investment and continued long enough, would be 2.4 instead of 2. The capital-output ratio rises by 40 percent of GNP. We can also recalculate the marginal product of capital. Once again, we take the output elasticity with respect to capital, which we have known since the

days of Paul Douglas to be 1/3, and we multiply the 1/3 by the reciprocal of 2.43. We subtract the depreciation rate just as before, and we find that the result of doing all this, if it kept on forever, would be to reduce the marginal product of capital to 9 percent. That would be the canonical number when we reconvened in the year 2050 or 2076. Marty Feldstein would tell us then that the rate of pre-tax marginal product of capital is 9 percent instead of 12 percent, but he would still say it isn't low enough and we had better do some more saving. The 9 percent is about 5.5 percent after tax, so the ultimate result is that in the long run the real interest rate (this is all real stuff) has got to be reduced by 160 basis points after tax, from about 7 to 5.4 percent.

The process I've just been describing would take a very long time — technically speaking, I guess it would take forever. But we don't have to worry about asymptotic properties. I can give you some indication by telling you what would happen to the capital-output ratio during the first year of this new austerity, in which we add to our saving 1.5 percent of GNP. Well, we start with a capital-output ratio of 2, and at the end of one year it would be 2.014. Eventually it must rise from 2 to 2.43, so in one year it has gone 14/430 of the distance. It's a long process.

All right, that is meant to show that you are not going to get a very rapid change from adopting the Feldstein-Munnell-Friedman proposals. It doesn't mean you shouldn't do it. Now, what does it take to get this new investment in the short run? I think many people would agree that to get more capital investment than accompanies the normal growth of the economy, you need the incentive of a positive difference between the rate of return on capital at its reproduction cost and the market cost of raising the funds. The cost of capital in the securities market — the bond and stock markets — to investing business firms must be below the after-tax marginal returns on their investments. That's what gives them the incentive to do the job. The difference that has to be created in the short run to induce the investment is not as large as the long-run steady-state reduction I calculated a few moments ago, but it is substantial. In the steady state we have to reduce the rate of interest by 160 basis points, according to that calculation. In the short run, in order to get the process started, we have to bring the after-tax market interest rate down by somewhat more than 100 basis points.

I didn't bring along a lot of investment equations in my briefcase, but I have one in my head which says that the short-run elasticity of investment with respect to the market valuation of capital relative to its replacement costs is around .8. A 1 percent increase in the market valuation of bonds and stocks relative to the costs of capital goods produces 8/10 of 1 percent response in investment. It takes two years to get the full response. What Ben Friedman is proposing is a 13 percent increase in gross investment. At least that's my interpretation. I'm talking about the 1.5 point increase in fixed investment relative to GNP, divided by the 11.5 base. To get that, we need a 16 percent increase in the market valuation of securities or, what amounts to the same thing, a 14 percent reduction

in the cost of capital. And if we said that the current after-tax cost of capital was something like 7 percent that means that we have to go down to 6 percent. In terms of the 10 percent rate before tax in Ben Friedman's proposal the reduction is to 8.6 percent.

This is by no means unattainable. But it is clear that the 1/2 point reduction in long-term bond rates, which would come about from holding other yields constant and just having the twist operation which Friedman's simulation tells us about, does not produce the needed interest rate stimulus. More is necessary to be sure that the additional saving, modest as it is, is successfully invested and not wasted in unemployment. There would have to be some reduction of other yields; the whole level of rates would have to go down. Friedman's twist of rate structure is not enough.

In particular, we would need a significant reduction in short-term rates. Well, I don't know what the interest-elasticity of demand for money is. But if it's 2/10 of 1 percent, then to cut short-term rates by 14 percent would take a 2.8 percent extra increase in money stock. This would be a once-and-for-all increase. It would have to be implemented over a period of time in which the apparent rates of growth of money stock as reported week-to-week would be larger than long-run sustainable rates. Actually, a bigger reduction of short rates, and a bigger monetary expansion, might well be necessary to bring long rates down as required. In order to implement this change in the composition of national output without losing the potential new saving in unemployment, you would have to have cooperation from the monetary authorities.

An alternative would be to give extra tax credit, of the same order of magnitude on investment. That brings up distributional issues. I think we already have given rather generous tax credits, so this might not be the way we want to go.

Now one other point about this calculation: when we throw extra saving into the economy, we cannot be sure it is all going to nonresidential investment. Some of it would naturally spill into houses and other types of domestic investment and into foreign investment. I guess the capital shortage that people are worried about is largely in fixed nonresidential capital. However, I personally don't see anything wrong with making the provision for the country's future retired people take the form of more houses as well as more machine tools.

My third point has to do with reasons for believing that Marty Feldstein may have overestimated the past, present and future effects of Social Security on saving and capital stock. Now I am not saying that there aren't such effects. I believe that the basic reference point of the analyses presented yesterday is the correct reference point. It is that in a pay-as-you-go system, the payment of benefits actually increases the consumption of the beneficiaries, while the contributions made in advance do not decrease the consumption of the contributors. So there is net additional consumption. But there are some significant departures from that reference point.

One is, of course, as mentioned yesterday, the inducement to retirement provided by the Social Security program itself. The second goes back to findings in the 50s by George Katona. His results contradicted the intuitive preconceptions of economists and therefore were largely dismissed. Katona found that covered workers — in those days you could distinguish in surveys between covered and uncovered workers — actually saved more outside the Social Security fund than otherwise comparable uncovered workers. Katona's explanation, which I think has some merit to it, was a rise in aspirations across an important threshold. Many people never thought, prior to Social Security coverage, that they could be on their own when they retired. They had been relying on the informal system. Once Social Security brought the goal of self-support within reach but didn't do the whole job, they were willing to do the rest of the job. Thus Social Security brought about a large change in retirement life styles. This effect, however, might be expected to weaken as time goes on, and maybe it already has.

Another point also refers mainly to the past, or at least one hopes so. Much of the history of Social Security consists of periods of underemployment when production was constrained by aggregate demand rather than by supply or by fiscal and monetary policy. In those periods the additional consumption of social insurance beneficiaries increased output and in that degree didn't displace investment. This would be so even if contributors did not change their consumption one bit as a result of the payroll taxes.

For the future, we should avoid funding Social Security at times when it would be contractionary. We don't want to be raising payroll taxes in bad economic weather. The proper procedure is for Congress to make appropriations for funding as a part of the budget. Then let Congress each year decide, following its regular budget procedure and appraising the economic situation, how much of those appropriations to pay out of taxes and how much of a deficit to run.

Another modification of Feldstein's pure theory is that beneficiaries of the Social Security program probably have to some degree increased their bequests as a result of the additional benefits. Perhaps they wouldn't do that if they completely foresaw that Social Security benefits also reduced their children's need for bequests. Nonetheless I suspect that many people were limiting bequests for lack of liquidity and therefore probably did not consume all of the additional Social Security benefits.

Another point, more relevant for the future than the past, is that the assets acquired by social insurance contributions are imperfect substitutes for other assets, in several respects. Their permanent yield is only the rate of growth of the economy in a pay-as-you-go system, and that is not as good a yield as the yield you can get by investment in physical capital. That indeed is Feldstein's main point. But as social insurance contributors also come to understand it, then they will not regard the acquisition of pension rights in a pay-as-you-go system as fully equivalent to other assets. They will do some extra saving to make up for the lower yield. The

same is true because of the illiquidities and contingencies of Social Security benefits, to which Franco called our attention earlier today.

The biggest point I would like to make is that a large fraction of the population is liquidity-constrained. These workers are not in a position to offset payroll taxes or other compulsory savings by borrowing or by dipping into previous savings. So when a payroll tax is levied on them, they are just not able to maintain consumption. To the degree that there are a large number of liquidity-constrained participants in the program, one cannot assume that they have compensated for their benefits in the future by reducing other saving or provisions for retirement. I think this could be a very substantial effect.

These are the reasons why the displacement effect is nowhere near as large as Feldstein's reference calculation, even though in the direction Marty has indicated.

To conclude, I am sympathetic with the notion that the mix of policy should try to shift the mix of national output toward capital formation of all kinds. I emphasize once again that when and if that is attempted, monetary policy must see that the additional saving actually gets into investment.

Response to Modigliani and Tobin

Benjamin M. Friedman

Since I agree with much of James Tobin's and Franco Modigliani's comments, and since many of their remarks do not bear directly on my own paper, I can be fairly brief in my response.

First, it is important to comment on a major aspect of the simulation experiments in my paper, upon which Professors Tobin and Modigliani have both touched in one way or another. Specifically, since I performed these experiments using a model of only one market (the long-term corporate bond market), they lie solidly within the sometimes troublesome realm of partial equilibrium analysis. As Professor Modigliani in particular has emphasized, for example, the simulated values of the long-term bond yield take as given the values of yields on all competing assets. To do otherwise — so as to facilitate making less qualified statements about the absolute level of the bond yield, rather than about the slope of the yield curve — I would have had to use a general equilibrium model of all asset markets. Similarly, these simulation results ignore potential feedback from induced increases in business investment, which would presumably lead not only to increased corporate borrowing (hence pressure on bond yields) but also to increased economic activity and increased demand for money (hence pressure on short-term interest rates, and through them on bond yields, in the absence of accommodating monetary policy). In addition, these simulation results have nothing at all to say about implications for the housing industry, which would probably work out more or less as Professor Modigliani has suggested. To allow for these and other feedback effects I would have had to use a general equilibrium model incorporating not only all asset markets but also the nonfinancial economy.

I certainly agree that a more general equilibrium analysis, in either of these two senses, would increase the usefulness of these experiments. Incorporating a flow-of-funds model — or even simply my own model of the bond market — within Professor Modigliani's MPS model, for example, would be a highly useful research endeavor.

Nevertheless, partial equilibrium analyses like the experiments in my paper do provide instructive insights about the first-round effects of various policy proposals. The chief message of that part of my paper is that the "preferred habitat" differences between pension funds and households

are greater than is often supposed and that, again on a first-round basis, implementation of pension funding proposals can therefore make long-term capital relatively less scarce. Since a key motivation for asking questions like these in the first instance is a concern that otherwise increasing relative scarcity of long-term capital may prevent the achievement of an adequate rate of capital formation, realizing that the first-round interest rate effects of a policy will lead to added capital formation is the point of the matter, despite the fact that feedback from the induced capital formation will in time erode the effect of policy on interest rates. The more induced capital formation (and hence the more such feedback), the better.

Next, I want to answer directly a few of the questions which Professor Tobin raised. To begin, I agree with him that, if the various proposals for civil service, military, and Social Security funding were to be implemented, these federally managed trust funds would not necessarily invest according to the portfolio preferences typically exhibited by state and local government pensions. Of course, if these trusts purchased long-term government securities then, to the extent that long-term government securities were close substitutes for the long-term corporate securities which dominate the portfolios of state and local government pensions, the effect in this context would be just the same. Nevertheless, our inability to judge in advance the portfolio behavior of these federally controlled trust funds, were they to accumulate large stocks of assets, is the precise reason why I performed each of the simulation experiments twice — once with the proposal for state and local government pensions only, and once with all four proposals together.

I also agree with Professor Tobin that, if the shift in the composition of saving toward investors preferring long-term assets is indeed to have the effect of reducing the relative scarcity of long-term capital, it is important that the Treasury not shift the mix of new U.S. government securities toward long-term issues and that the Federal Reserve not shift the mix of its securities purchases away from long-term issues. Just as preferred habitat effects present an opportunity for pension funding proposals to influence the pattern of relative scarcities within the financial markets, they also present an opportunity for debt management and open market policies to have an offsetting (or, by analogy, a reinforcing) influence.

I also agree with Professor Tobin that the relevant cost of capital for corporations is some combination of the yields on debt and equity; and I agree that, just as corporations will be trying to emphasize long-term debt in preference to short-term debt, they will be trying to issue equity whenever possible. My partial equilibrium model of the bond market cannot assess the effect of these pension funding proposals on equity yields; but, while equity purchases constitute a major share of the net asset accumulation of pension funds, they are usually a negative component in households' net asset accumulation. I would expect, therefore, that these proposals would also reduce the relative scarcity of equity capital.

I disagree with at least one premise which seems to underlie Professor Tobin's interesting arithmetic on the conditions required to shift an additional 1 percent of the gross national product into (net) capital formation. In particular, he assumes an unchanging Cobb-Douglas production function. While I do not know exactly what is the right production function today, I think instead that, whatever the production function is, after allowance for productivity trends it is shifting in the direction which requires more capital to produce the same amount of measured output. Several years ago a group of economists from New Haven — including Professor Tobin — suggested that their construct MEW ("measure of economic welfare") was superior to the conventional GNP construct in that it included environmental and several other relevant considerations. It is quite possible that, especially if MEW includes the benefits associated with energy independence, the capital-MEW ratio is not changing. The capital-GNP ratio, however, is rising as a result of large investments in expensive oil pipelines, stack scrubbers (which typically add some 20 percent to the cost of utility plants), and the like. In addition, since these pipelines require little labor maintenance once they are operational, and since stack scrubbers add only negligibly to the labor requirements of a utility plant, after allowance for productivity trends the capital-labor ratio is probably rising also.

Hence the demand for investment, to absorb additional saving induced by these pension funding proposals, will probably be present once the economy's recovery is under way. Professor Tobin is correct in pointing out that a shift in the saving schedule does not automatically lead to more investment (and I tried to say as much in my paper). Nevertheless, his arithmetic assumes no shift in the capital intensity and therefore relies on too low (and perhaps too flat) an investment function.

Finally, I can be very brief in response to Professor Modigliani's objections to two of the assumptions used in structuring the simulations in my paper. As for the incidence of Social Security taxes, I assumed full incidence on corporate profits because I wanted to use Professor Feldstein's calculations which assume that the covered wage base is invariant with respect to changes in the contribution rate. As for the dividend behavior of corporations, the assumption which I made was for convenience only (and I tried in my paper to qualify it). In principle — and here I return to the issue with which I began — both of these questions are best handled by carrying out the analysis within a full model including the nonfinancial economic system.