Investment and U.S. Fiscal Policy in the 1990s

by

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I. Introduction

Investment is key to policy analysis for at least two reasons. First, it is the source of capital accumulation, and therefore a major determinant of both the economy's long-run output capacity and the productivity of the labor force. Second, as a large and volatile component of aggregate demand, fluctuations of investment have a major influence on the short-run path of the business cycle.

For these reasons, investment has been the subject of much economic research over past decades, and it has been the focus of significant policy debate. Of late, discussions linking policy and investment have been near the top of the policy agenda, most importantly because of the widely held view that the federal budget deficit competes for the scarce pool of private saving and raises interest rates. The concern that higher interest rates will increase firms' cost of capital and therefore "crowd-out" private investment is, for many economists and policymakers, the primary reason for cutting the federal budget deficit. Also, the concern that higher deficits will weaken investment in the long run has handcuffed proposals to employ stimulative fiscal policy in response to the 1990s stagnation.

Furthermore, although the fervor behind "supply-side" economics of the 1980s has quieted to some degree, the assumed sensitivity of investment to the after-tax cost of capital is still a cornerstone of tax policy in some circles. If taxes are cut on the returns from saving and

investment, the argument goes, the expansion of investment and the capital stock will ultimately benefit the entire economy by increasing output, improving labor productivity, and raising wages. Indeed, the Bush administration lobbied for a capital gains tax cut on the basis of this reasoning. The 1993 tax changes also create a preference for capital gains by raising the tax rates on the wealthy for labor income, while keeping the top marginal tax rate on capital gains income at 28 percent. The *direct* beneficiaries of such tax initiatives, however, may well be wealthy taxpayers who save substantial amounts or have large claims on capital income.[1]

These influential policy positions take for granted that the cost of capital—appropriately adjusted for taxes and inflation—is a fundamental (if not *the* fundamental) determinant of investment: The importance of this effect is largely unquestioned in policy circles. While standard economic theory predicts a link between capital costs and investment, the theory in its most general form does not make any quantitative predictions about how strong the link will be. Although some empirical work has addressed this issue, the results to date have been mixed.

This paper analyzes the existing literature on investment and presents original research to assess the economic foundations of current policy debates. I find that the largely exclusive emphasis on the cost of capital in most current discussions is unjustified. The evidence shows that interest rates and the cost of capital play a small and uncertain role in the determination of investment when compared with the strength of firms' financial condition and the growth of their sales. The impact of policy through the standard cost-of-capital channel, therefore, may well be dominated by other factors.

Furthermore, the determinants of investment differ across firms. The capital spending of the fastest-growing firms studied appears to show no negative effects of higher interest rates or capital costs. These firms, however, are the most sensitive to alternative sales and financial determinants of investment. The fastest-growing firms may, therefore, be the most severely affected by reduced economic growth resulting from deficit reduction, while their level of investment benefits little from lower interest rates. One must pay attention to this heterogeneity when studying policy.

The policy lessons of these findings are developed in more detail in the final section of the brief. In summary, I emphasize three major points:

1. The most important determinant of investment is the strength of the economy. The indirect impact of taxation and spending initiatives on overall economic activity is likely to have a greater effect on investment than the influence of taxes or interest rates on the cost of capital.

2. For similar reasons, the negative ("crowding-out") effect of government deficits on investment is likely to be small. Moreover, in the current weak economy, the drag on the economy from tax increases and government spending cuts will probably overshadow any stimulus to investment that occurs from falling interest rates. Therefore, in today's economy, deficit cutting is more likely to reduce investment than to increase it. [This conclusion is supported by an illustrative simulation of the possible effects of the recently passed Budget Reconciliation Act of 1993; see Table 2].

3. Policy to stimulate investment directly should focus on *robust* policies designed to get cash into the hands of investing firms. Accelerated depreciation allowances and the investment tax credit are examples of this kind of policy since they not only reduce the cost of capital, but also increase firms' cash flow. Tax changes designed to increase saving, however, are not robust in this sense. They must work solely through the empirically weak cost-of-capital channel. Therefore, we could incur the distributional costs of regressive tax reform (designed to raise saving), without much benefit in terms of increased investment.

II. Do We Need More Investment?

This research explores the determinants of private investment and the impact of policy on investment. Yet there is a background issue that must be addressed, at least briefly, before proceeding. Why should public policy strive to stimulate investment in the U.S. during the 1990s?

Historical statistics show that investment has been weak in recent years. In spite of the fact that the early 1980s experienced two recessions—with the second widely thought to be more severe than the 1990–91 recession—gross nonresidential investment relative to GDP averaged 6.3 percent less from 1987 to 1992 than it did from 1980 to 1986. Its level in 1991 and 1992 was below the trough reached following the 1981–82 recession.[2] Other measures lead to similar conclusions. For example Harris and Steindel (1991, p. 6) report that "net capital supplies" from

both foreign and domestic sources dropped from an average of 6.5 percent of GNP during 1953–79 to an average of 4.0 percent of GNP from 1980–89. (Their figures for domestic capital supply alone were worse, dropping from 7.2 to 3.0 percent of GNP for the same period.)

There is surprising agreement across the political spectrum that policy should attempt to boost investment, in spite of sharp differences over the optimal means to pursue this goal. The Reagan and Bush administrations proposed to increase investment and economic growth by lowering taxes (especially those on capital gains) and deregulation: "*A major suspect in the slowdown of U.S. productivity growth is thus to be found...in the capital markets. To raise the rate of productivity growth, the national rate of investment should be increased*" (*Economic Report of the President,* 1992, p. 93, emphasis in the original). During the 1992 presidential campaign, even Democratic candidates Bill Clinton, Paul Tsongas, and Jerry Brown embraced capital gains tax cuts in some form to stimulate investment. Benjamin Friedman, a critic of the Reagan-Bush fiscal policies, argues that as a result of low investment in the 1980s, "productivity gains have continued to be disappointing and wages have lagged" (1991, p. 150). Murray Weidenbaum, the first chair of the Council of Economic Advisers during the Reagen administration, has called for a temporary investment tax credit on "produc-tivity-enhancing equipment for manufacturing companies" (quoted by Youngblood, 1992).

Yet there is reason to question whether the pursuit of policies that stimulate investment must necessarily enhance social well-being. Suppose output is given at a constant level. Consequently, an increase of investment necessarily involves the sacrifice of some goods or services that could

have been used for current consumption. It is not entirely obvious, therefore, that more investment is good. That is, the future benefits to society from higher investment may not be sufficient to justify the sacrifice of current consumption.

For several reasons, however, I believe that under current circumstances in this country, policy should strive to increase private investment. The most obvious of these is that the economy continues to operate below a level consistent with the full employment of its labor and capital resources. To the extent that higher investment spending increases the sales of businesses that supply investment goods, these businesses will increase production and employment. The incomes of their workers will rise, causing an increase in the demand for the things that workers buy—thus stimulating more sales, production, and employment elsewhere in the system. This "ripple effect" (what economists call the "multiplier") will propagate through the economy. Therefore, in the current economic environment, the premise necessary to conclude that higher investment requires a sacrifice of current consumption is false: Output is not fixed at a "given level." Higher investment will increase output and employment, accelerate economic growth, and increase the prospects for more consumption as well.

A longer-term concern also supports the conclusion that the U.S. would benefit from higher private investment. The 1990 report of the Social Security Administration predicts that the ratio of social security beneficiaries to employed workers who pay social security taxes will rise from 0.3 in 1990 to 0.5 about 40 years later (see Carlson, 1991, figure 6). This widely discussed change, caused by the aging of the baby-boom generation, will either greatly increase the burden

borne by future workers to support retirees or lead to substantial cuts in the benefits paid to retirees. Much has been written about the need to build up reserves in anticipation of this potentially serious intergenerational conflict in the next century. The popular understanding of the social security problem, however, is clouded by what economists call a "fallacy of composition": in essence, incorrectly concluding that what is true for an individual applies to the society as a whole. The obvious remedy for an individual who wants to provide for retirement is to save while working and then to use accumulated savings to finance consumption during retirement. Through their personal saving, people see themselves as transferring resources from the present to the future—and from their individual perspective this view is correct. But no such transfer of the actual goods that retirees want to consume occurs in the society taken as a whole. Baby-boom retirees will want to drive nice cars, eat good food, and consume high-quality medical care that will be the products of the future economy. No one accumulates stocks of such goods in massive warehouses planning to take them out for use when they retire in the second and third decades of the next century! The goods and services that the baby boomers will consume when they retire must come from the simultaneous production of society.

The best thing, therefore, that we as a society can do today to provide for the retirement of the baby boomers is to enhance the ability of the economy to produce goods and services in the future. This objective requires higher investment now. With these demographic realities in mind, the downward trend of investment in recent years is particularly discouraging. Investment should be rising as a share of production. The instruments that economic policy can employ to boost investment, therefore, form the core of this paper.

III. What Do We Know About the Determinants of Investment?

To understand how policy interacts with investment, we must first consider how investment decisions are made. With some risk of oversimplification, the determinants of investment studied in the voluminous academic literature on the subject can be divided into three broad categories: the cost of capital (including interest rates and various tax effects), output or sales variables, and measures of firms' access to finance. I consider each of these categories in some detail.

A. The Cost of Capital and the Neoclassical Investment Model

Early empirical work (Meyer and Kuh, 1957, for example) emphasized all three categories of investment determinants. In the 1960s, however, Dale Jorgenson developed what became the dominant view of investment in the economics mainstream: the neoclassical investment model (see Jorgenson, 1971, for a survey). This theory is most widely used to illustrate a link between investment and interest rates or taxes, and this theory, therefore, underlies most current policy analyses of investment.

According to the neoclassical model, firms make employment, investment, and production decisions to maximize their profits (more precisely, the present value of profits over time). The only constraints on firms' choices arise from market prices (which they cannot affect under typical, perfectly competitive assumptions) and technology (which determines the amount of output the firm can produce from its choice of employment and capital inputs). In this theoretical

framework, then, investment is determined by technology and the full spectrum of prices. These prices include interest rates and other determinants of the cost of capital such as depreciation, expected inflation, and aspects of the tax code relevant to income from capital.

The direct role played by policy in this framework is clear but narrow. To the extent that technology is exogenous, as most studies assume, policy impacts investment because policy affects relative prices. In principle, such influences could occur through any prices (wages or other input prices, for example), but the vast majority of work has concentrated on the cost of capital. In economists' terms, this concept represents the "opportunity cost" to firms' owners of sinking money into fixed capital investment: the opportunity owners forsake to make an investment. In a simple world without taxes on capital income (an assumption we shall relax momentarily), the two components of this sacrifice are reasonably clear. Suppose a firm buys a new machine tool for $100,000 rather than paying out these funds to its shareholders. The owners of equity will sacrifice the return they could have received by putting these funds into financial assets. This opportunity cost is usually measured by the interest rate adjusted for risk and anticipated inflation. In addition, as the firm uses the machine tool over the year, its value is likely to fall as it wears out from use and becomes technically obsolete. Depreciation and obsolescence are also part of the sacrifice the firm owners make when the firm buys the machine. Assuming the firm acts to maximize the wealth of its shareholders, it will purchase the machine only if the new capital contributes enough to the firm's profits to compensate shareholders for these opportunity costs. That is, the contribution of the machine to profits, determined by the firm's technology, must exceed the cost of capital. If the inflation-adjusted interest rate is 5

percent and the depreciation rate is 10 percent, a firm will buy a $100,000 machine if it adds $15,000 or more to annual profits.

In this simple environment, policy effects are limited. Policy can do nothing about depreciation rates or the productivity of capital, which are usually thought to depend on the exogenous technology. However, policy may affect interest rates: If the budget deficit forces heavy government borrowing, real (inflation-adjusted) interest rates can rise.[3] Therefore, the neoclassical framework predicts that deficits hamper investment. Monetary policy may also affect interest rates, although there is widespread doubt that monetary effects are important over a long horizon that should be relevant for capital investment.

This simple example, however, is only pedagogical because it ignores the complex array of taxes on capital income. On the one hand, corporate profits generated by capital investment are subject to the corporate income tax. On the other hand, capital investment creates depreciation deductions that reduce corporate taxes: For most of the period from 1962 until the Tax Reform Act of 1986, investment further reduced corporate taxes through a special subsidy called the investment tax credit. In addition, nominal interest payments made by firms that finance their investment with debt are deductible, but the dividends paid to shareholders who provide equity finance for investment cannot be deducted. Even personal taxes can have an impact on the cost of capital if managers act in the interest of their tax-paying shareholders. For example, the literature has placed much emphasis on the differential tax treatment of capital gains and dividends.[4]

These complexities can be integrated into the cost of capital.[5] The simple investment theory presented above is modified to predict that firms will invest in a new factory or machinery if the value of such a project exceeds the *after-tax* cost of capital. These tax effects introduce another lever for policy to affect investment. Changes in depreciation allowances or the personal taxation of capital gains, to name two examples that are widely discussed currently, change the cost of capital and potentially affect investment.

This discussion of the neoclassical investment model (and its policy implications) summarizes a theory. While the theory is logically coherent, it is based on liberal assumptions. For example, most versions assume that firms can purchase all the inputs and sell all the output they want to at given prices (firms operate in "perfectly competitive" markets). In addition, if firms do not have sufficient funds to finance a desirable investment project themselves, the model assumes that they can obtain all the resources they need externally by issuing new shares at a fair market price or by borrowing at an economy-wide interest rate. There is little doubt that these strong assumptions are violated to some degree in reality. The more important question for policy analysis, however, is whether a theory based on these assumptions nevertheless adequately describes the most important aspects of the way firms make investment decisions. This question must be answered by empirical tests of the theory.

Tests of the neoclassical theory immediately encounter an important problem in their attempt to evaluate the impact of interest rates on investment. The most widely used empirical model based on the theory links the cost of capital effect with variables that measure firms' output or sales

performance. Some of these models explain investment very well, but it is difficult to disentangle the explanatory power of interest rates from sales.[6] Thus, there is uncertainty about the extent to which policy influences investment through the cost of capital and interest rates. Section IV of this paper presents new empirical research aimed at resolving some of this uncertainty.

B. Sales and the Accelerator

In most versions of the neoclassical model, firms choose how much output they want to produce under the assumption that they can sell all they want to at the given market price. The only limitations firms perceive on their production arise from their technology and market prices. This "perfectly competitive" environment, however, does not adequately describe the circumstances of firms in most U.S. industries. Typically, firms have at least some control over the price they charge, and the sales they can make at a given price are limited by the strength of demand for their products. In these conditions, one would expect that firms' expectations of future sales would have an important impact on their investment spending. High sales growth, currently and in the recent past, will likely cause expectations of higher sales in the future and will give firms the incentive to invest in new productive capacity. Low sales growth will reduce the incentives to invest. This intuition underlies one of the oldest and most empirically successful investment models (going back at least to Clark, 1917): the accelerator. In its simplest form, the accelerator theory predicts that if a firm's sales growth increases, its investment will concurrently rise.

Various versions of the accelerator have been used in empirical investment studies for decades

with excellent results. As mentioned previously, strong accelerator effects have clouded the empirical evaluation of the neoclassical model because many versions of the neoclassical approach allow the cost of capital to affect investment only through variables that also include sales or output. Therefore, one often cannot determine the separate impact of sales and the cost of capital from this research, and it is difficult to evaluate the independent importance of these channels for policy analysis.

Some studies, however, have compared the separate effects of sales and the cost of capital for explaining investment. In a recent survey, Robert Chirinko (1991, p. 14) writes, "although empirical results with versions of the neoclassical model differ widely, they suggest to this author that output (or sales) is clearly the dominant determinant of investment spending with the [cost of capital] having a modest effect." Therefore, there is doubt about the important implicit assumption, largely unquestioned in policy circles, that changes in the cost of capital of the magnitude likely to arise from deficits or tax reform will have an important effect on investment. [New empirical evidence to address this problem is presented in Section IV.]

If sales dominate the cost of capital as a determinant of investment, and if sales are determined in part by the general health of the economy, then the links between fiscal policy and capital spending are significantly different from the policy implications of the orthodox model summarized previously. The indirect effects of the tax system on investment, working through the influence of taxation on aggregate spending and firms' sales, may dominate the direct effects of taxes on the cost of capital. In other words, the damage done to the economy through deficit

reduction may be greater than the economic benefits accrued via lower interest rates.

For example, compare the impact of a capital gains tax cut with an across-the-board tax cut of the variety often put forward as "middle-class tax relief." Cuts in the capital gains tax rate may reduce the cost of capital required by firms' shareholders, since the tax bite will be smaller on the appreciation in firm value that results from investment. But, as indicated above, the empirical effect of the cost of capital on investment may be small. Moreover, the impact of cutting capital gains taxes on aggregate spending will likely be minimal. As is widely discussed, most capital gains income accrues to relatively wealthy individuals, whose consumption spending is not likely to change much as the result of marginally lower taxes. In contrast, a middle-class tax cut, while it has little direct influence on the cost of capital, may stimulate consumer spending and increase firms' sales, thus improving the investment climate through the accelerator effect. This channel of influence could well be more important empirically than the cost of capital effect, which receives much more attention in policy debates.

Similar arguments can be made about the impact of government spending and the federal budget deficit. Theoretically, deficit spending hurts investment through the cost-of-capital channel as government borrowing increases interest rates and "crowds-out" private investment. But, again, this effect may be weak empirically. Deficit spending also stimulates demand and sales, however, leading to more investment through the accelerator effect, which is strong empirically. Therefore, it is not clear that a public capital accumulation program designed to improve education and national infrastructure, for example, will crowd-out private investment, even if it is financed by

an increase in the deficit. Through the accelerator effect, such a policy may lead to *more* private investment.[7] These observations suggest the need to evaluate the empirical strength of the cost-of-capital channel versus the accelerator channel in the determination of investment, an issue examined in detail later in this paper.

Many economists would qualify this discussion in an important way. Some allege that the effects of the accelerator, though empirically strong, are widely viewed as temporary, applying to transient circumstances when the economy operates below full employment of its labor and capital resources. In contrast, the cost-of-capital effects, although they are weaker empirically, are permanent in neoclassical theory, and they affect the desired stock of capital even at full employment. Some would argue, therefore, that policies designed to insure the long-run health of the economy should emphasize the cost-of-capital channel.

There are several important reasons, however, why such a focus could mislead policy design. Presently, the economy continues to suffer in an extended period during which capital and labor resources are vastly underutilized. The sacrifice imposed by the slack economy on material standards of living and, perhaps more important, the national sense of well-being, has been substantial. An important objective of investment policy over the short to medium horizon must be to invigorate the economy by creating jobs, improving productivity, and increasing incomes. There is little doubt that the accelerator effect is much more important than the cost of capital in this area. More specifically, the economy's interest may be much better served by a tax policy that gives a strong and reliable boost to investment over a three- to five-year horizon (the typical

operative period for the accelerator) than a policy that may have a more persistent effect, but one that is weaker and less certain (through the cost of capital).

The argument for greater emphasis on the accelerator may go even deeper because it is not clear that its effects are necessarily short term. The view that the investment stimulus through the accelerator is temporary relies on the assumption that the economy will eventually converge to a full employment equilibrium as a result of its own natural adjustment mechanisms. Furthermore, the output and employment forthcoming in this long-run equilibrium are assumed to be largely independent of how the economy has performed in the recent past. There are good reasons to question both of these critical assumptions.

The natural stabilizing forces in the economy that are usually assumed to restore full employment can be quite weak, and they may be dwarfed by destabilizing channels.[8] If this is the case, investment stimulus through the accelerator could have a prolonged effect by pushing the economy toward full employment when it otherwise may have continued to stagnate. If policymakers ignore the need for explicit stabilization policy, benignly relying on the weak stabilizing forces of the market alone to overcome stagnation, recovery may be long delayed or may not occur at all. Indeed, this perspective is consistent with current concerns about the anemic pace of economic recovery in the United States. During the recession (and even thereafter), many forecasters discouraged the use of a fiscal stimulus to fight slow-growth problems because of the deficit. After a prolonged period of disappointing economic performance, the group of "economic advisers still sticking to the 'just wait, things are about to get better' school is shrinking" (Wessel, 1992, p. 1).

In addition, even if the economy would get to a long-run, full-employment equilibrium on its own, the short-run performance of the system may impact the character of its long-run equilibrium. Such effects arise because short-run performance affects the extent of technical progress (which is also tied to the level of investment) and the productivity of labor. As Frank Hahn recently wrote, "We do not have to settle for the historical determinism entailed by unique steady state growth rates" (1990, p. 35). Furthermore, in an open economy, weak, short-run investment of a domestic industry vis-'a-vis its foreign competitors could cripple the industry permanently.[9] We must not, therefore, discount the importance of "short-term" fluctuations of investment or employment under the misguided assumption that all will be well in some unchanging, long-run, steady state, the character of which is independent of shorter-term problems suffered by the economy. Short-run macroeconomic weakness can have long-run consequences.

C. Finance and Investment

Recent research developments on the link between financial markets and investment also suggest a need to reexamine the economic foundations of investment policy debates. Much of the mainstream empirical research on investment is based on the assumption that firms can obtain financing for any investment project they believe is profitable (when the project is evaluated at a cost of capital based on market interest rates). New theoretical and empirical research, however, has made important advances in studying what are often called "finance constraints." The idea that the access to finance may limit investment—independent of traditional determinants such as

interest rates, taxes, and technology—now has wide (though not universal) support among economists.[10]

Suppose a firm does not have sufficient internal cash to undertake a desirable investment project. It must then seek funds from external sources: either new borrowing or stock issues. External finance, however, may be more costly than internal funds for a variety of reasons. It is even possible that some firms will not have access to any external funds.

Undoubtedly, there are transactions costs associated with external finance because of firms' need to work with financial intermediaries that must cover their own costs and make a profit on the deal. Estimates suggest these costs can be quite substantial (see the papers cited by Fazzari, Hubbard, and Petersen, 1988, pp. 148–154). Therefore, an investment project that would be undertaken when the firm has sufficient internal cash to finance it may be postponed, or not undertaken at all, if the firm must rely on more costly external funds.

Recent literature has emphasized deeper reasons financial constraints on investment may arise. Many of the problems center on different ("asymmetric") information available to borrowers and lenders that can lead to many nontraditional results. For example, credit may be "rationed," meaning that interest rates do not equate the supply and demand for loans, leaving some firms without finance and constraining their investment. Furthermore, the ability of a firm to undertake an investment project may depend not only on the economic fundamentals of the project under consideration, but also on the firm's financial condition. Again, the same project in which a firm

would invest if it had sufficient internal funds might not be undertaken if the firm had to raise external funds to finance the project.

This research program has also spawned new empirical work examining the importance of finance. The results strongly support the idea that the financial condition of firms matters. In particular, recent work has demonstrated the link between investment and internal cash flow, variations in which are determined largely by profits. This connection is most important for relatively small, fast-growing firms that are likely concentrated in the most dynamic sectors of the U.S. economy. The evidence implies that such firms face the most severe information problems. But presumably these firms are the most important in enhancing U.S. growth and international competitiveness, and therefore deserve special attention in the policy discussion.

Finance constraints also set up another channel through which accelerator effects operate. Fluctuations of internal finance are driven by fluctuations of profits, which move strongly in accordance with the business cycle.[11] Therefore, recessions have an indirect but important effect on investment because they hamper firms' ability to finance investment from internal profits. The financial problems that often arise in recessions also probably raise the cost and limit the amount of external credit that firms can obtain. The recent "credit squeeze" is a case in point.[12] These observations imply again that the impact of fiscal policy on the course of the business cycle may be a much more important channel of influence for investment than effects that work through the cost of capital.[13]

Financial effects on investment interact with the business cycle in another more subtle way. Profit (or cash flow more broadly) is not the only source of internal finance for investment. Firms can also finance capital spending by reducing the amount of other assets they hold. For example, if firms face a downturn in cash flow but want to maintain investment spending without resorting to new borrowing or stock issues, they can sell off (or simply not replace) inventories, reduce their cash holdings, or tighten their policies on collecting accounts receivable. The funds released by these reductions in liquid assets can be used to temporarily "smooth" a firm's investment spending.[14]

The extent to which this kind of behavior can occur depends on the liquidity of firms. Firms' ability to cushion investment against downturns in cash flow will be impaired if they hold fewer liquid assets or are more heavily indebted going into the recession. Again, this point is particularly relevant to current conditions. Coming into the early 1990s, U.S. corporations had lower inventory stocks and much higher debt than in recent history. This low liquidity may have magnified the shortfall of investment in the recent slow growth and recession period. The metamorphosis of financial circumstances, therefore, increases the importance of macroeconomic fluctuations for investment, and it correspondingly magnifies the role of policies that both create and contain the business cycle.

IV. Empirical Evidence on the Determinants of Investment

A. Motivation and Data

The theoretical analysis summarized in the previous section identifies a number of channels through which policy may impact investment. Many of the papers cited above provide empirical evidence that can be used to sort through the relative size of the various channels, and thus to provide a quantitative basis for policy proposals. But this evidence tends to be fragmented and results are often inconclusive or contradictory.

Moreover, even though the analysis of investment determinants is fundamentally a microeconomic issue, relevant to the behavior of individual firms, most of the empirical studies on these issues are undertaken using aggregate data, often under the assumption that the entire economy behaves "as if" it could be described by a single "representative firm." Obviously, this approach precludes any evidence to support the view that heterogeneity among firms is important for policy purposes. While some studies do analyze firm-level data, they usually do not cover enough of the economy to support strong conclusions for macroeconomic policy.

For these reasons, this section presents new empirical evidence on the determinants of investment. The primary innovation in the approach taken here is in the data analyzed. The data sample is constructed from the "full coverage" files of the Standard and Poor's COMPUSTAT database. It provides information for over 5,000 U.S. manufacturing firms from 1971 to 1990

(about 53,000 observations). Over this period, the total capital spending by these firms accounts for 42 percent of total U.S. fixed capital investment.[15] Therefore, these data capture a large part of the economy. The extent of macrocoverage provided by this sample is, to the author's knowledge, greater than any previous study of U.S. investment with firm-level data. More will be said later about how to generalize the results to the rest of the economy.

To measure the sensitivity of investment to the major determinants discussed previously, the investment regression equation includes three sets of variables: sales growth, firms' internal cash flow, and the percentage change of the cost of capital. The sales growth variables are suggested by the accelerator theory.[16] The effect of internal cash flow represents the importance of finance constraints: When firms have higher cash flow, they will have greater control over their investment spending because they depend less on external funds (new debt or stock issues) that may be excessively costly, or even impossible to obtain.[17] The percentage change in the financial cost of capital, which includes interest rates and tax adjustments, reflects the conventional channels for policy influence on investment.

The regression equations presented here are called "reduced forms" in the research literature. That is, they simply relate the dependent variable, firm investment in this case, to various determinants suggested by theory without imposing any particular structure on the empirical relationship.[18] This approach has been criticized for purposes of policy analysis because new policies may change the empirical parameters estimated from data generated under the old policies (this problem is called the "Lucas critique" in the literature, after Robert Lucas whose work emphasized these

issues). After obtaining results and considering their significance for policy, it is vital to consider how proposed policy changes might affect the economic structure that generates the empirical results.[19]

B. Firm Heterogeneity

To address the possibility that the importance of various determinants of investment will likely differ across firms, I have divided the sample into groups based on each firm's average real sales growth. This is only one of a number of interesting sample splits, but it is particularly appropriate for the purposes of this research. The interest is in the effects of fiscal policies on investment across firms with different potential to contribute to the long-run growth of productivity, employment, and international competitiveness. Sales growth captures these characteristics. Fast-growing firms are the ones that have been successful at producing for changing markets. These firms are most likely to be hiring new workers in the greatest numbers, and they are also most likely to develop and adopt new technologies.

The sample is split into four groups. The details of the sales-growth classification are given in Appendix A. Inflation-adjusted sales of the negative-growth firms contracted, on average, by 1 percent or more over the sample period. Table 1 shows that these firms accounted for almost 18 percent of the observations, but under 4 percent of the total investment. Average real sales for zero-growth firms grew between negative 1 percent and positive 2 percent. The highest proportion of the observations, the majority of investment, and the biggest firms fell into the

moderate-growth class. These firms had real sales growth rates that averaged between 2 and 7 percent. The high-growth firms, with average growth rates above 7 percent were expanding very fast indeed (average sales growth of nearly 16 percent).

Table 1

Characteristics of Sample Firms by Sales-Growth Class

	Growth Class			
Variable	**Negative Class**	**Zero Class**	**Moderate Class**	**High Class**
Range of Average Sales Growth Included	Below -1%	-1% to +2%	+2% to +7%	Above +7%
Percent of Observations	17.6%	22.5%	39.9%	20.0%
Percent of Investment	3.4%	18.4%	66.4%	11.8%
Average Capital (1982 dollars, in millions)	$160	$491	$986	$245
Average Sales Growth	- 5.4%	+ 1.1%	+ 5.6%	+ 15.9%
High-Tech Percentage	36.3%	40.8%	45.5%	64.8%
Average Stock Price Growth	9.0%	9.2%	9.5%	11.6%
Average Employment Growth	0.6%	0.9%	4.5%	12.5%
Investment to Capital Ratio	0.117	0.153	0.196	0.319
R&D Spending to Capital Ratio	0.091	0.087	0.124	0.264
Share of R&D in Capital Spending	27.4%	25.0%	29.1%	37.0%

Source: Author's calculations from COMPUSTAT manufacturing firm database. See Appendix A for further details.

Table 1 also provides statistics that highlight further differences between these groups of firms. Not only are the high-sales-growth firms expanding more quickly, they are more concentrated in high-technology industries.[20] The higher-growth classes provided much more employment growth over the sample period and their gross investment rate (plant and equipment spending divided by the capital stock) was much higher. The stock market value of firms in the highest growth class rose more quickly than for the other firms. Finally, research and development spending was much higher for the faster-growing classes. Together these statistics show that the moderate-growth firms and especially the high-growth firms represent the most progressive sectors of the U.S. economy. For this reason, their investment is likely crucial for productivity growth and international competitiveness.

C. Regression Results

[An econometric discussion of the specification used, the lag pattern, and standard errors is presented in Appendix A. For summary results of the investment regressions, see Table 3 in Appendix B.]

The impact of changing capital costs, which include interest rates, however, is much less certain. The evidence suggests that higher real rates cause investment to fall only for the negative- and slow-growth firms. The estimated effects for the moderate- and fast-growth classes, which undertake over three-quarters of the investment in the sample, actually go the wrong direction. The pre- and after-tax regressions were also run with alternative interest rates, including yields

on Treasury securities of different maturities. The results did not change materially. The results presented in Table 3 are from the regressions that predicted the largest negative effects of changes in capital costs. Appendix A contains more details about these tests.

One possible reason that I fail to find negative effects of changing interest rates for growing firms is that the regressions use rates determined in centralized securities markets (the Baa corporate bond yield adjusted for inflation and corporate taxes, for the results in Table 3). The interest rates that individual firms face may well vary substantially from such centralized rates. While this point is of interest for economic theory, it is not particularly important for policy purposes. If policy affects investment through interest rates, it certainly works through the interest rates set by the centralized securities markets (these centralized rates may then, in turn, drive firm-specific borrowing rates). If the deficit, for example, raises real interest rates and crowds-out a substantial amount of private investment, then we should detect a negative impact of government bond rates on investment spending. If this effect does not ultimately affect the investment of growing firms in this sample it is hard to see how it could be important for aggregate investment.

Furthermore, it is unlikely that the firms that are not included in the sample will be more affected by aggregate variables than the sample firms. While the sample is extensive and contains much heterogeneity, the U.S. firms not included in the sample are certainly smaller on average, and probably have less access to centralized credit markets. Therefore, if any policy-induced effects of market interest rates or tax parameters on investment exist, they should show up in this sample.

Let us put these results into a more relevant perspective. How might they be used to evaluate the impact of the recently passed Budget Reconciliation Act of 1993? Many private forecasters predict that the combination of spending cuts and tax increases will reduce economic growth over a short to moderate horizon.[21] If total spending falls just as much as the projected deficit is reduced (that is, there are no "multiplier" effects), growth will be about 0.3 percentage points lower over the next five years. Suppose that each percentage point reduction in economic growth reduces cash flow by a conservatively small 1.5 percentage points.[22] These factors will reduce investment through the strong channels discussed above. The predicted impact of these changes on the investment-capital ratio are given in the first two columns of Table 3 for each sales-growth class. Note especially the substantial difference in the determinants of investment across firms with different growth characteristics. The depressing effect of lower cash flow is over 13 times more important for the high-growth firms than it is for the contracting class. The importance of heterogeneity in firm characteristics is clear in these results and such differences must not be ignored in policy discussions.

Table 2

Estimated Change in Investment Due to Budget Reconciliation Act of 1993

(Cumulative Results: 1994–1998)

Growth Class	Percentage Point Change in the Investment-Capital Ratio due to Changes in: Sales Growth	Cash Flow	Interest Rate	Net Effect	Percent of Investment
Negative	-0.28	-0.09	+0.34	-0.03	-0.26%
Zero	-0.32	-0.30	+0.34	-0.28	-1.83%
Moderate	-0.50	-0.53	+0.34	-0.69	-3.52%
High	-0.54	-1.19	+0.34	-1.39	-4.36%

Source: Author's calculations from a simulation based on the assumptions described in the text and the estimated investment model presented in Appendix A.

What effects of deficit reduction offset the drag on investment resulting from a weaker economy? The conventional wisdom is that lower interest rates will boost capital spending, helping to justify the sacrifices necessary to achieve deficit reduction. Indeed, as it became likely that Bill Clinton would win the election in the fall of 1992, long-term interest rates began to fall. This trend continued through the ultimate passage of the deficit reduction bill. As of August 12, 1993 (after President Clinton signed the bill), the yields on long-term corporate bond rates had fallen an average of 1.13 percentage points from their peaks during the previous year.[23]

Although long-term interest rates should largely adjust to account for the impact of deficit reduction as the policy is announced and enacted, to be conservative I assumed that long rates

will continue to fall by another 1.13 percentage points as deficit reduction is implemented over the next five years. Furthermore, also to be conservative, I assumed that the interest rate effects on investment for *all classes of firms* would be the same as those estimated for the contracting class even though the estimated model implies that these effects for growing firms were actually weaker (or went the wrong direction) in the data. This assumption implies that the interest rate effect assumed in Table 3 is the most favorable of all my estimates to the view that deficit reduction will help investment.

The cumulative impact of these conservatively large interest rate changes on investment, for 1994 through 1998, appears in the third column of Table 2. For the negative-growth firms, the stimulus to investment due to lower interest rates almost offsets the depressing effects of lower cash flow and reduced sales growth. But for all the other classes of firms, which undertake the vast majority of investment in the sample, the depressing effects of deficit reduction through weaker sales growth and cash flow dominate any stimulus due to lower interest rates.[24]

These calculations are only illustrative. Predicting the impact of deficit reduction on sales growth, cash flow, and interest rates is a very complicated problem. Changes in the economic environment might affect the relationship between investment and its determinants relative to the period from which the data were drawn (as suggested by the Lucas critique discussed above). There may also be complex feedbacks between investment, sales, cash flow, and interest rates in the macroeconomic system. A complete analysis of these issues is beyond the scope of this paper. Nevertheless, the results in Table 3 show that the pursuit of deficit reduction in the hope

of an interest rate–driven boom in capital spending over the next several years is a risky gamble. I now turn to a more detailed discussion of the implications of these results for fiscal policy debates.

V. Fiscal Policy and Investment

The research summarized in the previous section shows that the strength of the economy and firms' access to finance strongly affect the path of fixed investment in the United States. In contrast, the impact of changes in the cost of capital, including interest rates and tax incentives, is decidedly weaker, especially for fast-growing firms. What can we learn from these results that will help guide government fiscal policy in the coming years? I emphasize three broad lessons: (1) the importance for investment of maintaining healthy economic growth, (2) the likelihood that reduced government deficits will not stimulate private investment to a substantial extent, especially in the current economic environment, and (3) the need for "robust" policies to boost investment that will be effective through channels other than lowering the cost of capital.

It is very clear that the path of investment *is* the path of the business cycle. Investment will be strong when firms perceive growing markets for their goods. A strong aggregate economy also supports profits and improves firms' ability to finance capital spending without relying on external funds. The empirical evidence summarized above provides compelling evidence about the importance of these channels of influence on investment. If the economy stagnates because

the Federal Reserve squeezes the economy in its zeal to reach zero inflation or because Congress and the president cut spending and increase taxes in ways that lower sales and profit growth, one of the costs will be lower investment.

Moreover, these costs are not necessarily temporary. Capital, by its nature, is durable and takes time to build and install. Downturns of investment induced by macroeconomic stagnation may keep the capital stock below its long-run trend for many years, and the trend itself may be affected if economic weakness today reduces the rate of technical innovation.

A realistic assessment of the determinants of investment also leads to a second lesson that changes the terms of what has become the dominant concern in post-Reagan fiscal policy: the huge and persistent federal budget deficit. In the minds of many analysts and policymakers, the chief problem with the deficit is that government borrowing "crowds-out" private capital investment, with obvious negative consequences for the economy. How might this happen? Government borrowing raises market interest rates, supposedly discouraging private capital spending. An often-cited rationale for deficit reduction, therefore, is that lowering the deficit will release saving now soaked up by government borrowing, thus lowering interest rates and the cost of capital. Most parties in the debate *assume* that such an interest rate decline will spur corporate investment and stimulate economic growth.

However, if the sensitivity of investment to changing interest rates is weak (as my results clearly show), this stimulative effect is small. The assumption that lower interest rates will cause an

investment boom has little empirical support, especially for growing firms. But the deficit will not decline in a vacuum. As is becoming more apparent in Washington, deficit reduction involves pain. If taxes rise, someone's disposable income will be lower, and firms' sales and profits depressed. Furthermore, in spite of the popular support for deficit reduction through government spending cuts, a dollar reduction in government spending is a dollar reduction in some firm's sales or someone's income. Thus, deficit reduction, whether through higher taxes or lower spending, depresses sales growth and firm cash flow. The evidence shows that such changes will likely have a negative impact on investment.[25]

The results presented here, therefore, contradict much of the conventional wisdom about deficit reduction. The possible boost to investment from lower deficits and lower interest rates is highly uncertain; evidence shows that it may be minimal. But the threats of deficit reduction for investment, especially in an economy operating well below full employment and growing lethargically, are strongly supported by the statistical evidence (see Table 2 for more details).

Consequently, the policy now pursued in Washington appears risky. Candidate Bill Clinton (in his second debate with George Bush and Ross Perot) appeared to have a better perspective on the benefits and costs associated with deficit reduction than President Bill Clinton (whose policy proposals have obviously been tempered by the political constraints imposed by Congress, especially by an effective filibuster threat from the opposition). The candidate argued that the deficit was not the only or even the chief economic evil. While there undoubtedly are virtues to a lower deficit over some horizon, the first step should be to pursue policies to restore healthy

economic performance, as candidate Clinton recognized. Then, in a healthy economy, the deficit could be tackled.[26]

This analysis strongly suggests that concerns about investment, especially in an economy failing to fully utilize its labor and capital resources, should not stand in the way of policy initiatives that have important social value but that may also increase the deficit. Such policies include efforts to rebuild American infrastructure and to invigorate education. As Eisner (1992) argues, enhanced infrastructure and education will likely increase the productivity of private capital in the long run, which can only be good for private investment. Policy discussions about the costs and benefits of deficit reduction need to be better informed about the relative importance of the various empirical channels through which the government's budget impacts private capital spending.

A third lesson from the results presented here is that certain kinds of policy initiatives designed to lower the cost of capital, especially those that exclusively focus on increasing saving, are an unreliable way to promote investment. Again, it is often taken for granted that more saving implies substantially more investment. Theoretically, this link occurs because higher saving lowers interest rates and reduces the cost of capital. A large effect of saving on investment, therefore, requires a substantial sensitivity of investment to the cost of capital, which is not strongly supported by the data. Indeed, in weak economic conditions, saving initiatives could well do more harm than good. More saving implies less consumption and weaker aggregate demand, with lower sales growth and profits following. As a result, policies that increase saving could,

paradoxically, reduce investment, especially over a short to medium horizon.

Since the Clinton administration has successfully engineered a tax increase on relatively wealthy individuals, this conclusion is increasingly relevant to the current debate over income tax policy. There is concern that higher taxes on the class of agents that do the most saving will lower saving, and thus reduce investment. But since this process must work through the cost-of-capital channel, which I find to be relatively weak, the results presented here suggest little need for concern that higher taxes on the wealthy will have any deleterious effects on the level of investment.[27]

In addition, the widespread calls for a capital gains tax cut to stimulate investment rely on the view that lower taxes on the returns from capital will lower the price that savers require to make their funds available to investing firms.[28] While this idea was marshalled by the Bush administration and Republican members of Congress, it also has some support from prominent Democrats. In fact, a (relatively weak) capital gains tax break remains part of President Clinton's overhaul of fiscal policy (see Endnote 5). But according to the results presented here, even a spectacularly successful capital gains tax cut—one that lowered the real cost of capital by one or two percentage points—would have a relatively small effect on investment for stagnant and contracting firms. For the growing firms in the economy, there is no clear evidence that the lower cost of capital would stimulate investment.[29]

On a more positive track, because uncertainty still exists about the relative strength of the determinants of investment, we should look for "robust" policy: initiatives that will be effective under a number of different views about how the investment process works. Cuts in the capital gains tax rate do not qualify as a robust policy. They will only be effective if investment is sensitive to the cost of capital. More broadly, any attempt to increase investment by raising private or public saving will not be a robust policy because it relies exclusively on the questionable cost-of-capital channel. Consider policies, however, that put more cash in firms' hands such as investment tax credits, lower corporate income taxes, or accelerated tax deductions for capital depreciation.

These policies would reduce the cost of capital. But they also will increase cash flow and relax financial constraints.[30] This effect could well be more important for investment than the lower cost of capital, especially in new high-technology firms that are most likely to face financial constraints (see Fazzari, Hubbard, and Petersen, 1988a). Similar arguments can be made in favor of research and development credits (see Himmelberg and Petersen, 1994). The fundamental question is: Why should we pursue policies—which have no strong empirical support for their effectiveness and usually have regressive distributional consequences—to tinker only with the cost of capital, when we have the means to boost investment with policies that are effective through a number of different channels?

Economic ideas matter for policy. But the particular ideas that dominate policy debates at any point in time are not necessarily those with the strongest empirical support. The view that interest

rates and cost of capital constitute the most important policy lever for the determination of private investment is, unfortunately, an example of a dominant hypothesis that underlies current policy positions even though it lacks strong empirical support in the research presented here. I have argued that in the light of new evidence about the determinants of investment, the policy discussion should place greater weight on cyclical movements of the macroeconomy and financial conditions of the corporate sector, and less emphasis on the cost-of-capital channel. I believe such a shift of emphasis offers the best chance in the short run to restore healthy capital growth to the U.S. economy, with corresponding benefits for output, employment, productivity, and wages.

Appendix A

Econometric Study

Definition of Sales-Growth Classes

To limit the effect of extreme observations in the classification of firms, annual real sales growth figures in each year were capped between negative 20 and positive 20 percent. These limited sales growth data were then averaged for each firm. Firms were put into the negative-growth class if their average was less than negative 1 percent. The zero-growth class includes averages from negative 1 percent to positive 2 percent. Moderate growth covers 2 to 7 percent, and high-growth firms had real sales growth that averaged over 7 percent.

Data Definitions

Investment (I) is capital spending on plant and equipment from the firms' sources and uses of funds statements. Sales (S) is total revenue from operations less discounts or returns. Cash flow (CF) includes after-tax profits, depreciation and amortization expense, extraordinary items, and deferred taxes. The sales data were deflated by the GNP deflator. Cash flow and investment were deflated by the implicit deflator for nonresidential fixed investment.

The capital stock (K) calculations used estimates of capital price inflation and economic depreciation to calculate a replacement value of capital. The method used was similar to that reported in Fazzari, Hubbard, and Petersen (1988b) with modifications to better account for

acquisitions and divestitures and to measure depreciation more robustly. Further details about this calculation are available from the author.

The interest rate data used in the regressions reported in the text are the average yields on corporate bonds carrying Baa ratings taken from the 1991 *Economic Report of the President.* The percentage change in the real financial cost of capital (PCR), adjusted for expected inflation and the deductibility of nominal interest on corporate tax returns is taken from Chirinko and Fazzari (1993). Additional tests were conducted using one-year Treasury bill rates (real and nominal). The results for these alternative variables indicated weaker cost of capital effects than those for the real Baa rates, and there was virtually no effect of using the alternative changes in the financial cost of capital variables on the other results reported in the text.

Regression Sample Selection Criteria

All available annual data from COMPUSTAT for manufacturing firms (SIC codes 20 to 39) were put into the initial sample. The version of COMPUSTAT used to construct the sample included information from 1971 through 1990. The 1971 through 1973 data were used to construct lags and therefore the regression sample covers 1974–1990. Some observations were deleted because of major mergers, or large inconsistencies in the accounting information. The regressions reported in the sample exclude outliers of the ratios used in the regressions defined as follows: investment to capital (I/K) exceeding 2.0; real sales growth (SG) less than -75 percent or greater than 200 percent in a given year; cash flow to capital (CF/K) less than -2.5 or greater than 2.5. These limitations reduced the sample by just over 5 percent. The regression results were much more

robust after removing the outliers, especially for sales growth. The cash flow and cost of capital variables performed in similar ways in the full sample and limited samples. Tighter sample limits than those used for the reported regressions did not change the results materially.

Regression Specification and Estimation

The estimated regression equations had the form:

$$(I/K)_{jt} = a_j + (a_{10})\, SG_{jt} + (a_{11})\, SG_{jt-1} + (a_{12})\, SG_{jt-2}$$
$$+ (a_{20})\, (CF/K)_{jt} + (a_{21})\, (CF/K)_{jt-1} + (a_{22})\, (CF/K)_{jt-2}$$
$$+ (a_{31})\, PCR_{t-1} + (a_{32})\, PCR_{t-2}$$

where the variables are defined as above. The "a" symbols represent estimated coefficients. The j subscript indicates different firms; t indexes time periods. The ratios used for I/K and CF/K make these variables dimensionally equivalent to SG and PCR. This kind of specification also controls for the heteroscedasticity that would be substantial in firm data if the regression were run using the level of investment rather than the investment-capital ratio. Because the intercept term was allowed to vary across firms, the estimator used captures time-series variation (the "within" fixed-effects estimator for panel data). The regression results reported in the text are the sum of the coefficients on the contemporaneous and two annual lags for each variable except PCR. The contemporaneous value of PCR was dropped from the regression because simultaneity could have affected the estimation of this coefficient. When the contemporaneous PCR variable was included, it had a positive effect on investment in all the regressions. Thus, excluding

contemporaneous PCR makes the cost of capital effect more negative, increasing the strength of the conventional cost-of-capital effect.

Up to four annual lags of all the variables were also included in alternative regressions. The longer lags did increase the sums of the SG and CF/K variables. Longer lags of PCR, however, made their sums less negative. Therefore, basing the analysis on the shorter lag specification increases the relative size of the cost-of-capital effect. Including a lagged dependent variable also had little effect on the results, suggesting that serial correlation is not an important problem.

Regression Results

Complete regression results for the specification analyzed in the text follow. The estimated t statistics for the null hypothesis that the coefficient on each variable is zero are in parentheses below the parameter estimates.

Dependent Variable: $(I/K)_{jt}$

Ind. Variable	Negative Growth	Zero Growth	Moderate Growth	High Growth
SG_{jt}	0.069	0.091	0.143	0.170
	(10.0)	(12.6)	(22.6)	(14.9)
SG_{jt-1}	0.052	0.055	0.072	0.063
	(7.6)	(7.7)	(11.6)	(5.8)
SG_{jt-2}	0.024	0.013	0.032	0.034
	(3.5)	(1.9)	(5.4)	(3.4)
CF/K_{jt}	0.044	0.058	0.070	0.128
	(9.2)	(10.4)	(14.6)	(16.1)
CF/K_{jt-1}	0.060	0.086	0.105	0.149
	(12.6)	(14.8)	(21.1)	(19.0)
CF/K_{jt-2}	0.045	0.041	0.057	0.023
	(10.4)	(7.8)	(12.7)	(3.5)
PCR_{t-1}	-0.032	+0.014	+0.033	+0.089
	(2.1)	(1.0)	(2.8)	(3.6)
PCR_{t-2}	-0.001	-0.037	+0.018	+0.048
	(0.1)	(2.6)	(1.5)	(2.0)
Adjusted R-Squared	0.131	0.149	0.179	0.213

The adjusted R-squared figures do not include the explanatory power of the firm fixed effects. As mentioned in the text, it is clear that the statistical significance of the SG and CF/K variables is much stronger than the cost of capital variables.

Appendix B

As found by other studies, the sales growth (accelerator effects) are very strong. Also the cash flow effects that capture the impact of financial constraints are quite important. Both the sales growth and cash flow effects are much stronger for the faster-growing firms, a result that we shall discuss in more detail in a moment. One can overwhelmingly reject the hypothesis that these effects are in fact zero, with the positive estimated effect due simply to random variation. These results leave no doubt about the importance of sales growth and cash flow as determinants of investment.

Table 3 Summary of the Estimated Impact of Investment Determinants on the Investment-to-Capital Ratio
By Sales-Growth Class

	Independent Variables		
Growth Class	Sales Growth	Cash Flow	Percent Change of Capital Costs
Negative	0.145	0.149	- 0.033
Zero	0.159	0.185	- 0.023
Moderate	0.247	0.232	+0.051
High	0.267	0.300	+0.137

Source: Author's calculations from the COMPUSTAT manufacturing firm database. The figures are the sum of the regression coefficients for the independent variables. See Appendix A for specification details and t statistics.

Endnotes

1. In principle, tax changes to stimulate saving need not be regressive. For example, a consumption tax with steeply increasing tax rates as consumption rises could increase the progressivity of federal taxes for many individuals. In practice, however, most proposals that have been put on the table to increase saving, the capital gains tax cut in particular, provide greater benefits to individuals with higher incomes.

2. This "gross" measure of investment includes capital spending that replaces depreciated capital. Conceptually, "net" investment, which excludes depreciation, may provide a better measure of the growth of productive capital. But the statistical adjustments made to account for depreciation are controversial. Recent net investment data have a much more pronounced downward trend.

3. This assumption is quite standard, but it can be questioned, especially if the economy is operating below full employment. I assume here that deficits do increase real interest rates and then I estimate the effect of this increase on investment. If deficits do not increase real interest rates substantially, the analysis presented here still applies, but the focus of the policy discussion will be somewhat different.

4. The Tax Reform Act of 1986 removed the personal tax exclusion for capital gains income. Nevertheless, capital gains income still enjoys a substantial tax advantage because shareholders can defer tax on the increase in the value of assets until they sell these

assets, and heirs pay no capital gains taxes on assets held until death. The size of this benefit rises the longer one holds an appreciating asset. See Auerbach (1992) for further discussion. As mentioned previously, the tax reform passed by Congress in the summer of 1993 expands the tax preference for capital gains income because it raises tax rates on other kinds of income for wealthy taxpayers.

5. See, for example, the treatment in Jorgenson and Yun (1989). A less technical explanation for many of these tax adjustments and a discussion of how they were affected by the Tax Reform Act of 1986 can be found in Fazzari (1987).

6. More recently, much empirical work on investment has focused on the estimation of "Euler equations" derived from explicit dynamic models of firm value maximization. This work is not particularly relevant for the discussion here since the structure of Euler equations usually imposes an important role for the cost of capital rather than testing this impact. Furthermore, the assumptions that underlie the Euler equation approach are often rejected empirically.

7. Further stimulus to private investment from infrastructure spending will arise if public capital enhances the productivity of private capital. For example, better water and sewer systems probably increase the productivity of manufacturing plants. Robert Eisner (1992)

makes similar arguments.

8. The primary stabilizing factor is price adjustment. The relevant references are too numerous to include here. See Caskey and Fazzari (1987) and Tobin (1993) for more information.

9. This point is an application of the more general concept of "first-mover" advantages; its relevance for the link between investment and finance is discussed in Fazzari and Petersen (1993).

10. Although the resurgence of interest in this topic is relatively new in the economic mainstream, it is prominent in earlier ideas about investment, going back at least to Keynes (1936). Also see Meyer and Kuh (1957) and Minsky (1975). For a more extensive discussion of the ideas and results presented here, and for additional references, see Fazzari, Hubbard, and Petersen (1988b).

11. From 1971 through 1990, the correlation between real growth in corporate profits and GNP was 73 percent. Over the same period, a one percentage point change in GNP growth was associated with just under a five percentage point change in corporate profit growth. See Carpenter, Fazzari, and Petersen (1993) for further discussion.

12. See Bernanke and Lown (1991) for a statistical analysis of the credit squeeze and discussion of its potential causes.

13. Gertler and Hubbard (1988) find support for the view that financial conditions constrain investment more tightly in recessions.

14. This argument is discussed in detail and supported by empirical evidence in Fazzari and Petersen (1993). Also see the analysis in Carpenter, Fazzari, and Petersen (1993).

15. Because of changes in the number of firms tracked over time, the proportion of aggregate fixed investment covered by the sample changes. It peaks at 49.2 percent in 1981, and the low point is 36.1 percent in 1973.

16. Most accelerator models relate the level of investment to the level or the difference in sales. At the firm level, however, this relation depends on the firm's capital-output ratio. This ratio can differ substantially across firms. Under the assumption that the capital-output ratio is constant for a particular firm, but not the same across firms, the relation between the investment-capital ratio and sales growth captures the accelerator effect.

17. See Fazzari, Hubbard, and Petersen (1988b) and Fazzari and Petersen (1993) for extensive discussion of how to interpret the cash flow–investment link. In particular, these papers

analyze how to distinguish financial effects on investment from the possible role played by cash flow as a proxy for factors that shift investment demand.

18. One must assume a functional form for the regression equation. It is usually linear, which can be viewed as a general approximation to more complicated functions.

19. Another approach to address the Lucas critique employs economic theory to derive empirical specifications that allow estimation of parameters that do not vary with policy changes. But one can usually identify such specifications only under restrictive assumptions. The particular issues involved are beyond the scope of this paper. Briefly, to capture the effects of a variety of important issues (the importance of financial constraints or heterogeneity across different kinds of firms, for example), it would be difficult, if not impossible, to use an approach that solved the problems of the Lucas critique in all respects. Moreover, attempts to overcome some of the Lucas critique problems along these lines would necessarily impose very restrictive assumptions on the analysis, which have often been rejected in other empirical work on investment.

20. I considered an observation in a high-technology industry if the firm's primary standard industrial classification (SIC) two-digit code was 28 (chemicals), 35 (machinery), 36 (electrical components), or 38 (instruments). See Himmelberg and Petersen (1994) for a further discussion of these industries and additional references.

21. See, for example, the article "Economists Expect Impact of Plan Will Be Limited," *Wall Street Journal,* August 9, 1993, p. A4 by Rick Wartzman and Lucinda Harper. The economists surveyed in this article predict a reduction in real economic growth of 0.25 to 1.00 percentage points.

22. Carpenter, Fazzari, and Petersen (1993) report that cash flow is four to five times more volatile than sales (using coefficients of variation).

23. This calculation was based on the Merrill Lynch Bond Indexes, averaging across maturities and quality. The data were taken from page C16 of the *Wall Street Journal,* August 13, 1993.

24. These effects refer only to business fixed capital investment. They do not include possible stimulus to residential investment resulting from lower interest rates. Also, the simulated effects do not account for the possibility that lower interest rates might help investment indirectly by increasing cash flow. Estimating this effect would require additional equations that are beyond the scope of this study. Note, however, that even if this feedback effect were to completely offset reduced cash flow, the simulated net impact on investment from deficit reduction would remain negative for the moderate- and high-growth firms that account for about 79 percent of investment in the sample.

25. The link between deficits and firm cash flow and profits was a key element of the

economic analysis of Jerome Levy. See Levy and Levy (1983).

26. It should be noted that the Clinton administration, consistent with the candidate's stance in the campaign, did pursue an economic stimulus package in advance of deficit reduction, albeit a small one. This measure was killed in the Congress, however. Two of the substantive concerns about the deficit are the regressive distributional effect of broad-based taxes levied to pay interest on the national debt and the international distributional consequences of foreign holding of U.S. government assets. In addition, if reduced deficits do lower interest rates, deficit reduction could reduce the exchange value of the dollar and bolster exports and international competitiveness.

27. If personal tax increases reduce consumption, they will weaken the economy and hurt investment through the strong sales growth and cash flow channels. It is likely, however, that by targeting tax increases more toward the wealthy, the depressing effects of lower consumption will be less severe relative to what might occur after a broad-based tax increase.

28. Some economists have suggested that the capital gains tax rate operates through an alternative channel by stimulating venture capital. A detailed analysis of this idea is beyond the scope of this paper. I note, however, that venture capital accounts for a very small proportion of investment finance in the U.S. Moreover, the benefits from an overall capital gains tax cut would accrue overwhelmingly to the owners of assets that do not

qualify in any sense as venture capital.

29. Another argument often made for cutting capital gains taxes is that the allocation of investment will be improved by lowering what is often called the "lock-in" effect. Because capital gains are taxed only when assets are sold, the capital gains tax creates an incentive to hold on to assets longer than might be optimal. But as Auerbach (1992) discusses, this problem could be solved by taxing capital gains at the time they are accrued rather than when they are realized by asset sales (effectively increasing the capital gains tax rate). The lock-in effect alone is not an effective justification for lower capital gains tax rates.

30. William Vickrey (1992, p. 307) favors cutting or eliminating corporate taxes as opposed to capital gains initiatives for similar reasons. One way to understand this issue more formally is to recognize that in the conventional view, taxes on marginal investment are what matter. But if a tax cut is more important empirically for investment because lower taxes increase cash flow, rather than because lower taxes reduce the cost of capital, the average tax burden on firms is what matters. This point is made by Fazzari, Hubbard, and Petersen (1988a). Petersen (1991) provides empirical evidence that the cash flow impact of tax cuts is indeed important for investment. See Meyer, Prakken, and Varvares (1993) for a balanced discussion about the marginal and average effects of an increase in the investment tax credit.

References

Auerbach, Alan J., "On the Design and Reform of Capital-Gains Taxation," *American Economic Review*, Vol. 80, May 1992, pp. 263–267.

Bernanke, Ben S., and Carla Lown, "The Credit Crunch," *Brookings Papers on Economic Activity,* 1991, Number 2, pp. 205–239.

Blecker, Robert, "Are Americans on a Consumption Binge? The Evidence Reconsidered," Economic Policy Institute, 1990.

Carlson, Keith M, "The Future of Social Security: An Update," *Review*, Federal Reserve Bank of St. Louis, Vol. 73, January/February 1991, pp. 33–49.

Carpenter, Robert, Steven M. Fazzari, and Bruce C. Petersen, "Inventory (Dis)Investment, Internal Finance, and the Business Cycle," mimeo, Washington University in St. Louis, August 1993.

Caskey, John P., and Steven M. Fazzari, "Aggregate Demand Contractions with Nominal Debt Commitments: Is Wage Flexibility Stabilizing?," *Economic Inquiry*, Vol. 25, October 1987, pp. 583–597.

Chirinko, Robert S., "Business Fixed Investment Spending: A Critical Survey of Modeling Strategies, Empirical Results, and Policy Implications," Federal Reserve Bank of Kansas City, 1991.

Chirinko, Robert S., and Steven M. Fazzari, "Factors in Business Investment: An Econometric Exploration," mimeo, September 1993.

Clark, J. M., "Business Acceleration and the Law of Demand: A Technical Factor in Economic Cycles," *Journal of Political Economy,* Vol. 25, March 1917, pp. 217–235.

Eisner, Robert, "Deficits: Which, How Much, and So What?," *American Economic Review*, Vol. 80, May 1992, pp. 295–298.

Fazzari, Steven M., "Tax Reform and Investment: Blessing or Curse," *Review*, Federal Reserve Bank of St. Louis, Vol. 69, June/July 1987, pp. 23–33.

Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen, "Investment Financing Decisions and Tax Policy," *American Economic Review*, Vol. 78, May 1988a, pp. 200–205.

——, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity*, 1988b, Number 2, pp. 141–195.

Fazzari, Steven M., and Bruce C. Petersen, "Working Capital and Fixed Investment: New Evidence on Financing Constraints," *Rand Journal of Economics,* Vol. 24 (Autumn), 1993.

Friedman, Benjamin M., "U.S. Fiscal Policy in the 1980s: Consequences of Large Budget Deficits at Full Employment," *Debt and the Twin Deficits Debate*, edited by James M. Rock, Bristlecone Books, Mountain View, Calif., 1991.

Gertler, Mark, and R. Glenn Hubbard, "Financial Factors in Business Fluctuations," *Financial Market Volatility*, Federal Reserve Bank of Kansas City, 1988, pp. 33–78.

Hahn, Frank H., "Solowian Growth Models," *Growth/Productivity/Unemployment*, edited by Peter Diamond, MIT Press, Cambridge, Mass., 1990.

Harris, Ethan S., and Charles Steindel, "The Decline in U.S. Saving and its Implications for Economic Growth," Federal Reserve Bank of New York *Quarterly Review*, Vol. 15, Winter 1991, pp. 1–19.

Himmelberg, Charles P., and Bruce C. Petersen, "R&D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries," *Review of Economics and Statistics*, forthcoming, 1994.

Jorgenson, Dale W., "Econometric Studies of Investment Behavior: A Survey," *Journal of Economic Literature*, Vol. 53, December 1971, pp. 1111–1147.

Jorgenson, Dale W., and Kim-Young Yun, "Tax Policy and the Cost of Capital," Discussion Paper Number 1465, Harvard Institute of Economic Research, Cambridge, Mass., November 1989.

Keynes, John M., *The General Theory of Employment, Interest, and Money,* Macmillan, London, 1936.

Levy, S Jay, and David Levy, *Profits and the Future of American Society*, Harper & Row, New York, 1983.

Lindsey, Lawrence B., "The Case for Disinflation," *Economic Commentary*, Federal Reserve Bank of Cleveland, March 15, 1992 (transcription of an address to the Government Bond Club of New England given on March 12, 1992).

Meyer, John, and Edwin Kuh, *The Investment Decision*, Harvard University Press, Cambridge, Mass., 1957.

Meyer, Laurence H., Joel Prakken, and Chris Varvares, "Designing an Effective Investment Tax Credit," *Journal of Economic Perspectives,* Vol. 7, Spring 1993, pp. 189–196.

Minsky, Hyman P., *John Maynard Keynes*, Columbia University Press, New York, 1975.

Petersen, Dorothy, "Do Average Tax Rates Matter for Corporate Investment?," mimeo, 1991.

Poterba, James M., "Comparing the Cost of Capital in the United States and Japan: A Survey of Methods," Federal Reserve Bank of New York *Quarterly Review*, Vol. 15, Winter 1991, pp. 20–32.

Stiglitz, Joseph, and Andrew Weiss, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, Vol. 71, June 1981, pp. 393–410.

Tobin, James, "Price Flexibility and Output Stability: An Old Keynesian View," *Journal of Economic Perspectives*, Vol. 7, Winter 1993, pp. 45–66.

Vickrey, William, "Meaningfully Defining Deficits and Debt," *American Economic Review,* Vol. 82, May 1992, pp. 305–310.

Wessel, David, "Wanted Fiscal Stimulus Without Higher Rates," *Wall Street Journal*, October 5, 1992, p. 1.

Youngblood, Dick, "Quick Fix Means Economy Will Be Long-Term Broke," *Minneapolis Star Tribune*, January 27, 1992.