Journal of Economic Perspectives- Volume 7. Number 2- Spring 1993- Pages 189–196

Policy Watch
Designing an Effective Investment Tax Credit

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Public policies are often made without much recourse to economic reasoning. Economists are often unaware of what is happening in the world of public affairs. As a result, both the quality of public decision-making and the role that economists play in it are less than optimal. This feature contains short articles on topics that are currently on the agendas of policy-makers, thus illustrating the role of economic analysis in illuminating current debates. Suggestions for future columns and comments on past ones should be sent to Timothy Taylor, c/o Journal of Economic Perspectives, Department of Economics, Stanford University, Stanford, CA 94305-6072.

Introduction

The investment tax credit (ITC) allows firms to reduce their tax liability by an amount related to their expenditures on equipment, and thus reduces the cost of acquiring capital. Provisions of this sort have been introduced and repealed several times in the last 30 years. A 7 percent ITC on gross investment in business equipment was introduced initially in 1962 during the Kennedy administration; it was repealed in 1969, then reinstated in 1972, raised to 10 percent in 1975 and finally repealed in 1986 under President Reagan as part of the Tax Reform Act.

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An investment tax credit can be introduced temporarily to stimulate investment as part of a countercyclical fiscal policy, or permanently as part of a strategy to enhance capital formation, raise labor productivity, and so speed longer-term economic growth. The discussion in this paper will focus mainly on the permanent ITC, although it will include some comments on the temporary version. As this paper is being written, President-elect Clinton is widely expected to propose an ITC (of some sort) to Congress soon after taking office. Since the federal deficit continues to constrain fiscal policy, attention has been focused on designing an ITC that delivers the greatest stimulus per dollar loss of revenue.

The ITC in Macroeconomic Analysis

Most economists consider a permanent investment tax credit within the context of neoclassical investment theory, pioneered during the 1960s by Hall and Jorgenson (1967). According to this view, the equilibrium stock of capital depends upon the "user cost" of the marginal unit of capital. The user cost itself is a function of the real rate of interest, the relative price of the investment good, its rate of depreciation, and the tax treatment of income derived from capital. The introduction of a permanent ITC raises the desired stock of capital by lowering its user cost. A spurt of net investment ensues as the actual capital stock adjusts towards its new, higher equilibrium level.

A substantial body of empirical evidence has accumulated to support the existence of a statistical relationship between the capital stock and the user cost of capital. A typical result is that a 10 percent ITC lowers the user cost of capital by about 10 percent, and that, for an unchanged interest rate, the capital stock rises by about 10 percent over a period of several if not many years.[1] In our own recent work we have estimated that a 10 percent reduction in the user cost would raise the capital stock by a lesser 6 percent (that is, we have estimated the elasticity of substitution to be 0.6 rather than unity), a comparatively conservative figure.[2]

Most studies of the elasticity of investment with respect to the cost of capital have relied on "partial equilibrium" analysis, which assumes that the interest rate is fixed, or to put it another way, that the supply of saving required to finance the higher demand for investment is perfectly elastic. But of course, unless the additional saving can be induced effortlessly from either the private sector or from foreigners, or unless the federal government pays for the credit by cutting spending or raising some other tax, the rate of interest must rise.

[1]See the citations in Hall and Jorgenson (1967) and the analysis in Bischoff (1971) for evidence supporting a unitary elasticity of substitution.

[2]In some work of our own (1991) we have estimated the elasticity of substitution between capital and labor to be as low as 0.4. However, in the current version of our econometric model, estimated after the last benchmark revision of the National Income Accounts and used to generate the results reported in this paper, this key parameter assumes the still conservative value of 0.6.

This, in turn, may either coax forth additional saving or reallocate investment away from those capital goods not favored with the ITC; it also undermines the original increase in investment demand brought about by the introduction of the ITC. In general equilibrium analysis, therefore, the increase in the capital stock and the associated rise in potential output almost certainly will be less—perhaps dramatically so—than in the simpler partial analysis. In addition, neoclassical models of investment assume that firms enjoy unimpeded access to capital markets. In fact, if firms must rely on cash flow to finance investment, their response to an ITC could be delayed if not reduced.

Since a temporary ITC does not change the long-run user cost of capital (by definition), it can have no permanent impact on the stock of capital. Instead, the effect that a temporary ITC has on aggregate demand derives from the efforts of firms to minimize their tax burden by accelerating investment spending that would have occurred anyway. Economists have little idea how much investment can be pulled forward in time by a temporary ITC. However, many knowledgeable observers feel that the impact is probably larger than would be generated by a permanent ITC in its first year.

Several arguments in favor of an ITC have been advanced that go beyond the straightforward claim that the user cost of capital should be reduced. One is that an ITC can be used crudely to offset the adverse effects of other elements of the tax code biased against investment, such as the double taxation of dividends or the deduction of depreciation allowances in historical rather than replacement prices. Another line of argument is based on the premise that the social returns to investment, or to particular kinds of investment, exceed the private returns. While this argument is standard for investments in R&D, more recently De Long and Summers (1991) have argued that it applies more generally to investment in equipment. This also suggests providing an incentive only to equipment, rather than to all business fixed investment.

Design and Effectiveness

In the United States, the investment tax credit historically has applied to gross investment in business equipment, defined quite broadly. In principle, however, the ITC can be designed in a variety of ways, with differing consequences for the incentive to invest and the amount of federal tax revenue lost.

For example, the revenue loss can be curtailed by limiting the size of the ITC, by "targeting" it to a particular subset of investment goods, or by making it temporary rather than permanent. Unfortunately, in each of these three cases the undesired side effect is to reduce (or eliminate entirely) the long-term expansion of aggregate supply associated with the credit. Hence, the challenge for economists is to design an ITC that preserves as much of the long-run advantage of the credit while surrendering the least possible federal revenue—that is, to design an ITC with the biggest bang for the buck.

The incentive for capital formation afforded by an ITC is determined by the credit received on the marginal (or incremental) unit of investment. However, the government's associated loss of revenue depends not on the marginal credit but rather on the average. Hence, the key to designing an effective ITC is to create an incentive for investment with a high marginal credit while minimizing the loss of revenue with a low average credit. In the remainder of this section we consider four specifications of the ITC and present simulation results using the Washington University Macroeconomic Model. We began with a baseline simulation, projecting the evolution of the macroeconomy in the absence of the implementation of the ITC. Next, each specification of the ITC is introduced, effective January 1, 1993, and we traced the effects through 1996. Table 1 reports comparisons of how each of the four policies would affect key variables like equipment spending, real GDP, tax revenue, and others by 1996, relative to the baseline simulation.

The first option, an *ITC on Gross Investment*, is the sort of credit allowed historically in the United States. All investment qualifies for the credit whether that investment simply replaces depreciating capital or serves to increase the capital stock. Therefore, an investing firm may claim the credit not only the first time that a piece of equipment is purchased, but thereafter whenever that equipment is replaced. By the end of 1996, this sort of credit raises real GDP by $57.4 billion and employment by 800,000 (as shown in column 1 of Table 1). To gauge the dynamic "bang for the buck" of the ITC on gross investment, we have divided the rise in the nominal equipment stock by the end of 1996 by the corresponding increase in the federal debt to arrive at a ratio of 0.8. The drawback to an ITC on gross investment is that the marginal and average credits are the same. Consequently, it offers the largest incentive of any design considered here, but also surrenders the most revenue by subsidizing the replacement of capital already in operation.

Under the second proposal, an *ITC on Net Investment*, only investment that increases the capital stock qualifies for the credit. In other words, an investing firm may claim the credit with an original purchase of equipment, but not each time subsequently when that equipment is replaced. Clearly, this formulation reduces the loss of revenue, but it also offers less incentive for capital formation than an ITC on gross investment. The shortcoming of this design is that it reduces both the average and the marginal credit by a factor that reflects the share of net in total investment.

By the end of 1996, a net ITC would raise real GDP by $10.5 billion and employment by 100,000 (see column 2 of Table 1). The ratio of the increase in the nominal equipment stock to the increase in the federal debt is 1.1, better but not much different than for the ITC on gross investment. This underscores an interesting point. The two designs have similar "bang for the buck" because formulating the credit in net terms does not raise the marginal credit relative to the average. However, the ITC on net investment has only about one-sixth the power (or "bang") of an ITC on gross investment precisely because it is relatively unsuccessful at reducing the user cost of the marginal unit of capital.

Table 1

The Impacts of Four Different ITCs

(relative to baseline by 1996)

	On Gross PDE	*On Net PDE*	*On Gross PDE Above Fixed Base*	*On Gross PDE Above Moving Base*
GDP (Bil $87, SAAR)	57.4	10.5	56.1	51.8
PDE (Bil $87, SAAR)	41.6	6.7	41.3	37.9
Real PDE Stock (Bil $87)	96.8	15.9	94.3	88.3
User Cost of PDE (%)	−11.9	−2.8	−11.9	−11.4
Employment (Mil)	0.8	0.1	0.8	0.7
Federal Deficit (Bil $)	44.7	7.4	12.4	7.5
Nominal PDE Stock (Bil $)	101.3	17.9	98.2	92.1
Federal Debt (Bil $)	130.2	16.5	23.0	14.9
"Bang for the Buck"	0.8	1.1	4.3	6.2

Source: Laurence H. Meyer & Associates (November 1992)

Note: PDE is Producers' Durable Equipment; SAAR is Seasonally Adjusted Annual Rate.

Under a third version, an *ITC on Gross Investment Above a Fixed Base*, gross investment in excess of some fixed (nonzero) threshold qualifies for the credit; if the threshold is chosen to be the level of depreciation at the time the ITC is introduced, this version of the ITC amounts to a credit on any investment that first raises and then maintains the capital stock above its initial level. If originally an investment qualifies for the credit, it also will qualify thereafter whenever it is replaced. Hence, an ITC on gross investment above a fixed base offers the same incentive for investment as an ITC on all gross investment. However, the revenue loss initially is much smaller, increasing over time only as investment advances further and further above the fixed threshold. This design sharply reduces the average credit relative to the marginal. To perform this simulation, the expression in the model for federal tax receipts was altered to reflect the assumption that only spending on equipment in excess of a fixed base of $301 billion qualifies for the ITC. This figure is 80 percent of the baseline level of nominal spending on equipment in 1992, and roughly equals depreciation on equipment in that year.

By the end of 1996, real GDP had risen $56.1 billion (or 1 percent) and employment is higher by 800,000 (see column 3 of Table 1). Thus, the real effects of an ITC on gross investment above a fixed base are practically identical to the real effects of the ITC on all gross investment. However, while the latter loses $130 billion of revenue over four years, the former loses only $23 billion and so, in terms of the measure used here, supplies over four times the bang for the buck.

It is tempting to presume that revenue lost in the "out years" to an ITC on investment above a fixed base can be re-captured painlessly by defining the base as a moving average of the levels of investment undertaken by the firm in

preceding years. The simplest such example (where the moving average is only one year) is an ITC applicable to investment in excess of the previous year's level. Schemes like this one that relate the base to a firm's past investment are akin to the ITC on net investment: if depreciating capital is replaced continuously, the investing firm claims a credit on an original purchase of equipment, but not on its subsequent replacement. Hence, while the loss of revenue is limited to the credit granted with the original purchase of equipment, the incentive to invest also is curtailed sharply.

Both an ITC on net investment and on gross investment above a moving base lose comparatively little revenue, but do so by undermining the inherent incentive for investment. The reason is that, under both these schemes, firms realize that investments taken today reduce the value of tax credits in the future. However, if the threshold can rise in a manner not directly related to a firm's decisions, then the ITC affords a fuller possible incentive to invest with a smaller reduction revenue. One such scheme is to augment the threshold each year by an amount that reflects not the firm's past investment behavior, but the growth rate of the aggregate economy—a variable beyond the influence of any single investor. Then, the cumulative loss of revenue could be curtailed sharply without undermining the incentives for investment otherwise afforded by the ITC.

In this fourth version, an *ITC on gross equipment spending above a moving base*, the base is raised at the beginning of every calendar year by an amount reflecting the growth rate of nominal GDP over the previous four quarters. The simulation results show that by the end of 1996, real GDP is up $51.8 billion and employment is higher by 700,000 (see column 4 of Table 1). On one hand, the floating nature of the base slightly diminishes the impetus to investment (and overall GDP) compared to the case in which the base is fixed. On the other hand, a $92.1 billion rise in the nominal equipment stock is accomplished by surrendering only $14.9 billion of federal revenues, a ratio of 6.2 compared to 4.3 when the base is fixed.

Conclusions and Caveats

This analysis suggests that an investment tax credit on gross investment above either a fixed base or a base that grows with the overall economy is well-suited to stimulate aggregate demand and enhance potential output at a time when policy-makers are especially deficit-conscious. By our measure, an ITC on gross investment above a fixed base delivers about five times the "bang for the buck" as an ITC on all gross investment; if the base rises with the overall economy, the margin is nearly eight to one!

There are, however, two sets of reservations about this conclusion. The first includes qualifications that would reduce the effectiveness of any of the specifications of the ITC considered above and the second identifies qualifications that would reduce the effectiveness of a marginal relative to a gross ITC.

On balance, all the reservations suggest that there may be some upward bias in the effectiveness of the ITC in the simulation results.

All our simulations presume that an ITC actually does lead to an increase in the demand for capital. As noted earlier, many researchers have adopted a value of unity for this key parameter, and our estimate is a conservative (we think) 0.6. However, on the basis of their econometric analysis, some researchers have concluded that the elasticity of substitution is zero.[3] In that case, an ITC of any design ultimately surrenders tax revenue without encouraging any additional capital formation, certainly an unfavorable trade-off. The same would be true if additional saving, whether domestic or foreign, or a reallocation of investment towards spending on equipment cannot be affected by a rise in the rate of interest.

In the United States, corporations must pay the larger of their tax liability computed under the regular corporate income tax, or their tax liability computed under the rules of the alternative minimum tax. We believe that as the law currently is written, firms filing under the alternative minimum tax could not claim an ITC were the credit re-instituted. Since perhaps as many as half of corporations now file under the alternative minimum tax, including an impressive array of our nation's largest businesses, any form of ITC would have much less impact than suggested here unless the alternative minimum tax is relaxed to allow claiming of the credit. Relaxing the AMT to allow the full effect of an ITC, however, might partly defeat the purpose of the AMT, namely, to insure a fairer distribution of taxes across corporations.

Our results build upon a neoclassical assumption that all companies enjoy unimpeded access to capital markets. If, however, some firms' investment is constrained by the availability of internally generated cash flow (for example, Fazzari, Hubbard and Peterson, 1988), a gross ITC will be more effective than a marginal specification because the former yields more cash flow than the latter. The same conclusion is reached if firms assign a significantly lower opportunity cost to internally generated funds than they do to monies raised in capital markets.

The incremental designs also can be faulted on the grounds that they favor strong firms over weak, or younger and expanding firms over mature companies. Another potential difficulty is that firms will "game" the incremental versions of the ITC, changing organization structure in an effort to maximize the credits they can claim. While careful legal design might limit this sort of abuse, enforcing such steps is costly and there remains disagreement as to whether it is even possible to write legislation that would enforce a "marginal" ITC.

Finally, if the base moves with the macroeconomy, there is a danger that many firms might not be able to take advantage of the marginal credit when the economy slips into recession. In this case, the marginal credit would work

[3]See, for example, the pure "accelerator" specification of investment equations on pp. 124–26 in Ray Fair's (1976) macroeconomic model.

as an automatic de-stabilizer, encouraging pro-cyclical patterns of investment. The chances of this pitfall could be minimized by tying the base not to nominal GDP, but rather to the nominal level of aggregate investment in equipment. Doing so would also ameliorate similar problems that could arise if the relative price of equipment continues to fall as sharply in the future as it has in the past.

Finally, the constraints imposed by the Omnibus Budget Reconciliation Act (OBRA) suggest that the merits of a particular ITC should not be judged in isolation from other elements of the entire package of which the credit necessarily must be a part. For example, because the ITC on all gross investment loses considerably more revenue than the incremental versions of the credit, it would have to be paired with much larger spending cuts or tax increases to conform with the "pay as you go" rules set forth in OBRA. If an ITC on all gross investment was paired with large spending cuts and tax increases that discouraged current consumption, the total package might enhance long-run potential output more than an incremental version of the ITC combined with comparatively small cuts in spending or tax increases. However, if an ITC is to be paid for by raising other taxes on capital, then the incremental designs surely must be preferable in the context of a deficit-neutral package of fiscal initiatives.

■ *The analysis of the investment tax credit reported here was begun as a study for the Clinton Campaign Committee. During our work for the Clinton campaign, we benefited from discussions with Alan Blinder and Robert Solow about the implications of alternative specifications of the ITC. We alone are responsible for any errors in the analysis.*

References

Bischoff, Charles W., "The Effects of Alternative Lag Distributions," Fromm, Gary, ed., *Tax Incentives and Capital Spending*. Washington, DC: The Brookings Institution, 1971, 61–130.

De Long, J. Bradford and Lawrence H. Summers, "Equipment Investment and Economic Growth, Quarterly Journal of Economics, May 1991, *106*, 445–502.

Fair, Ray C., "A Model of Macroeconomic Activity," Vol. II. *The Empirical Model*. Cambridge: Ballinger Publishing Co., 1976.

Fazzari, Steven, R. Glenn Hubbard, and Bruce Peterson, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity*, 1988, *19*, 141–95.

Hall, Robert E. and Dale W. Jorgenson, "Tax Policy and Investment Behavior," *American Economic Review*, June 1967, *57*, 391–414.

Prakken, Joel L., Chris P. Varvares, and Laurence H. Meyer, "Tax Reform and Potential Output: A Retrospective analysis of the Tax Reform Act of 1986." In Melzer, Allan H. and Charles I. Plosser, eds., Carnegie Rochester Conference Series on Public Policy, 1991, *35*, 113–184.