

# Report for Congress

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## Using Business Tax Cuts to Stimulate the Economy

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Jane G. Gravelle  
Senior Specialist in Economic Policy  
Government and Finance Division

# Using Business Tax Cuts to Stimulate the Economy

## Summary

Increased interest in providing business tax cuts to stimulate the economy has followed the terrorist attacks of September 11, 2001, which heightened concerns about an economic slowdown. Among the tax proposals discussed were a corporate rate cut and an investment subsidy; the final version of H.R. 3090 enacted in March 2002 contained the latter: temporary partial expensing for equipment. Interest in this issue continues, including proposals by President Bush for reductions in taxes on corporations through dividend relief

Some economists suggest that additional fiscal stimulus is not needed; others also doubt the efficacy of fiscal policy in general, especially in an open economy and given the difficulties of achieving proper timing. Also, deficit financing of a tax cut has potential negative long run effects because it crowds out investment; a stimulus designed to increase investment spending (rather than consumption spending) would, if successful, reduce that negative effect. Investment subsidies had largely been abandoned as counter-cyclical devices over the last two decades, in part because of lack of evidence from statistical studies relating investment spending to the cost of capital. However, the empirical studies were subject to a number of serious flaws. More recent empirical evidence has found some larger effects, at least with some studies, although not enough to suggest that all of the tax cut is spent (especially with corporate rate reductions). Moreover, the average behavioral response identified in these studies may be larger than responses during a downturn when many firms have excess capacities, and planning lags may make investment responses poorly timed.

An investment subsidy has more “bang-for-the-buck” than a corporate rate cut, since the latter benefits existing as well as new capital. A corporate rate cut is estimated to produce between one-third and two-thirds of the investment induced by an investment credit with an equivalent revenue loss. The most common type of investment subsidy is the investment credit, although the same effect could be achieved with accelerated depreciation or partial expensing. A temporary investment credit would be more effective than a permanent one, and a temporary investment credit could also be made incremental. (It is not really possible to structure a permanent incremental credit.) One disadvantage of a permanent investment credit is that it distorts the allocation of investment and can easily produce negative tax rates, particularly with current lower tax rates and lower inflation. A 10% investment credit would produce negative tax rates in excess of 100% for short lived assets.

Arguments have been for a corporate tax rate cut because of estimated large effects on the stock market. These stock market calculations are overstated because they do not take into account the adjustment process and the possibility of interest rate increases. Given the uncertainty about the size of stock market effects or their beneficial effect on the economy, there is a case for not considering stock market effects an important factor in choosing an investment subsidy. Indeed one could argue that the prospect of future tax cuts are causing the stock market values to decrease by increasing future interest rates (and also discouraging investment for the same reason). This report will be updated to reflect major legislative developments.

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# Using Business Tax Cuts to Stimulate the Economy

Increased interest in providing business tax cuts to stimulate the economy has followed the terrorist attacks of September 11, 2001, which heightened concerns about an economic slowdown. Among the tax proposals that were discussed in the 107<sup>th</sup> Congress were a corporate rate cut and an investment credit. An investment credit could be considered on either a temporary or a permanent basis. On October 24, the House passed H.R. 3090, which included temporary partial expensing (for three years), a provision similar to an investment credit. The bill also contained some other provisions, including a repeal of the corporate alternative minimum tax and an extension of net operating loss carrybacks.

Proposals developed in the Senate contained business tax cuts as well. The Finance Committee Chairman's plan included several tax cuts for business: allowing 10% of investments placed in service to be expensed, an increase in expensing dollar limits for small businesses, and some other provisions. The Finance Republican's plan would provide 30% expensing and repeal the corporate alternative minimum tax, but without refunding accumulated credits immediately as was the case in H.R. 3090. The 10%, one year, expensing provision was included in the version of H.R. 3090 that was approved by the Senate Finance Committee on November 8. This bill did not pass the Senate; however, Majority Leader Daschle proposed a streamlined bill (using H.R. 622 as a vehicle) that would include a 30% one year expensing provision. A final version of H.R. 3090 approved in early March included the expensing provision.

President Bush has proposed corporate tax relief in the form of an exclusion for dividends and a step up in basis. This proposal provides tax reductions for corporate income to the investors rather than the firm. The effects would probably be similar to corporate rate cuts in the long run, but may have different effects in the short term. In particular, such cuts might be more likely to be translated into spending because they would be received directly by individuals.

This report discusses issues associated with the use of business tax subsidies. First, is fiscal policy appropriate? Second, how successful are subsidies likely to be and what form might they take to be most effective? Finally, what other consequences might flow from the use of business tax subsidies, especially if they are to be permanent?

Investment subsidies have typically been provided through an investment tax credit. The investment tax credit was originally introduced in 1962 as a permanent subsidy, but it came to be used as a counter-cyclical device. It was temporarily suspended in 1966-1967 (and restored prematurely) as an anti-inflationary measure; it was repealed in 1969, also as an anti-inflationary measure. The credit was

reinstated in 1971, temporarily increased in 1975 and made permanent in 1976. After that time, the credit tended to be viewed as a permanent feature of the tax system. At the same time, economists were increasingly writing about the distortions across asset types that arose from an investment credit. The Tax Reform Act of 1986 moved toward a system that was more neutral (within the limits of empirical estimates of depreciation) and repealed the investment tax credit while lowering tax rates.

Investment subsidies can also be provided through accelerated depreciation, but these measures tend not to be used for counter-cyclical purposes. At least one reason for not using accelerated depreciation for temporary, counter-cyclical purposes is because such a revision would add considerable complexity to the tax law if used in a temporary fashion, since different vintages of investment would be treated differently. An investment credit, by contrast, occurs the year the investment is made and, when repealed, only requires firms with carry-overs of unused credits to compute credits. An exception to the problem with accounting complexities associated with accelerated depreciation is partial expensing, that is allowing a fraction of investment to be deducted up front and the remainder to be depreciated. This partial expensing approach also is neutral across all assets it applies to, but the cash flow effects are more concentrated in the present (and revenue is gained in the future). A temporary partial expensing provision, allowing 30% of investments in equipment to be expensed over the next two years, was included in H.R. 3090, and expensing provisions are also being considered in the Senate.

Historically, corporate rate changes have tended not to be used for counter-cyclical purposes. The recent interest in the corporate tax rate cuts appears associated with arguments about the effects of tax changes on stock markets. (A similar argument has been made for a capital gains tax cut.)

The repeal of the corporate alternative minimum tax, also included in H.R. 3090, is similar to a corporate tax rate in some respects, but its effects on marginal investments are uncertain and could possibly discourage investment.

## **Is Fiscal Policy Needed?**

Many economists have expressed uncertainty about the desirability of an additional fiscal stimulus. Moreover, economists have, in general, become more skeptical of fiscal policy as a counter-cyclical tool, particularly through the mechanism of tax cuts. Because of lags in decision-making and administrative lags in getting tax cuts to individuals, a fiscal stimulus enacted through a tax cut can be poorly timed. Finally, in an open economy with flexible exchange rates some of the fiscal stimulus can be offset through a decline in net exports, as increased interest rates attract capital from abroad and bid up the price of the dollar.

## What Fiscal Stimulus is Most Effective?

The objective of a fiscal stimulus is to increase spending, and fiscal policies can differ in the extent to which they induce spending. While a fiscal stimulus delivered through direct spending has a relatively straightforward effect, a fiscal stimulus delivered via a personal tax cut tends to have a more muted effect on the economy, because only part of it will be spent. The smaller the share spent, the smaller the stimulus, although for most types of tax cuts, the presumption is that much of the tax reduction will be spent. There are, however, theoretical reasons to believe that higher income individuals will spend a smaller fraction of a tax cut, and empirical evidence to support that view.<sup>1</sup> Indeed the propensity to save makes capital gains tax cuts, which have been under discussion, questionable candidates for stimulating aggregate demand.<sup>2</sup> There is also a fear that consumers who feel uncertainty about the future will not spend a tax cut.

Note that there is a tension between short run and long run fiscal policy. Measures that increase consumption are expansionary in the short run, but may detract from growth in the long run because deficit finance causes aggregate savings to fall (unless the economy is at such a low rate of employment that the stimulus induces sufficient output to offset the loss in savings). That is, government spending and tax reductions financed by deficits tend to crowd out investment. However, if the policy could be in a form that would stimulate investment spending, this negative effect on long run growth might be avoided. Government investment spending, such as spending on infrastructure, is one possibility that could provide a short run stimulus without detracting much from long term growth (and can even enhance long-term growth if the productivity of the government investment is greater than the productivity of private investments). However, it is often difficult to enact and implement such spending in a timely fashion. Another policy aimed at expanding investment is a subsidy to private investment spending: if the revenue loss (which adds to the deficit) were spent on investment, there would be no crowding out. There is, however, a caveat: if the type of business subsidy is one that is permanent and not neutral in the long run, the economy will also sustain a permanent loss in efficiency from the mis-allocation of capital.

The success of such a policy hinges on the effectiveness of investment subsidies in inducing spending. It is difficult to determine the effect of a business tax cut, and particularly the timing of induced investment. A business tax cut is aimed at stimulating investment largely through changes in the cost (or price) of capital. If there is little marginal stimulus or if investment is not responsive to these price effects in the short run, then most of the cut may be saved: either used to pay down debt or paid out in dividends. Some of the latter might eventually be spent after a lag. That is, if a tax cut simply involved a cash payment to a firm, most of it might

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<sup>1</sup> A recent study that finds evidence of higher marginal propensities to save among wealthy individuals is Jonathan McCarthy, "Imperfect Insurance and Differing Propensities to Consume Across Individuals," *Journal of Monetary Economics*, Vol. 36, No. 2 (November 1995).

<sup>2</sup> See CRS Report RS21014, *Economic and Revenue Effects of Permanent and Temporary Capital Gains Tax Cuts*, by Jane G. Gravelle.

be saved, particularly in the short run. Business tax cuts (of most types) also have effects on rates of return that increase the incentive to invest, and it is generally for that reason that investment incentives have been considered as counter-cyclical devices.

Why, then, might a business tax cut be considered, and how might alternative tax cuts be evaluated? First, we consider the empirical evidence which might determine whether a business subsidy should be considered at all. Then we discuss the “bang for the buck,” which determines how much of each dollar of cost might be spent. Then we discuss other advantages or disadvantages

## Empirical Evidence on the Effectiveness of Investment Incentives

Despite attempts to analyze the effect of the investment tax credit, considerable uncertainty remains. Time series studies of aggregate investment using factors such as the tax credit (or other elements that affect the tax burden on capital or the “price” of capital) as explanatory variables tended to find little or no relationship.<sup>3</sup> A number of criticisms could be made of this type of analysis, among them the possibility that tax subsidies and other interventions to encourage investment were made during periods of economic slowdown. A recent study using micro data found an elasticity (the percentage change in investment divided by the percentage change in the user cost of capital) for equipment of -0.25.<sup>4</sup> A widely cited study by Cummins, Hassett, and Hubbard used panel data and tax reforms as “natural experiments” and found effects that suggest a price elasticity of -0.66 for equipment.<sup>5</sup>

This last estimate is a much higher estimate than had previously been found and reflects some important advances in statistical identification of the response. Yet, it is not at all clear that this elasticity would apply to stimulating investment in the aggregate during a downturn when firms have excess capacity. That is, firms may have a larger response on average to changes in the cost of capital during normal times or times of high growth, when they are not in excess capacity. Certainly, one might expect the response to be smaller in low growth periods.

An additional problem is that the timing of the investment stimulus may be too slow to stimulate investment at the right time. If it takes an extensive period of time

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<sup>3</sup> A summary of this early literature can be found in several sources. For a non-technical summary, see Jane G. Gravelle, *The Economic Effects of Taxing Capital Income*, Cambridge, MIT Press, 1994, pp. 118-120.

<sup>4</sup> Robert S. Chirinko, Steven M. Fazzari, and Andrew P. Meyer. “How Responsive is Business Capital Formation to its User Cost? An Exploration with Micro Data?” *Journal of Public Economics* vol. 74 (1999), pp. 53-80.

<sup>5</sup> Jason G. Cummins, Kevin A. Hassett, and R. Glen Hubbard, “A Reconsideration of Behavior Using Tax Reforms as Natural Experiments.” *Brookings Papers on Economic Activity*, 1994, no. 1, pp. 1-72.

to actually plan and make an investment, then the stimulus will not occur very fast compared to a cut in personal taxes that stimulates consumption. Indeed, the stimulus to investment could even occur during the recovery when it is actually undesirable

## The Optimal Design of Business Tax Subsidies

In this section we consider several issues surrounding the optimal design of business tax subsidies.

### Bang for the Buck

It follows from a principal rationale for choosing an investment subsidy (to prevent longer run loss of productivity due to deficit finance) that one would seek the most powerful incentive per dollar of revenue loss. Three issues arise in evaluating the ratio of induced spending to revenue loss: the general type of tax incentive, whether one can increase the incentive per dollar of revenue loss by making the subsidy temporary, and whether one can be successful by restricting the subsidy to marginal investment.

#### **Type of Business Tax Cut: Corporate Rate vs. Investment Subsidy.**

Generally, an investment credit (or other subsidy confined to investment, such as accelerated depreciation) has more “bang for the buck” than a corporate rate cut because it does not reduce taxes on the flow of income to existing capital assets. The size of both the absolute amount and the difference between an investment credit and a corporate rate cut depend on the durability of the investment. As derived in the appendix, a corporate rate cut has an effectiveness compared to an investment credit based on the ratio:

$$\frac{(g+d)(1-u)}{(r+d)}$$

where  $g$  is the normal growth rate,  $r$  is the after tax rate of return,  $d$  is the economic depreciation rate, and  $u$  is the corporate tax rate. Setting  $g$ ,  $r$ , and  $u$  to 0.025, 0.05, and 0.35 respectively, this measure suggests a 44% ratio for structures (assuming  $d$  equals .03) and a 57% ratio for equipment (assuming an average depreciation rate of 0.15). As  $d$  gets very large, the value approaches 65% and as it gets very small, the value approaches 32.5%. Thus, a corporate rate cut will stimulate from 1/3 to 2/3 as much investment per dollar of revenue loss as an investment subsidy directed at the same type of investment. Note also that the superior performance of the investment credit relative to the corporate rate cut is less pronounced for short lived assets. This effect occurs because investment is larger relative to the existing capital stock because of the need to replace the stock more frequently. Corporate assets also include non-reproducible capital (e.g. land) that receives a tax reduction with no investment increase, which also reduces the stimulus per dollar of revenue loss.



At the same time, short lived assets may have a somewhat larger absolute “bang for the buck,” for an investment credit since the size of the stimulus per dollar of revenue loss is  $e/(1-uz)$ , where  $e$  is the investment demand elasticity and  $z$  is the present value of tax depreciation (which is larger for short lived assets). For the typical equipment investment, if  $e$  is  $-0.25$ , each dollar of revenue loss from an investment credit produces 35 cents of investment. For structures (assuming the same elasticity), the increase is 28 cents. Even at the high elasticities estimated at  $-0.66$  these increases would not be dollar for dollar: the equipment investment would increase by 92 cents and the structures by 74 cents. (Note, however, that the elasticities could vary across assets, and in particular could be smaller for structures.)

Another aspect of an investment credit vs. a corporate rate cut is the degree of certainty about the subsidy. If businesses fear that lower corporate rates will subsequently be raised, they will have less of an incentive to invest. Indeed, a perception that corporate rates could be increased could actually have negative effects on investment (as discussed below). Investment credits, however, are allowed at the time of the investment and are certain, since tax benefits would be highly unlikely to be retroactively disallowed.

Some other types of corporate tax changes can be likened more to an investment subsidy or to a rate reduction. An acceleration of depreciation (allowing costs of investments to be deducted more quickly), or allowing expensing (deducting the entire cost when the expenditure is made) for some fraction of investments is like an investment credit. A repeal of the alternative minimum tax<sup>6</sup> provides a benefit for existing assets, but mixed effects on investment, since the marginal tax burden on investments under the minimum tax can be greater than or less than the burden under the regular tax. For firms permanently on the minimum tax, the tax burden on new investment is actually smaller than the tax burden under the regular tax, so that repealing the minimum tax would actually discourage investment in this case. A modification of the minimum tax by allowing accelerated depreciation methods (lives are already equated or virtually equated) would be like an investment subsidy for firms that remain under the alternative minimum tax but could have mixed effects if the change caused firms to switch to the regular tax. It would be less likely to discourage investment than a repeal of the tax. Expanding the net operating loss carry-back periods (or investment tax credit carry-back periods if such a credit were enacted) has a large cash flow effect which is like a corporate rate cut, but it would also allow more firms to benefit more fully from investment subsidies and existing accelerated depreciation.

**Temporary vs. Permanent Subsidies.** Since investment subsidies act through changes in price, there have been attempts to increase the “bang for the buck.” Two methods have been proposed (and could be combined). The first is to make the investment tax credit temporary. Theoretically, a temporary investment subsidy, like the investment credit, would have a more pronounced effect on investment in the short run than a permanent one, and, of course, would cost much less. Like a temporary sale, demand should shift and firms should move planned

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<sup>6</sup> The alternative minimum tax is a tax system that imposes an alternative tax with a lower rate and a broader base that must be paid if higher than the regular rate.

investment spending forward. It is, however, very hard to find good empirical evidence of this effect, in part because the same problems that have plagued earlier empirical studies remain, among them the fact that temporary subsidies have been enacted during a downturn. And, assuming that investment is only shifted, the crowding out issue still remains.

Another of the difficulties with temporary subsidies is that in order for them to have a more powerful effect than permanent subsidies, investors have to believe that such subsidies will, indeed, be temporary. Historical experience teaches otherwise: temporary subsidies have a tendency to become permanent.

Note that a temporary corporate rate cut will have the opposite effect relative to a permanent rate cut: it will have little effect on new investment. In fact, a temporary rate cut could discourage certain types of investment because, due to accelerated depreciation, deductions are larger in the early part of an investment's life than should be the case to reflect economic depreciation, while they are too small in the later part.<sup>7</sup>

**Incremental Subsidies.** In the past, policy-makers have also looked into the possibility of incremental investment subsidies that would focus more of the effect on the margin. Such a subsidy was discussed at the beginning of President Clinton's administration.

A subsidy could be more focused on the margin by applying it only to investment in excess of a fixed base. While a temporary incremental subsidy is feasible, it is virtually impossible to design a permanent incremental subsidy. This issue is a complicated one which is discussed in considerable detail in a CRS study written at that time.<sup>8</sup>

## **Consequences of Permanent Tax Changes on the Allocation of Capital**

A final issue in choosing a subsidy is the potential effect on the allocation of capital. A lower corporate tax rate may (up to a point) increase economic efficiency because currently corporate income is taxed more heavily than other types of capital income. A corporate rate is also neutral across different types of assets. Moreover, a corporate tax rate reduction cannot go to the point that investments are subject to negative tax rates.

An investment credit, however, has the potential for distorting investment (because it favors short lived assets and is generally applied only to certain categories of investment). It can also easily produce negative tax rates. Moreover, with the

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<sup>7</sup> A proposal to exploit this effect by enacting a future corporate rate cut could work in theory, but is unlikely to be very effective if firms doubt that the rate cut would actually take place. It would also not provide firms with cash flow to make increased investments.

<sup>8</sup> See CRS Report 93-209, *Incremental Investment Subsidies*, by Jane G. Gravelle.

present value of depreciation so high because of low inflation rates, and the tax rate much lower than in the past, historical levels of investment credits will produce negative tax rates.

Consider 5-year property, which accounts for about 44% of investment. Depending on the time of year the investment is made, we estimate the present value of depreciation deductions assuming a 7% nominal discount rate (reflecting a 5% real return and a 2% inflation rate) is between 0.86 and 0.89 per dollar of investment, depending on the time of year the investment is made. To avoid negative tax rates any investment credit that does not have a basis adjustment (that is, depreciation is allowed on the entire investment not just the cost net of the credit) cannot exceed 3.85% at the higher present value and 4.9% at the lower value. With a basis adjustment, the credit can range between 5.59% and 7%. The zero tax rate is reached when the present value of tax depreciation deductions multiplied by the tax rate plus the credit exceed the tax rate times the investment.<sup>9</sup>

If a 10% investment credit without a basis adjustment were enacted, these assets would have a marginal effective tax rate of -122% to -196%, that is, a negative effective tax rate. (The computation of effective tax rates is explained in the appendix.)

Accelerated depreciation methods can be designed to be more neutral, and there are several types of investment subsidies that are relatively neutral at least across the assets they apply to (including partial expensing, allowing credits only for investment in excess of depreciation, or varying credits with asset durability). However, the largest distortion that has typically occurred is between assets eligible for credits or accelerated depreciation and assets that are not eligible, primarily equipment in the former case and structures in the latter case. (Partial expensing in H.R. 3090 is restricted to equipment but is not permanent.)

## Effects on the Stock Market

Some arguments have been made that the effect of a business tax change might help the economy by raising the stock market price. It is not clear what consequences a rise in the stock market induced by tax changes might have as an independent influence on the economy, although such a rise might help to maintain consumer confidence in the economic outlook.

Some simple calculations of this effect have been discussed based on comparing tax rates. For example, cutting the corporate tax rate from 35% to 25% (a very large

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<sup>9</sup> These estimates measure effective tax rates at the firm level. Rates would increase because of the individual level tax by shareholders, but would decrease because of the deduction of the inflation portion of interest by a firm with a higher tax rates. The net effects depend in part on whether investments made through pension funds and IRAs are considered marginal. For unincorporated businesses, rates could be higher or lower (absolute value of the negative rates lower or higher) depending on the marginal tax rate of the individual; they would probably be lower, that is, have a higher subsidy rate.

cut), which would lead to an increase of around 15% based on the ratio of  $(1-t^*)/(1-t)$ , where  $t^*$  is the new tax rate of 0.25 and  $t$  is the old tax rate of 0.35. This calculation is based on a rational expectations view of the world (rather than any empirical measures of the supply and demand responses in the stock market that some economists would prefer to use). Even so, this analysis is a partial equilibrium one that does not take account of three important effects: the expected adjustment of the capital stock in response to change, adjustment costs of such changes, and the possibility of higher interest rates. We discuss these in turn.

Consider a simple adjustment process where a geometric adjustment path occurs. In that case, beginning at time zero, the rate of return  $t$  years into the future given a fixed after tax rate of return  $r$  will be:

$$p(t) = r/(1-t^*) + [r/(1-t) - r/(1-t^*)]e^{-gt}$$

and the after tax rate of return be:

$$r(t) = p(t)(1-t^*)$$

If this expression is integrated (summed), after being discounted at rate  $r$ , from time zero to infinity (the same approach that produces the original 15% price increase), the increase in the stock market price will be  $[(1-t^*)/(1-t)][r/(r+g)]$ . If  $g$  is, say, equal to  $r$ , then the initial effect on the stock market will be only half as big. This value will also begin to fall as time goes on until it returns to its original value.<sup>10</sup>

Secondly, the value will be reduced if the firm faces adjustment (temporary loss of productivity due to alteration of the productive processes).

How quickly this adjustment path occurs and the magnitude of adjustment costs is something we know relatively little about in an empirical sense, but it will clearly reduce, perhaps significantly, the initial increase in value.

The second problem with the analysis of stock market effects is that it not only assumes no adjustment costs but assumes there are no other effects in the economy that might alter the rate at which earnings are discounted. But the interest rate will almost certainly rise. Indeed, in a simple world, with only one asset and a fixed savings rate (even ignoring the resource claims on the deficit by assuming the revenue is made up elsewhere), a tax cut simply increases the after tax rate of return, and raises the discount rate just enough to offset the rate cut. The result is that there would be no effect on the stock market. This criticism is perhaps a more serious one which could greatly reduce any potential effect on the stock market. But, without a general equilibrium analysis, such an effect cannot be estimated.

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<sup>10</sup> With imperfect competition, the value might settle at a different level, depending on the nature of the industry and how equilibrium is reached; these complexities are beyond the scope of this paper.

Indeed, one could argue that the future tax cuts are causing the stock market values to decrease by increasing future interest rates (and also discouraging investment for the same reason).<sup>11</sup>

Note that, according to this type of analysis, the effect of an investment credit on the stock market can either raise or lower stock prices. While profits rise in the short run, in the long run the value of financial assets relative to the physical value of the firms assets falls. If the investment credit were 10%, for example, the asset value would fall by 10%. With two opposing forces in play, the initial effect on the stock market is uncertain according to rational expectations theory, which may be one of the reasons that some analysts have proposed a rate cut rather than an investment credit.

For those economists who doubt that a rational expectations approach is the best method of predicting the effects on the stock market in the short run, however, the inclination would be to expect an initial rise in the stock market from either policy as more investors choose to buy stocks. The magnitude of these effects is, however, very difficult to determine, but is likely not to be very large relative to the other short run swings in the market. Such a view would suggest that considerations of the stock market not play an important rule in evaluating alternative counter-cyclical tax instruments.

## Summary

This analysis suggests that fiscal stimulus may not necessarily be desirable currently and that a business tax subsidy may not necessarily be the best choice for fiscal stimulus, largely because of the uncertainty of its success in stimulating aggregate demand. If such subsidies are used, however, the most effective short run policy is probably a temporary investment credit. Permanent investment credits, while more effective than corporate rate cuts in the short run, will distort the allocation of investment in the long run.

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<sup>11</sup> This latter point was made by Christopher Carroll, "Don't Cut Capital Gains Tax," *Baltimore Sun*, September 25, 2001.

## Appendix

### Measuring “Bang for the Buck”

The rental price of capital, with an investment credit (without a basis adjustment) is:

$$(1) c = (r+d)(1-uz-k)/(1-u)$$

where  $c$  is the price of capital,  $r$  is the after tax rate of return to corporate investment,  $u$  is the corporate tax rate,  $d$  is the economic depreciation rate,  $z$  is the present value of depreciation deductions and  $k$  is the investment tax credit. If we take logs and differentiate this expression with respect to  $k$ , assuming an initial rate of the credit of zero, we obtain the following expression for the percentage change in the cost of capital:

$$(2) dc/c = \frac{-1}{(1-uz)} dk$$

We denote the elasticity of investment with respect to the price of capital as

$$(3) (dI/I) = -e (dc/c),$$

where  $e$  is the elasticity and  $I$  is investment. By substituting (2) into (3) and rearranging, we obtain:

$$(4) dI = \frac{eI}{(1-uz)} dk$$

We can also relate this incentive to the revenue cost, which is  $-kI$ , hence the ratio of stimulus per dollar of revenue loss is  $e/(1-uz)$ . This stimulus is bigger for shorter lived assets (assuming the elasticities are the same).

Compare the effect of a rate reduction. To simplify the analysis, we restate equation (1) as:

$$(5) c = \frac{r}{(1-au)} + d$$

where  $a$  is less than one when  $z$  is greater than economic depreciation (which is  $d/(r+d)$ ) and greater than one when  $z$  is less than economic depreciation.

Differentiating with respect to  $u$  we obtain, dividing by  $c$  and substituting into (4), we obtain the effect on investment of a rate reduction:

$$(6) dI = \frac{eIa(r/(1-au)^2)}{r/(1-au) + d} du$$

How does this compare with revenue? The only way to make a fair comparison between an investment credit that appears only in the first year and applies to new investment, and a rate reduction that lasts over the entire life of the investment but also benefits existing capital is to compare investment per present value of revenue cost. The present value of the cost of an investment credit if investment grows at rate  $g$  and is discounted at rate  $r$  is  $-Idk/(r-g)$ . The effect on today's investment per present value of revenue loss is therefore  $e/((R-g))(1-uz)$ . The cost of a rate reduction is  $arKdu/(1-au)^2$ , where  $K$  is the current capital stock. Since  $I$  equals  $(d+g)K$  the effect on today's investment per present value of revenue loss is  $e(g+d)/((r-g)*(r/(1-au)+d))$ . Therefore the ratio of the cost of an investment credit to the cost of a corporate rate reduction after equating (1) and (5) is:

$$(7) \frac{\text{Cost of Investment Credit}}{\text{Cost of Corporate Rate Cut}} = \frac{(g+d)(1-u)}{(r-g) + d}$$

## Measuring Marginal Effective Tax Rates

A marginal effective tax rate is determined by a discounted cash flow analysis, where the internal rate of return with and without taxes is compared. This type of measure can take into account all of the timing effects which are the crucial features of certain tax preferences, including accelerated depreciation and deferral of taxes on capital gains until realization.

In the case of a depreciating asset, the relationship between pre-tax return and after tax return in the corporate sector is determined by the rental price formula:

$$(8) r_p = ((r_f + s)(1-uz(1-mk)-k))/(1-u) - d$$

where  $r_p$  is the pre-tax real return,  $r_f$  is the after tax discount rate of the firm,  $d$  is the economic depreciation rate,  $u$  is the statutory tax rate of the firm (equal to the corporate tax rate for corporate production and equal to the individual tax rate for non-corporate production),  $z$  is the present value of depreciation deductions for tax purposes,  $k$  is the investment tax credit rate, and  $m$  is the fraction of  $k$  that reduces the basis for depreciation purposes. The value of depreciation is discounted at the nominal discount rate,  $r_f + \pi$ , where  $\pi$  is the rate of inflation. This formula applies to investments in equipment and structures which are subject to depreciation. The effective tax rate is measured as  $(r_p - r_f)/r_p$ .