ESTIMATING LONG-RUN REVENUE EFFECTS OF TAX LAW CHANGES

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INTRODUCTION

The attempts of the Congress to control the growth in the deficit and to coordinate overall fiscal policy have led to some unintended consequences for the making of tax policy. The first question asked of a tax proposal is not necessarily "Does it increase efficiency?", or "Is it fair?", or even "Is it possible to administer?" but "How much does it cost?"

Moreover, the answer to the question, "How much does it cost?" is really the answer to the question, "How much does it cost over the 'budget horizon'?" The budget horizon used in any particular piece of legislation is an arbitrary period of time set sometimes by official rules or sometimes by informal agreement. In the past, the official budget horizon has been a single year in some cases; currently revenue estimates are prepared over a five-year horizon. Even in cases where there is no formal rule, informal agreements may make revenue costs for a short period of time crucial. For example, the Tax Reform Act of 1986 was, in a political deal, agreed upon to be revenue-neutral for five years.

The Joint Committee on Taxation is charged by law as the official source of revenue estimates. In a peculiar twist, not only is the revenue horizon a short period of time, but the Committee specifically has declined to estimate beyond that horizon. The reasons given by a recent Committee print [U.S. Congress, Joint Committee on Taxation, 1992, 18] on revenue estimating are the need for reliance on macroeconomic estimates of the Congressional Budget Office and the uncertainties attendant to longer-run estimates.

The importance of the revenue estimates in the survival and design of tax changes has led to a great deal of squabbling about how they are done and, in particular, the extent to which they take into account behavioral consequences. An issue of perhaps greater importance for permanent budgetary and tax policy is the long-run cost of a proposal. And, while such long-run costs may be difficult to estimate with precision, it is not impossible to estimate the general magnitudes. Fundamentally, no one is likely to be interested in the nominal value of revenue loss fifteen or twenty years into the future. Rather, the concern is how large costs are relative to output and whether they are different in scale from the short-run costs.

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For some tax changes, the short-run costs are probably good indicators of the long-run magnitudes. For example, a proportional corporate or individual rate cut will cost similar amounts relative to output assuming the ratios of the tax bases to output are constant over time. Similarly, an investment credit will tend to yield the same revenue cost as a fraction of output over time. In other cases, the short-run revenue effects will yield long-run effects that are much different from short-run effects.

SOME ILLUSTRATIONS FROM RECENT LEGISLATIVE PROPOSALS

Consider two recent examples from tax legislation in 1992. Two bills were considered in 1992 — the economic stimulus bill (H.R. 4210) and the urban aid bill (H.R. 11). Both bills were vetoed, for reasons unrelated to the long-run costs, by President Bush. We briefly consider two types of tax provisions where the pattern of long-run versus short-run costs were very different — intangibles and capital gains. The intangibles issue reappeared in the 1993 tax legislation, included in the Omnibus Budget Reconciliation Act of 1993 (OBRA93).

Intangibles

The House-passed versions of both 1992 bills and the final provision of H.R. 11 contained a provision aimed at simplifying the tax treatment of purchased intangible assets. When a firm's assets are sold, the residual after accounting for tangible property (land, plant and equipment, and inventories) is an intangible asset. The Internal Revenue Service has taken the position that these intangible assets (unless identified specifically, as in the case of patents) were goodwill, which cannot be depreciated. Many taxpayers have claimed, and have been successful in some courts with the claim, that these assets could be depreciated, because they represented assets, such as customer lists, that did deteriorate over time.[1]

The objective of the legislation was to simplify the tax rules and end future disputes by allowing all subsequently acquired intangibles to be amortized (deducted in equal amounts) over a single longer period of time. The proposal was designed to be revenue neutral over the five-year budget horizon.

Although it may not have been recognized when the proposal was being developed, such a revision will, of necessity, lose money in the long run. To illustrate this point, assume that under existing rules half of intangibles are eligible for a write-off of 8 years and half are not eligible at all. Using this assumed amortization period of 8 years and a constant amount of sales, revenue neutrality during the budget period could be achieved by allowing a tax life twice as long for all assets.

This example can be simplified by assuming no growth in purchases. Under preexisting rules, for each dollar of total purchased intangibles, 1/8 of $0.50 could be written off in the first year. If a 16-year life for all assets were used, 1/16 of $1 could be written off — an equal amount which leads to no revenue loss.

As time goes on, the total amount of write-offs associated with purchases incurred after the law was changed will grow. In the second year, under previous rules, 1/8 of the first year's purchases would be written off (the second year's write-off of the first year's acquisitions) and 1/8 of the second year's purchases (the first year's write-off of the second year's assets). Thus, with no growth, the cumulative amortization will be 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, 7/8 and 8/8, in each year multiplied by $0.50 for each dollar of purchase. In year 9, however, the write-offs will stabilize. Although another year of amortization will be added for the purchases in year 9, the purchases in year one are now completely written off. The steady state for this depreciation is a write-off of $0.50 for each dollar of purchase.

In the case of the 16-year write-off, the same deductions will occur — one half the percentage write-off will be applied to twice as large a base. These amounts will be 1/16, 2/16,..., 8/16, all multiplied by a dollar. But the amount of depreciation will continue to grow past year 8, because the first-year's purchases will not be fully written off. These amounts will continue to grow from year 9 to year 16 — 9/16, 10/16,..., 16/16. After 16 years, one dollar will be written off. In the long-run steady state, this proposal will increase deductions from $0.50 per dollar to $1 per dollar, for a net cost of $0.50.

One of the difficulties with failing to prepare these long-run revenue estimates was that there was no clue to the magnitude of the long-run costs. Regardless of how large they are, the revenue cost in the budget horizon will be zero. Although the possibility of long-run revenue costs eventually entered the debate, there were no official estimates of exactly how large of a long-run cost was being accrued by the government through this proposal. In addition, the provision, in present-value terms, was beneficial on average to the taxpayer, whereas the intent of the proposal was to simplify rather than to provide an effective tax reduction.

There was, however, a simple way to design a proposal that would not generate these long-run costs — simply provide that all taxpayers be able to amortize one half of their intangibles over eight years. Indeed, this was a case where there was no need at all for precise, or even imprecise, long-run estimates. Rather, there was a need to recognize the general pattern of the time path of revenue costs.

In 1993, the House added the intangibles provision to the tax proposals that were part of the budget reconciliation legislation. In the interim, the Supreme Court had found for the taxpayer in an intangibles case regarding the purchase of a newspaper (the *Newark Morning Ledger*). As a result of this case, the Joint Tax Committee changed the baseline (the presumption of what would occur with no tax legislation) to allow more intangibles to be written off, and the intangibles provision now became one that gained revenue during the budget horizon. Nevertheless, it was a revenue loser in the long run.

When the Senate considered the intangibles provision, it was modified so that only 75 percent of the cost could be amortized. This approach raised more revenue in the short run, and probably resulted in virtually no effect in the long run. The Senate approach was one where the discrepancies between short-run costs and long-run costs were smaller, and this effect apparently played some role in the development of the Senate provision. In the end, however, the House version prevailed in Conference.

The effects of this legislation are not trivial in magnitude. My estimates suggest a long-run revenue cost that approaches $2 billion for this provision (in 1998 income levels). Although the issue of the long-run cost was discussed during the development of the legislation,[2] it failed to have an impact on the final decision and there were never any official estimates of the cost in the long run.

Prospective Capital Gains Indexing

Yet another provision in last year's economic stimulus package that would have yielded a much larger long-run cost was a proposal to index capital gains. Under current law, capital gain subject to tax includes the inflation portion (the change in the value of the asset arising from general price increases) as well as any real gain. The proposed revision was to apply only to assets acquired after the date of the legislation.

This prospective application reduces the revenue cost of the proposal in the short run, since it does not provide a deduction for assets already held. But it also produces a time pattern that results in a much smaller cost in the short run.

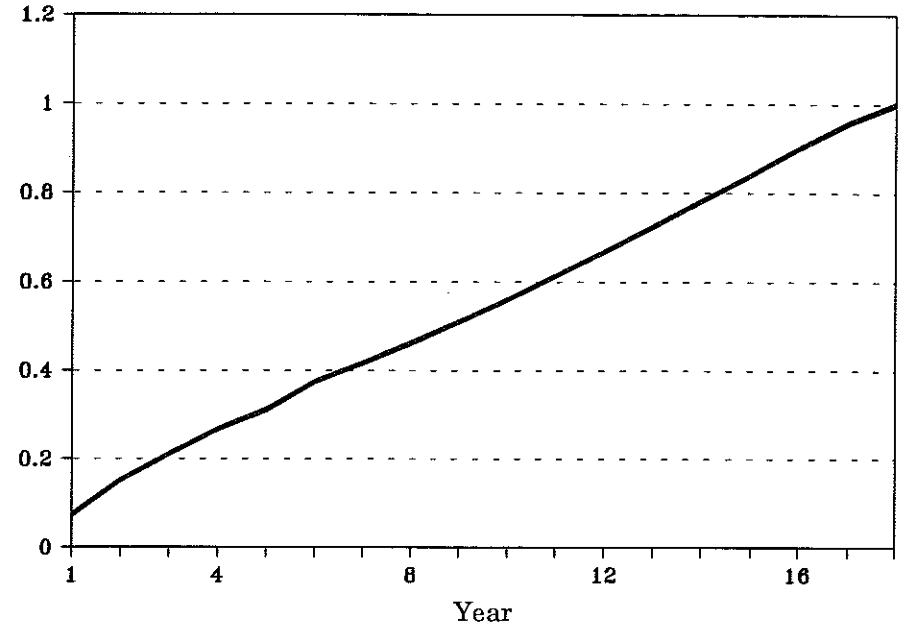
Consider the following simple illustration of capital gains receipts. Suppose out of any vintage of assets purchased, a fraction S_1 is sold in the first year, a fraction S_2 is sold in the second year, and so forth. If all capital gains are subject to indexation, then in the first year, the amount excluded from taxation will be one year's inflation on the amount of basis represented by fraction S_1, two years of inflation on the basis represented by fraction S_2, three years of inflation on S_3, four years of inflation on fraction S_4, and so forth until all vintages are accounted for.

If, however, only newly purchased assets are included, in the first year the revenue cost will be only the inflation on S_1. This is the only asset that is both purchased and sold after the enactment date. In the second year, the cost will be two years of inflation for the initial asset purchased and held for two years, and one year of inflation for the asset purchased after a year and held for one year.

The estimated pattern of revenue cost, relative to the steady-state cost, is shown in Figure 1, based on data on average holding patterns [Holik, et al., 1989]. The data on the distribution of gain by age are provided for each year up to only ten years; the remainder is assumed to be realized in equal increments so that the holding period is truncated to 18 years, at which point the cost reaches its steady state. (These calculations are based on historical averages of a 5 percent inflation and a 3 percent real growth rate, and are shown relative to gross national product (GNP). With nominal growth, the dollar value of these costs would rise more steeply and then grow at the growth rate of GNP after the steady state is reached.)

This example illustrates that the short-run cost can be very small relative to the long-run costs. Moreover, in the actual estimation, it was apparently assumed that some individuals might sell their assets in the short run and purchase others so as to qualify for inflation indexing, so that the official estimates might be even smaller — or even be a gain — in the short run. Any induced sales will, however, increase future costs. (There also may be differential behavioral responses in the short and long run.)

FIGURE 1
Revenue Loss from Prospective Indexing
Ratio to Steady State Loss



Note: Assumes 5 percent inflation, 3 percent real growth.

SOME CONSEQUENCES FOR TAX POLICY

These uneven time paths of revenue provisions can have some very important consequences for tax policy. For example, they may lead to choices of tax provisions that may not otherwise be desirable in order to achieve budgetary objectives in the short run.

One example of this kind of activity is the speedup in estimated tax payments. For example, suppose a dollar of tax due to be paid next year is paid a year earlier. If there is no growth in the economy, the revenue loss will represent a one-time gain. In the second year, there will be a speedup from the third year payment but the second year payment has already been collected — for a net gain of zero. Thus, the speedup represents a one time gain. If there is growth at rate g, there will be a speedup from the third year of $1+g$, offset by one, for a gain of g. In the next year, the gain will be $g(1+g)$, in the next $g(1+g)^2$, in the third $g(1+g)^3$, and so forth. Estimated tax speedups have been popular for inclusion in recent tax legislation.

The most recent tax legislation (in OBRA93), aimed at reducing the deficit, included such an estimated tax speedup, which raised revenue of $7.8 billion in the five year (1994-98) period. Virtually all of this revenue is temporary. This provision actually involves two speedups, and a clue to the pattern can be found in the individual fiscal year revenue estimates. According to the Joint Tax Committee's estimates, the provision would gain for Fiscal Years 1994-98 (in billions): \$2.116, \$0.428, \$0.059, \$4.279, and \$0.929. Because the speedups are for calendar years and the revenue estimates are in fiscal years, some of the revenue gain from each speedup is spread over two years. Nevertheless, it is the third year estimate, of only \$59 million, that is the clue to the modest gains that estimated tax speedups actually produce on a permanent basis.

A second consequence for tax policy will be in influencing the choice of certain types of tax benefits that might otherwise be identical. One illustration of such influence can be found in the case of investment subsidies. A subsidy for new investment in depreciable assets can be achieved in a variety of different ways — investment credits, accelerated depreciation, indexation, or partial expensing (allowing a fraction of the investment to be deducted when incurred).

To illustrate these choices that are economically identical, but different in their revenue patterns, consider a simple example of an investment that is depreciated on a straight line basis. Also, assume that depreciation is not indexed for inflation. Using a continuous time formula for depreciation, the present value of depreciation is:

(1) $$z = (1 - e^{[-(r+p)T]})/[(r+p)T]$$

where z is the present value of depreciation, r is the real after tax discount rate, p is the inflation rate, and T is the depreciable life.

Suppose a policy being considered is to index depreciation deductions. If deductions grow at the inflation rate, the result is the equivalent of discounting depreciation at the real rate of return:

(2) $$z^* = (1-e^{-rT})/(rT)$$

where z^* is the new present value of depreciation.

Consider three different methods of achieving the same present value results — and thus to provide benefits that are the economic equivalent of inflation. The first is to shorten the life. Depreciation will then be:

(3) $$z^* = (1-e^{[-(r+p)T^*]})/[(r+p)T^*]$$

where T^* is the new life. In order to achieve the same present value as in equation (2), the new tax life, T^*, should be set so that $(r+p)T^* = rT$. For example, if p and r are the same size, T^* should be half as long as T.

The next way is to provide an investment tax credit, of amount k, which allows a fraction of the cost to be credited against tax. If the tax rate is u, one can convert it to a deduction equivalent of k/u. The value of k can then be chosen so that:

(4) $$k/u + (1-e^{[-(r+p)T]})/[(r+p)T] = (1-e^{-rT})/(rT).$$

Another way of expressing this is that $k/u = z^* - z$.

A final way of providing a benefit is through partial expensing, which allows a fraction, x, of the asset to be deducted when incurred, and the remainder of the cost depreciated, so that:

(5) $$x + (1-x)\{(1-e^{[-(r+p)T]})/[(r+p)T]\} = (1-e^{(-rT)})/(rT).$$

Another way of expressing this is that $x = (z^* - z)/(1 - z)$.

All of these equivalent investment subsidies have the same present value. They have, however, completely different revenue patterns. If the economy is growing at rate g, beginning with new investment, and using a revenue pattern relative to GNP (that is deductions normalized by dividing by GNP), the depreciation deductions for pre-existing law will be:

(6) $$D(t) = (1-e^{[-(g+p)t]})/[(g+p)T]$$

where $D(t)$ is depreciation at time t, t less than T, and

(7) $$D(t) = (1-e^{[-(g+p)T]})/[(g+p)T]$$

for t greater than or equal to T.

In the case of indexing, the depreciation deductions will be:

(8) $$D(t)^* = (1-e^{-gt})/(gT)$$

where $D(t)^*$ is depreciation at time t, t less than T, and

(9) $$D(t)^* = (1-e^{-gT})/(gT)$$

for t greater than or equal to T.

The revenue loss at any time period will be $u(D(t)^* - D(t))$. The difference between the two will begin at a very small level, and then grow until time period T, where it will reach a steady state.

In the case of accelerated depreciation:

(10) $$D(t)^* = (1-e^{[-(g+p)t]})/[(g+p)T^*]$$

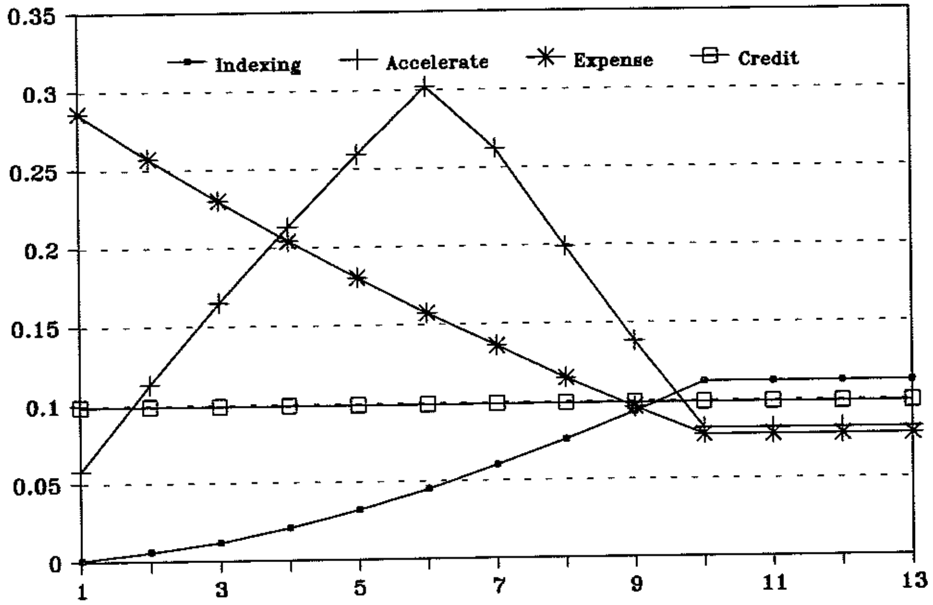
where $D(t)^*$ is depreciation at time t, t less than T^*, and

(11) $$D(t)^* = (1-e^{[-(g+p)T^*]})/[(g+p)T^*]$$

for t greater than or equal to T^*.

The difference between $D(t)^*$ and $D(t)$ will begin small, then grow to a peak at T^* years, and then decline, reaching a steady state at T years.

FIGURE 2
Revenue Loss from Investment Subsidies
Per Dollar of Original Investment Times Tax Rate



The investment credit is straightforward: the deduction equivalent will be k/u in each period, and the revenue cost k. There will be a constant (relative to GNP) cost of this subsidy.

The partial expensing provision will have a different pattern. In any one period:

(12) $$D(t)^* = x + (1-x)\{(1-e^{[-(g+p)t]})/[(g+p)T]\}$$

where $D(t)^*$ is depreciation at time t, t less than T, and

(13) $$D(t)^* = x + (1-x)\{(1-e^{[-(g+p)T]})/[(g+p)T]\}$$

for t greater than or equal to T.

The revenue cost will be $ux(1-D(t))$. Since $D(t)$ begins at a very small level and grows, the revenue cost in this case will begin at a large level and then decline.

The pattern for these revenue costs is illustrated for the case $T = 10$, $g = 0.03$, $r = 0.05$, and $p = 0.03$ in Figure 2. Since the only reason for this illustration is to show the pattern of relative costs, we have arbitrarily expressed the cost as relative to a dollar of investment, multiplied by the tax rate. Thus, the investment credit equivalent is approximately 9 percent of the tax rate u.

The tax policy problems that arise from these provisions are varied. In many cases, the best form of a tax subsidy is likely to be partial expensing. If we are beginning from a neutral system, partial expensing will be neutral across assets. Moreover, partial expensing tends to reduce the errors in incorrectly estimating economic depreciation — indeed, full expensing is the equivalent of a zero effective marginal tax rate for all investments. Yet, if policy constraints are focused on short-run revenue costs, a partial expensing option would be difficult to consider.

Moreover, there may be a temptation to choose indexation of depreciation, even though this approach, in the context of current tax law, would not be as neutral, and even though it would probably be difficult to administer. (Indexation of depreciation, however, would remove the influence of variable inflation rates from the value of depreciation.)

The provision that has the most consistent pattern of revenue costs across time is the investment credit, but this provision would not be neutral unless the rate were varied across assets.

Again, one has to look no further back than the 1993 legislation to find examples of investment incentives — or revisions in those incentives — of dramatically different forms. The 1993 legislation contains one provision that is an expensing provision (for small businesses): this provision tends to lose a substantial amount of revenue in the budget horizon because of its expensing approach, but it is a provision of modest size in the long run (compare a loss of $2.3 billion in the first year with a loss of $0.2 billion in the fifth).

It also includes, as a revenue-raising provision, a lengthening of depreciation lives for nonresidential structures from 31.5 years to 39 years. This provision gains $3.4 billion in revenue over the five-year period. In terms of Figure 2, such a provision would involve a gain with a pattern similar to the accelerated depreciation curve, except in this case the peak would be reached slowly after 31.5 years and would then decline to the steady state after 39 years. As a result, using the same mathematics developed above, the cost would be three to four times as large in the long run, as in the short run.

Moving in the opposite direction, however, is the provision that makes permanent the low income housing credit, which costs $4.8 billion over the five-year period. This credit, rather than provided in the first year, is spread out over ten years. Thus, the loss will grow substantially, with the same general type of formula that measures the cumulation of depreciation over time (equation (1)). In the long run, the cost will be about three times the average cost in the first five years.

These observations also lead to a final point about the revenue estimates — it is possible to pass a piece of tax legislation and have no idea of what the effects will be in the long run. For example, during the course of this discussion we have identified five provisions in the 1993 Act whose revenue effects are substantially different in the short and long run: intangibles, estimated taxes, the expensing provision for small businesses, the write-off period for real estate, and the low income housing credit. There was some discussion of the long-run effects with respect to intangibles, and estimated taxes are widely recognized as involving virtually nothing but timing effects. Otherwise, there was no discussion of this issue of revenue cost in the long run.

Overall, these five provisions gained about \$4 billion over the five years, but a rough calculation of the long-run effects suggests that they instead would *lose* about \$9 billion.

The most important provisions in the 1993 act were of the type that had a relatively constant steady-state effect (rate increases, gasoline taxes), so that the major deficit-reduction thrust of the legislation remained intact. Moreover, there were some offsetting effects from the proposals discussed here. This outcome is not, however, necessarily the case. Although the 1992 bills were not enacted, provisions such as individual retirement accounts (IRAs, discussed below) and prospective capital gains were important parts of these proposals in 1992. The Tax Reform Act of 1986, which was designed to be revenue neutral, most likely lost revenue in the long run [Gravelle, 1992].

A POSSIBLE SOLUTION

Is there a method of consistent cost accounting that would make tax policies that are of equal value to the taxpayer (i.e., whose present discounted values are identical) be equal in revenue costs?

Perhaps no other policy illustrates the challenges and the possibilities for consistent cost accounting for tax provisions as the case of IRAs. IRAs are tax provisions that allow the individual to deduct contributions to a retirement account. The individual includes in income any withdrawals from the account. This treatment is the same as contributions to a pension plan.

IRAs are subject to a dollar ceiling. They were first allowed for individuals not covered by an employer plan in 1974. In 1981, they were made available to everyone, but in 1986 they were repealed except for lower income individuals and those not covered by an employer plan.

During the years following the repeal of IRAs, some proposals were made to restore IRAs. Many of these proposals were made in a different form, referred to as a "backloaded" IRA. With a regular, or "frontloaded" IRA, the individual deducts the cost of the investment up front, but pays taxes on the investment when funds are withdrawn. With a backloaded IRA, the individual does not deduct the tax payment up front, but pays no tax on withdrawal. These treatments are identical in that they result in an effective tax rate of zero for the invested funds, but the cash flow pattern is quite different. Indeed, it is hard to find a reason for choosing the backloaded IRA, given the taxpayer's familiarity with the other form, except for the revenue consequences.

To illustrate these differences, consider a contribution to an IRA with the funds held in for T' years and paid out as a flat annuity so that the IRA is exhausted after T years. Consider first the case of a backloaded IRA, which is somewhat more straightforward. Assuming that there will be no additional aggregate savings in the economy, the revenue loss to the government is the foregone taxes on the return to assets invested in IRAs.[3]

In order to calculate the forgone taxes, one must calculate the assets that are in nontaxable accounts. Again using continuous time formulas, the value of any IRA per dollar of original investment will be:

$$V(t) = e^{rt}, \quad t \text{ less than } T'. \tag{14}$$

At the end of T' years, when the asset will be valued at $e^{rT'}$, it can be converted into a flat annuity, A, of:

$$A = re^{rT'}/[1 - e^{-r(T-T')}] \tag{15}$$

During the period of the annuity payout, when t is between T′ and T, the value will be:

$$V(t) = e^{rT}[1 - e^{-r(T-t)}]/[1 - e^{-r(T-T')}], \qquad T'<t<T \tag{16}$$

Note that when t becomes T, the value of equation (16) becomes zero. In order to project the revenue path, it is necessary to cumulate the assets. Assume that contributions grow continuously at rate g, which is also the growth rate of the economy. At any time in the future, the value of an asset purchased t years in the past, t less than T', relative to a dollar of asset purchased at the current time is:

$$V(t) = e^{(r-g)t}, \quad t \text{ less than } T'. \tag{17}$$

The cumulative value of such assets is:

$$CV(t) = (e^{(r-g)t} - 1)/(r - g), \quad t \text{ less than } T'. \tag{18}$$

At a time t in the future, greater than T', but less than T, the value of assets purchased up to T' years ago is:

$$CV(T') = (e^{(r-g)T'} - 1)/(r-g) \tag{19}$$

and the remaining older assets have a value of:

$$V(t) = e^{rT'}e^{-gt}\,[1-e^{-r(T-t)}]/[1-e^{-r(T-T')}] \tag{20}$$

When these older assets are cumulated over the past years T' to t, the cumulative value is:

$$CV(t) = e^{(r-g)T'}[1-e^{g(t-T')}]/\{[1-e^{-r(T-T')}]g\} + e^{-r(T-T')}[e^{(r-g)t} - e^{-g(t-T')}]/\{[1-e^{-r(T-T')}](r-g)\} \tag{21}$$

Total assets at time t greater than T' and less than T are the sum of (19) and (21).

Finally, in the long-run steady state, at times greater than or equal to T, the cumulative value of assets is the same value with t replaced by T.

To obtain the steady state revenue loss, the asset value is multiplied by ru, where u is the tax rate.

The frontloaded, or deductible, IRA requires some modifications. While these treatments lead to the same tax rate, because there is a deduction at the beginning of the contribution, the individual will have more consumption if he saves the same amount as in the IRA; similarly, because the contributions are taxed when withdrawn the individual will have less consumption in the future. In order for the individual to have the same initial and retirement consumption as in the backloaded case, he must save $1/(1-u)$ dollars for each dollar he would have saved in the backloaded case. Only when this amount of savings occurs are the tax benefits of equal value to the taxpayer (i.e., they allow him identical consumption paths over time). Note that his additional saving will just offset the government's additional revenue cost and keep the amount of total savings in the economy the same, but that a larger amount of capital will now be in a non-taxable status. Thus, the costs of the backloaded account must be divided by $1/(1-u)$.

In addition, the revenue path must account for the deductions and for the contribution. In each year, this deduction will entail a revenue cost of $u/(1-u)$. Beginning at time T' in the future, these withdrawals for each vintage of investment made at time greater than T' will be:

(22) $$W(t) = Ae^{-gt}/(1-u).$$

When these amounts are cumulated, they will equal

(23) $$CV(t) = e^{(r-g)T'}[1-e^{-g(t-T')}]/\{[1-e^{-r(T-T')}][g(1-u)]\}.$$

Note that the amount in equation (23) is the first term in equation (21), except that it is divided by $(1-u)$. The amounts in equation (23) are multiplied by u; in the steady state, t is replaced by T.

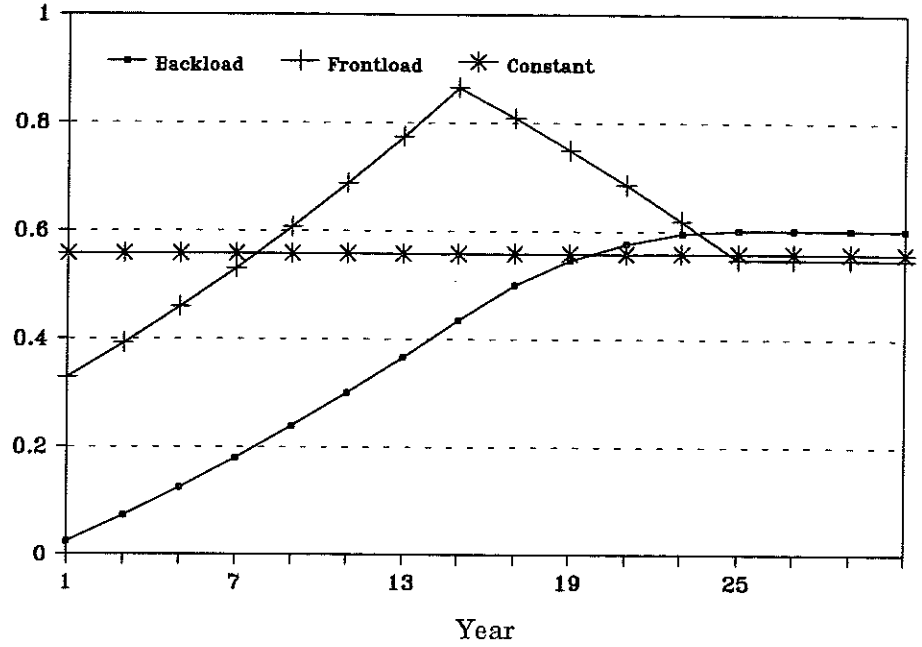
Once the problem has been set up, a solution recommends itself. While the policy debate would be informed by examining the pattern of these revenue losses, one might ask if there is any way to express these costs in equivalent terms. One method that would also be familiar would be to take the present value of all of the revenue costs, and turn it into an annual annuity that would maintain a constant proportion relative to GNP.

In this simple case, where the contributions grow with the economy's growth rate, it is only necessary to take the present value of taxes saved for the first vintage of investments. This value will then grow with the economy as contributions grow.

In order to do so, the stream of revenue losses would be discounted at an after tax rate of return, $r(1-u)$. Up until time T', the present value of any revenue loss at time t is:

(24) $$PV(t) = ure^{rt}e^{-r(1-u)t}.$$

FIGURE 3
Revenue Cost of Individual Retirement Accounts
Percent of Initial Investment, Constant Incomes



From time T' to t, the present value of the revenue loss is:

(25) $$PV(t) = ure^{rT}e^{-r(1-u)t}[1-e^{-r(T-t)}]/[1-e^{-r(T-T')}], \qquad T'<t<T.$$

When equation (24) is integrated over the period from zero to T', and equation (25) over the period from T' to T, the present value, after some simplification is:

(26) $$PV = [e^{ruT'} - e^{-r(T-t)}]/\{[1 - e^{-r(T-T')}][1 - u]\} - 1.$$

These values — for the frontloaded, backloaded, and present value calculations per dollar of investment in a backloaded account are shown in Figure 3 for the case $r = .10$, $g = .03$, $u = .23$, $T' = 15$, and $T = 25$. In this case, the short-run estimates understate the normalized revenue cost of the provision for both types of programs, but the understatement is more severe in the case of the backloaded IRA.

Finding a method of equating the two costs does not solve the revenue estimating problem of determining future behavior. For example, it is possible that contributions will not grow at the rate of the economy. The methodology could be adjusted for this assumption if it were thought likely. But it does provide a method of assessing costs. At the least, such a methodology might be employed along with estimates of the long-run time path to clarify the economic equivalence of various proposals. This present value calculation is much like the use of the investment credit in Figure 2 to represent the general magnitude of different types of investment subsidies.

The methodology could also be applied to the capital gains indexing provision discussed earlier as well as the other tax provisions. In the case, for example, of the one time speedup of collections, the present value converted into an annuity that grows at the rate of the economy would result in a value equal to $r(1-u)$ times the one time change. If this after tax discount rate were, for example, 5 percent, then for each dollar shifted, the savings would be \$.05 per annum, growing with the economy.

It would also be possible to normalize the treatment of temporary provisions. For example, there were a number of provisions, such as the R&D tax credit, that were enacted over a fixed period. In this case, one could convert them to an annuity over their finite period. For revenue provisions with a constant relationship to the economy, the treatment as an annuity would be identical to the revenue cost; for those with an uneven pattern, the costs would be different.

NOTES

The views in this paper do not necessarily reflect those of the Congressional Research Service.

1. Depreciating even those intangibles where depreciation can be established is not necessarily the best tax policy in any case [Gravelle and Taylor, 1992].
2. The author of this paper wrote several memoranda to Committees and Members of Congress detailing the revenue problem, and these were circulated during the debate.
3. The evidence on the savings effects of IRAs has been in some dispute. See Gravelle [1991] for a review.

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