NBER WORKING PAPER SERIES

INVESTMENT VERSUS SAVINGS INCENTIVES: THE SIZE OF THE BANG FOR THE BUCK AND THE POTENTIAL FOR SELF-FINANCING BUSINESS TAX CUTS

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Working Paper No. 1027

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge MA 02138

November 1982

Paper presented to the Symposium on the Economic Consequences of Government Deficits, sponsored by Washington University's Center for the Study of American Business and the Institute for Banking and Financial Markets, October 29 to 30, 1982. We are grateful to the National Bureau of Economic Research and the National Science Foundation for financial support. This research is part of the NBER's program in Taxation. Andrew Myers provided excellent research assistance. The views expressed are solely those of the authors.

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Abstract

This paper examines the closed economy effects of government policies that vary with respect to whether they treat newly produced capital differently from old capital. Policies that do make this distinction are denoted _investment_ policies, while those that do not are labelled _savings_ policies. While both types of policies alter marginal incentives to accumulate new capital, investment incentives can generate significant inframarginal redistribution from current holders of wealth to those with small or zero claims on the existing capital stock. Among the principal findings, based on simulations of a general equilibrium, perfect foresight, overlapping generations life-cycle model, are:

1) Investment incentives, even if financed by short run increases in the stock of debt, significantly increase capital formation.

2) Deficit-financed savings incentives, in contrast, typically reduce the economy's long run capital stock.

3) Deficit-financed investment incentives can actually be self-financing, in that they may lead to a long run surplus without any increase in other tax rates.

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I. Introduction

In closed economies, saving and investment represent, respectively, the supply of and demand for new domestic capital. Saving incentives shift the supply curve for new domestic capital, while investment incentives shift the demand curve. The basic public finance equivalence theorem that the real effects of a tax (subsidy) are independent of who nominally pays the tax (receives the subsidy) applies equally well to the market for new capital. Hence, in closed economies, saving and investment incentives do not represent conceptually distinct policies, and the real effects of taxes or subsidies applied to the supply of new capital, saving, can be replicated by taxes or subsidies applied to the demand for new capital, investment.

While economically meaningful distinctions between saving and investment incentives do not arise, there are meaningful distinctions between policies that affect saving*s*, the sum of past and current saving, and those that directly affect only current saving, or, in equilibrium, current investment.

This paper examines the closed economy effects of government policies that vary with respect to whether they treat newly produced capital differently from old capital. Policies that distinguish new capital from old are denoted investment policies, while those that do not are labelled saving*s* policies. While both types of policies alter marginal incentives to accumulate new capital, investment incentives can generate significant inframarginal redistribution from current holders of wealth to those with small or zero claims on the existing stock of capital. In the context of a neoclassical growth model, this redistribution runs, in large part, from the elderly to young and future generations. The direction of this intergenerational transfer is opposite to that associated with the "burden of government debt"; in the case of debt, the government passes the tax bill for current expenditures on to future generations.

Intergenerational transfers can have important effects on national saving and capital formation in the life growth cycle model that posits zero or limited intergenerational altruism. The process by which these transfers affect capital formation is often referred to as "crowding out" of investment. A natural question to pose in a life cycle model is whether the "crowding in" of new capital formation arising from investment incentives exceeds the crowding out produced by deficits potentially associated with these incentives. This question has particular relevance to present economic affairs since current U.S. projected deficits reflect, in large part, business tax cuts.

In addition to analyzing the net impact on capital formation of deficit-financed business tax cuts, this paper considers the potential for self-financing business tax cuts. A self-financing business tax cut is defined here as a deficit-financed investment incentive that produces an increase in the economy's long run tax base sufficient to permit the government to reach long run budget balance without ever raising tax rates.

A third issue of considerable relevance to current economic policy is whether gradual increases in investment incentives delay investment until the incentives have been fully phased in. The 1981 Economic Recovery Tax Act (ERTA) provided for even greater investment incentives after 1984 than between 1981 and 1984. The 1982 Economic Report of the President indicated a potential decline in the effective tax rate on equity financed new investment in general industrial equipment from 21 percent in 1982 to negative 54 percent in 1986. In part, these figures reflect steadily declining projected inflation rates interacting with historic cost depreciation provisions. In addition, ERTA authorized more favorable depreciation schedules starting in 1985. While the 1982 tax act reduced future increases in the acceleration of depreciation, the 1981 act may, in part, be responsible for the historically low investment rate in 1982.

The principal findings of this paper with respect to these three issues are:

(1) Investment incentives, even those financed by short run increases in the stock of debt, significantly increase capital formation in life cycle economies.

(2) Deficit-financed savings incentives, in contrast, typically reduce the economy's rate of capital formation in the long run.

(3) Deficit-financed investment incentives can be self-financing for particular, but not unreasonable, parameterizations of neoclassical life-cycle growth models.

(4) Gradual phasing in of investment incentives can actually reduce rather than stimulate short term investment.

(5) The underlying explanation for the relative efficacy of investment as opposed to savings incentives in stimulating capital formation in life cycle models is that investment incentives redistribute from the old to the young. Since the old in life cycle models have higher marginal propensities to consume out of lifetime resources than the young, this transfer reduces current consumption, permitting the "crowding in" of current investment.

The analysis of investment incentives is based on the Auerbach-Kotlikoff (1983) life cycle computer simulation model. The model describes the perfect foresight growth path of life cycle economies in response to a wide variety of fiscal policies. For purposes of this study the model has been expanded to include full or partial expensing of new capital as a policy option. Expensing is only one of several types of currently legislated investment incentives; its use is limited to a small subset of total U.S. investment. However, expensing is a convenient devise for analyzing a variety of other investment incentives including the investment tax credit and the acceleration of depreciation; rates of fractional expensing can be chosen that produce effective tax rates on new investment equal to those arising from these other policies. In addition, if deficit policy is chosen appropriately, expensing policies can produce a time path of cash flows to the government similar to those that would arise from changes in the ITC or depreciation schedules.

The second substantitive addition to the model is the inclusion of cost of quickly adjusting the economy's capital stock. As described by many authors (including Abel, 1979; Hayashi, 1981; and Summers, 1981), such increasing marginal costs of investment generate inframarginal rents to existing capital. As a consequence, the market valuation of the economy's existing capital stock can differ from its replacement cost. The assumption of quadratic adjustment costs leads to a theory of investment in which the rate of investment is a linear function of Tobin's q (Tobin, 1969), the ratio of the stock market value of capital to its replacement cost. Tobin's q is also an important variable in determining household consumption and labor supply decisions. These decisions are based on the current and future wages and rates of return households foresee, but also on the household's initial wealth, including the market value of its claims to existing capital.

Since the elderly are the primary owners of capital in a life cycle model, consideration of adjustment costs, with their associated implications for changes in the wealth of the elderly, can be quite important in assessing the redistributive impact of numerous fiscal policies. One example is a switch from an income to an equal revenue consumption tax. Such a policy suggests a significant loss in welfare to the elderly, whose wealth holdings must now be spent, in part, to meet taxes on the purchase of consumption goods. With capital adjustment costs, however, there is a countervailing effect serving to increase the wealth and welfare of the elderly. The stimulus to capital formation associated with the consumption tax produces an immediate increase in stock market values, reflecting increased inframarginal rents to the existing capital stock. The higher initial stock market values obviously redound to the advantage of the elderly.

In addition to mitigating the intergenerational redistribution from the old to the young in the case of a switch to a consumption tax, the inclusion of adjustment costs in the model cushions the fall in stock market values associated with investment incentives that discriminate against old capital. Permitting expensing of new capital at higher rates than were previously allowed and restricting this expensing solely to new capital is an example of a policy injurious to the elderly, since it places existing capital at a financial disadvantage relative to new capital. But the welfare loss to the elderly is mitigated to the extent that the economy's desire for an ultimately greater level of capital per worker raises inframarginal rents on previously installed, i.e. existing, capital.

The next section of this paper ignores the issue of adjustment costs in order to clarify, in a simple framework, differences between investment and savings incentives. The discussion points out equivalence relationships between investment incentives and other fiscal policies. In particular, permitting 100 percent expensing of new capital in the presence of a capital income tax (levied either on individuals or on businesses, in the form of a profits tax) is equivalent to imposing a one time wealth tax at a rate equal to that of the capital income tax. If the economy also taxes labor income at this same rate, introducing 100 percent expensing taxes wages and initial wealth at the same rate. This tax structure, in turn, is equivalent to a proportional consumption tax.

With the exception of the investment tax credit, new U.S. business investment incentives are available to old as well as new capital; the old capital must, however, be sold to qualify for the new incentives. The sale of old capital requires payment of recapture taxes calculated on the difference between the asset's new sale price and its adjusted basis. If the taxes incurred in turning over old assets exceed the present value gain in investment incentives from such a transaction, turnover will not be stimulated; in this case the economic outcome of new investment provisions that do not explicitly exclude old capital will be identical to that which would have occurred had the new incentives been restricted solely to new capital.

Section III considers the potential for turning over old capital under the 1981 Tax Act; for much of U.S. capital produced prior to 1981 the costs of turnover exceed the benefits. For the remaining assets, however, turnover, in the absence of transaction costs is profitable, but turnover taxes still recapture most of the gains from these transactions. Hence, with respect to recent tax legislation, the effective, if not the nominal, tax treatment of new and old capital is quite different, and the new law primarily provides investment as opposed to savings incentives.

Section IV describes the version of the Auerbach-Kotlikoff simulation model used to compare savings and investment incentives in both the presence and absence of capital adjustment costs. The following section presents simulations of these policies and examines the extent of short-run and long-run crowding out.

Section VI considers three alternatives to the deficit-financing of investment incentives. One involves a delay in the introduction of expensing. A second involves actually increasing the tax on capital income in conjunction with full expensing, while a third involves a reduction in the extent to which expensing is permitted.

The first simulation shows that a time path of increasingly generous investment incentives can be associated with simultaneous declines in stock market values, quite low and, possibly, negative short term interest rates and fairly large, positive long term interest rates. Such a policy actually suppresses short-run investment. The second simulation demonstrates the somewhat paradoxical result that given a structure of investment incentives, increases in capital income tax rates (e.g., corporate or dividend tax rates) will generally stimulate, rather than retard, capital formation, while requiring an immediate decline in wage taxes to avoid running surpluses. Finally, our third simulation shows that the government, through a policy of partial expensing, can raise investment and generate a surplus without ever raising either the capital income tax or the labor income tax.

The last section of the paper summarizes major findings and relates these results to recent economic events.

II. Investment Incentives - Structural Relationship to Other Fiscal Policies

A simple two period life cycle model of economic growth provides a convenient framework for examining the underlying nature of investment incentives. Consider such an economy with a tax $\tau_{w,t}$ on labor income, a tax $\tau_{r,t}$ on business profits, and an expensing rate for new capital of e_t. The subscript t denotes the period in which the three instruments are applied. To simplify the analysis further, assume individuals work only when young and that the depreciation rate, the rate of population growth, and the rate of technological change are zero.

Equations (1) and (2) characterize the economy's process of capital formation:

$$(1) \qquad K_t = (W_{y,t-1}\ (1 - \tau_{w,t-1}) - C_{y,t-1})/q_{t-1}$$

$$(2) \qquad C_{0,t} = q_{t-1}\ K_t\ (1 + r_t)$$

In (1), $W_{y,t-1}\ (1 - \tau_{w,t-1}) - C_{y,t-1}$ is the saving of the young in period t-1, their after tax wages in period t-1 less their consumption in period in t-1. The net price of a unit of capital in period t-1 is given by q_{t-1}. Dividing the financial saving of the young by q_{t-1} determines their purchase of physical capital. The physical capital acquired by the young at the end of period t-1 equals the economy's capital stock at the beginning of period t, K_t; the old generation in period t (those young in t-1) hold claims to all the economy's capital, since the young in period t have no beginning of period assets.

For the old in period t, consumption, $C_{0,t}$, equals the return of principal, $q_{t-1}\ K_t$, plus the after tax return on the investment, $q_{t-1}\ K_t\ r_t$. The after tax return, r_t, includes capital gains and losses:

(3) $$r_t = \frac{F_{K,t}\,(1 - \tau_{r,t}) + q_t - q_{t-1}}{q_{t-1}}$$

In (3) $F_{K,t}\,(1 - \tau_{r,t})$ equals marginal after tax profits per unit of capital. In combination, (2) and (3) imply:

(4) $$C_{O,t} = q_t\,K_t + K_t\,F_{K,t}\,(1 - \tau_{r,t})$$

This new expression is also intuitive: the consumption of the old in period t (the young of period t-1) equals after tax business profits plus the value of the sale of their capital at the prevailing asset price q_t.

Equation (5) expresses q_t, the net price of purchasing a unit of capital, in terms of $\tau_{r,t}\,e_t$:

(5) $$q_t = 1 - \tau_{r,t}\,e_t$$

For new capital the net acquisition cost is 1, the price of new capital, less the tax rebate from expensing, $\tau_{r,t}\,e_t$. Equation (5) also determines the price of old capital. Since old capital and new capital are perfect substitutes in production their net acquisition costs must be identical in equilibrium; hence, old capital sells for $\tau_{r,t}\,e_t$ less than new capital because the purchaser of new capital receives $\tau_{r,t}\,e_t$ from the government, while the purchaser of old capital receives no tax rebate. Since the value of old capital depends on the product of $\tau_{r,t}\,e_t$, the price of old capital falls not only when expensing is increased (and $\tau_{r,t}$ is positive), but also when the rate of business profits taxation rises, given an expensing policy.

Equations (1), (4), and (5) may now be combined to indicate the lifetime budget constraint of the young in period t-1,

(6) $$C_{y,t-1} + C_{O,t}\,\frac{(1 - \tau_{r,t-1}\,e_{t-1})}{(1 - \tau_{r,t}\,e_t) + F_{K,t}(1 - \tau_{r,t})} = W_{y,t-1}\,(1 - \tau_{w,t-1}),$$

and the old in period t-1:

(7) $$C_{0,t} = K_{t-1} (1 - \tau_{r,t-1} e_{t-1}) + K_{t-1} F_{K_{t-1}} (1 - \tau_{r,t-1})$$

These equations suffice to describe the relationship of savings and investment incentives to other tax structures. First, consider the case of zero expensing ($e_{t-1} = e_t = 0$). This assumption produces an economy with period t capital income and wage tax rates of $\tau_{r,t}$ and $\tau_{w,t}$ respectively. In such an economy, the return to new capital, capital produced in period t-1 and old capital, capital produced prior to period t-1, are taxed at the same effective rates in period t and beyond. With zero expensing, there is no discrimination in favor of newly produced capital; the relative price of new and old capital is always unity. Changes in the time path of $\tau_{r,t}$ and $\tau_{w,t}$ that satisfy the government's long run budget constraint (see Auerbach and Kotlikoff, 1983) are classified, in our taxonomy, as savings incentives. Section V indicates that lowering capital income tax rates will typically depress rather than stimulate long-term capital formation if such savings incentives are deficit-financed.

The essential feature of investment incentives can be illustrated most simply by assuming zero wage taxation, permanent capital income taxation at rate τ_r, zero expensing prior to period t-1, and a permanent move to 100 percent expensing starting at time t-1. Under these assumptions, all tax terms drop out of equation (6); the young of period t-1 and all future generations face zero effective taxation over their lifetimes. While the young and future generations nominally pay business profits taxes in their old age, the reduced cost of purchasing capital when they are young exactly offsets the present value cost of this taxation. Stated differently, new generations starting in year t-1 are subsidized when young to purchase capital and taxed when old on its return. The subsidy and tax cancel in present value and the young face no net taxation on their capital investments.

While this new tax structure effectively exempts the young of period t-1 and all future generations from paying any taxes over their lifetime, elderly individuals at time t-1 suffer a capital loss on their assets equal to $K_{t-1}\ \tau_r$. According to (7), the consumption of the elderly falls by this amount; the $K_{t-1}\ \tau_r$ capital loss constitutes a one time wealth tax on the old of period t-1. Considering the tax treatment of the young and old together, this new tax system is equivalent to the government's collecting $K_{t-1}\ (1 + F_{K_{t-1}})\ \tau_r$ in taxes from the old in period t-1 and abolishing taxation thereafter.[1]

This example highlights the special feature of investment incentives, namely that they tax initial holdings of wealth. A second important feature is that they lower the effective tax on the return to saving of young and future generations. With 100 percent expensing the effective capital income tax rate is reduced to zero.

The presence of wage taxation alters the analysis somewhat. Let us now assume positive and permanently fixed values of τ_r and τ_w. In this case moving to full expensing leaves young individuals facing a lifetime wage tax, or equivalently a lifetime consumption tax, since (6) can now be rewritten as:

$$(6') \qquad C_{y,t-1}(1 + \tau_C) + C_{0,t}\ \left(\frac{1 + \tau_C}{1 + F_{K,t}}\right)\ = w_y$$

where

$$1 + \tau_C \equiv \frac{1}{1 - \tau_w}$$

The elderly in period t-1 again face an additional wealth tax of $K_{t-1}\ \tau_r$ in addition to business profits taxes of $K_{t-1}\ F_{K_{t-1}}\ \tau_r$. If τ_r equals τ_w, the case of a proportional income tax, (7) becomes:

$$(7') \qquad C_{0,t-1}\ (1 + \tau_C) = K_{t-1}\ (1 + F_{K_{t-1}})$$

Equations (6') and (7') demonstrate that the movement to full expensing in the presence of a proportional income tax produces a consumption tax, or equivalently, a wage tax plus a one time wealth tax on the elderly where the wage and one time wealth tax rates are identical. This tax structure corresponds exactly to that proposed by Hall and Rabushka (1982) in their recent flat tax proposal. While the Hall-Rabushka proposal generates a genuine consumption tax, other proposals such as unlimited use of IRAs and abolition of the corporate income tax, which are billed as "providing consumption tax treatment" of income flows, produce wage tax rather than consumption tax structures. In the case of unlimited IRAs, the initial owners of capital can place all their holdings of capital into IRAs, receiving tax deductions that equal in present value the taxes on withdrawals of principal plus interest from the IRA. Thus the owners of existing capital face no effective taxation on the conversion of their capital into consumption expenditures; a policy of unlimited IRAs effectively eliminates the capital income tax component of the income tax with no effective wealth tax on existing assets. For those with no initial assets, wage taxation and consumption taxation are structurally equivalent. Hence, a policy of unlimited IRAs and a zero corporate income tax replicates a wage tax. It does not replicate a consumption tax.

Another complication of the foregoing analysis is that the actual U.S. tax law permits existing assets to qualify for new tax incentives, if they are sold by the existing owner. For example, the 1981 Accelerated Cost Recovery System (ACRS) does not explicitly exclude old capital, though application of ACRS to old capital requires a change in the capital's ownership. It is important to distinguish here between direct capital ownership and indirect ownership through firms. One normally thinks of life cycle transfers of assets as being accomplished by the sale of shares in firms owning capital goods. This is not considered to be a change in the ownership of the capital goods themselves, which would require the sale of the actual goods by one firm to another. Thus, we may imagine that in selling off their assets the elderly can choose whether to transfer ownership of assets or ownership of firms, with the only resulting difference being whether sale of the capital goods themselves is recognized for tax purposes. We refer to the former case as "turnover" of assets.

If old capital is eligible for new investment incentives (expensing) subject to recapture taxation, the budget constraint facing the elderly is no longer (7), but rather:

$$(7'') \qquad C_{0,t-1} = K_{t-1}\,(1 - R_{t-1}) + K_{t-1}\,F_{K_{t-1}}\,(1 + \tau_{r,t-1})$$

where R_{t-1} is the recapture tax per unit capital.

A comparison of (7) and (7'') implies that sale of old capital to acquire eligibility for current investment incentives available to new capital will only occur if $\tau_{r,t-1}\, e_{t-1}$ exceeds R_{t-1}. If these two terms are equal, the elderly are indifferent between selling their capital as old capital, e.g. selling equity title to previously expensed capital, or selling the actual capital at its replacement cost of unity and paying recapture taxes.

If turnover is advantageous, (7'') indicates that recapture taxes are equivalent to lump sum taxes of equal size on the initial generation of elderly. For the young in period t-1, the lifetime budget constraint is no longer (6) but:

$$C_{y,t-1} + \frac{C_{0,t}\,(1 - \tau_{t-1}\, e_{t-1})}{1-R_t + F_K(1 - \tau_{r,t})} = W_y\,(1 - \tau_{w,t-1}) \tag{6''}$$

For given values of F_K, $\tau_{r,t-1}$, $\tau_{r,t}$ and e_{t-1}, values of R_t that make turnover profitable imply a larger effective after tax return on the saving of the young. In the case of a zero recapture tax, expensing implies no additional taxation of the elderly, and an effective subsidy on capital income to the young.

III. Recapture Taxes and the Exclusion of Old Capital From the Accelerated Cost Recovery System

The extent to which recapture taxation inhibits turnover is an empirical question that depends on the size of changes in investment incentives. The set of new incentives considered here are those provided by the Accelerated Cost Recovery System. Though the business tax provisions have again been altered by the Tax Equity and Fiscal Responsibility Act of 1982, the more recent legislation represents a small change from previous law, and introduces no additional incentives to turn over old assets to obtain the tax treatment accorded new assets. This is because the 1982 Act maintains current depreciation allowances indefinitely.

The 1981 Act introduced a sharp increase in the present value of depreciation allowances relative to those previously available. Like an increase in the expensing fraction restricted to newly produced capital, accelerated depreciation can lower the value of existing assets. While the new ACRS provisions are available to owners of old assets provided they sell (turnover) their old assets, the sale of these assets generates recapture taxes that may exceed the net increase in depreciation allowances. To the extent that such a sale is attractive, the fraction of the loss in value that the seller recoups represents a "leakage" to old capital of the investment incentive embodied in ACRS.

The recapture treatment of structures and equipment differs and they must be considered separately. For structures, the seller must pay a tax on the difference between sale price and depreciated basis, with the difference between sale price and hypothetical straight-line basis taxed as a capital gain, and the additional difference between straight-line basis and actual basis (positive if a more accelerated depreciation method has been used), taxed as ordinary income. Thus, the total tax due on an asset with a one dollar sale price is:

(8) $R = c\ (1 - B_{SL}) + \tau\ (B_{SL} - B)$

where c is the capital gains tax rate (equal to .28 for corporations) and τ is the income tax rate (.46 for corporations). The basis B and hypothetical straight-line basis B_{SL} depend on the age of the asset, which determines the extent to which depreciation allowances have been taken, and the asset's initial purchase price. If a t year old asset physically depreciates at a constant exponential rate δ, and the inflation rate is π, then its initial purchase price was $e^{(\delta-\pi)t}$. Thus, letting b^t_{SL} and b^t be the straight-line basis and actual basis for an asset aged t per initial cost, we have from (8)

(9) $$R_t = c(1 - b^t_{SL}\ e^{(\delta-\pi)t}) + \tau\ e^{(\delta-\pi)t}(b^t_{SL} - b^t)$$

In return for this recapture tax, the potential seller receives one dollar times the number of units of capital (at replacement cost) for his asset rather than the value it would command with its old depreciation allowances. Since investors must be indifferent between old and new capital, the price of an asset not turned over must reflect the difference in depreciation allowances afforded new capital and those available to old capital.

(10) $$q^t = 1 - \tau\ (Z_{ACRS} - Z^t_0\ e^{(\delta-\pi)t})$$

where Z^t_0 is the present value of remaining depreciation allowances for an asset of age t initially purchased for a dollar and Z_{ACRS} is the present value of allowance per dollar of new capital under ACRS. Equation (10) corresponds to the earlier equation (5) derived for the case of expensing. Here, the expensing fraction e is replaced by the more general expression of the difference between the values of prospective depreciation allowances on new and old assets.

Using (9) and (10), we may now ask whether the turnover tax R_t exceeds the increase in sale price $(1 - q^t)$ that the seller can obtain by opting for recapture. In addition, letting Z_0 be the present value of depreciation allowances for a new asset purchased under pre-1981 law, we may calculate what fraction of the capital loss generated by ACRS is avoided when turnover is profitable. Since the price of an asset of age t would have been

$$(11) \qquad q_0^t = 1 - \tau \, (Z_0 - Z_0^t \, e^{(\delta - \pi)t})$$

had there been no change in tax regime, the capital loss caused by ACRS for existing assets not turned over is

$$(12) \qquad q_0^t - q^t = \tau(Z_{ACRS} - Z_0)$$

per dollar of age t capital.

Our calculations require parameter values for δ and π, the depreciation and inflation rates, and prior depreciation provisions. For purposes of illustration, we set $\delta = .03$ and $\pi = .08$. We assume an after tax nominal discount rate of .10 and that prior tax depreciation followed the 150 percent declining balance formula with optimal straight-line switch-over, based on a tax lifeline of 35 years. These estimates of both actual and tax depreciation are meant to correspond roughly to a typical structures investment (see Jorgenson and Sullivan, 1982). We assume assets are purchased six months into the tax year and that tax payments are made annually, midway through the tax year as well. Post-1981 tax depreciation follows the 175 percent declining balance formula with optimal straight-line switch-over, based on a tax lifetime of 15 years, as dictated by ACRS.

Table 1 shows the results of calculations of q^t and R^t for structures purchased t years before the enactment of ACRS. The last column shows the fraction of the capital loss caused by ACRS (equal to 12.1 cents per dollar of capital) that could be recouped by turnover. Though turnover would not be useful for structures already completely written off, it appears advantageous for the bulk of structures. Because of growth and depreciation, a large fraction of the structure's capital stock is represented by assets purchased in recent years. For those assets, recoupment is substantial. For structures purchased within four years of the 1981 tax change, turnover allows a recoupment of over half the capital loss caused by ACRS. This figure is 85 percent for assets only one year old. Overall, if we assume a constant real rate of annual investment growth of 3 percent, this recoupment from turnover amounts to about one third of the capital loss on structures, given our parameterization. This result also suggests that, absent transaction costs, a large fraction of the structures capital stock ought to have been turned over upon the enactment of ACRS. However, such costs are clearly substantial for certain assets, such as factories and buildings, complementary to other productive factors in a company's production process. However, one would expect to see a greater turnover activity in commercial structures, such as apartment buildings and office buildings.

We turn next to the recapture treatment of equipment. Here, the analysis is complicated by the fact that most equipment qualifies for the investment tax credit, but only if the asset is new. The law greatly restricts the ability of an investor in used property to obtain the ITC. Moreover, the credit obtained by the original purchaser is also subject to recapture if the number of years the asset has been held is less than the minimum number of years required to qualify for such a credit. For example, equipment purchased before 1981 needed

Table 1

THE INCENTIVE TO RESELL ASSETS
(Structure)

Age (t)	Per Dollar of Age t Capital: Recapture Tax - R^t	Value without Resale - q^t	Gain from Resale $(1 - q^t - R^t)$	Fraction of Capital Loss Recovered
1	.021	.876	.103	.85
2	.046	.864	.090	.74
3	.069	.853	.078	.64
4	.090	.843	.067	.55
5	.107	.834	.059	.49
6	.124	.825	.051	.42
7	.139	.818	.043	.36
8	.153	.811	.036	.30
9*	.164	.805	.031	.26
10*	.174	.800	.026	.21
	. . .	. . .	. . .	
> 35	.280	.727	-.007	--

* Once an asset is 100 months old, the fraction of $(B_{SL} - B)$ subject to ordinary income taxation declines by one percent per month until it reaches zero at 200 months. This is accounted for in these calculations.

a tax lifetime of at least seven years to qualify for the full 10 percent credit. Assets with lifetimes of between five and seven years received only a 6-2/3 percent credit, and those with lifetimes between three and five years received a 3-1/3 percent credit. If an asset with a lifetime exceeding seven years were sold after, say, six years, the seller would have to repay one-third of the original credit received; if the sale were after four years, two-thirds of the original credit would be repaid, and so on.

A second difference in recapture treatment of equipment is that the entire differential between sale price and basis is taxed as ordinary income, unless sale price exceeds initial purchase price, in which case the gain on purchase price is taxed as a capital gain. These two differences in the recapture treatment of equipment make turnover less attractive than in the case of structures.

As long as the sale price of the asset is less than original purchase price, the total recapture tax on one dollar of equipment aged t is

$$(13) \qquad R_t = \tau\,(P - b^t e^{(\delta-\pi)t}) + (k - k^t)\, e^{(\delta-\pi)t}$$

where b^t, δ, π and τ are defined as before, k is the investment tax credit claimed originally, and k^t the credit that, <u>ex post</u>, the asset lifetime t would have dictated for the asset. P, less than unity, is the sale price. It accounts for the fact that, unlike a dollar of new capital, this asset will only receive the ACRS depreciation deductions and not the investment tax credit. Thus:[2]

$$(14) \qquad P = 1 - (k + \tau Z_{ACRS} - \tau P Z_{ACRS})$$

or

$$P = \frac{1 - k - \tau Z_{ACRS}}{1 - \tau Z_{ACRS}}$$

If the asset is not sold, then the value of the t-year old capital per dollar of replacement cost is:

(15) $q^t = 1 - (k + \tau Z_{ACRS} - \tau Z_0^t e^{(\delta-\pi)t})$

which differs from the equation for structures (10) only in the inclusion of the investment tax credit.

The seller of an asset will gain from turning the asset over if $P - q^t$ exceeds R^t. However, for representative parameters for equipment, this will not occur. Table 2 shows the values of R^t and q^t for an asset that depreciates at a rate of .12 and under old law was written off over a tax lifetime of ten years using the double-declining balance method with a switch-over to straight line. The value of P is .839, and the inflation rate and discount rates are, as above, set at .08 and .10. As the results show, the prospective seller would always lose by turning assets over on resale. Thus, owners of equipment can escape none of the capital loss induced by the liberalization of depreciation allowances for new capital goods. This loss is described by equation (12) and equals 10.5 cents of capital (measured at replacement cost).

Thus no equipment, but a substantial fraction of structures, could gain by being brought under ACRS. In the case of structures, a large fraction of the capital loss induced by ACRS could be avoided in this way. However, the presence of transaction costs of unknown magnitude makes it difficult to know how much of this turnover would take place. We may place upper and lower bounds on the size of the capital loss induced by the introduction of ACRS. With no turnover, the loss equals approximately 10.5 cents per dollar of existing equipment and 12.1 cents per dollar of existing structures. With the maximum gain from turnover, about one third of the loss on structures is recouped. Using estimates of the equipment/structures breakdown of 44.4 percent and 55.6 percent, respectively, obtained from data for 1975,[3] and with an estimate of 2.56 trillion dollars for the value in 1980 of the replacement cost of the business capital[4]

Table 2

THE INCENTIVE TO RESELL ASSETS
(Equipment)

Age (t)	Per Dollar of Age t Capital: Recapture Tax - R^t	Per Dollar of Age t Capital: Value without Resale - q^t	Gain from Resale ($P - q^t - R^t$)
1	.054	.847	-.062
2	.135	.796	-.092
3	.167	.753	-.081
4	.215	.718	-.103
5	.220	.690	-.071
6	.255	.667	-.083
7	.246	.645	-.052
	.	.	.
	.	.	.
	.	.	.
>10	.386	.521	-.068

stock, we obtain a range of 233 to 292 billion dollars as the effective wealth tax induced by the introduction of ACRS.

This result is only a rough calculation, and ignores the actual heterogeneity of the capital stock. Moreover, in the presence of adjustment costs (see below), the prices of all capital goods, including old ones, may rise with a surge in demand induced by an investment incentive such as ACRS. This would act to offset part of the capital loss induced by the more generous tax treatment of new capital versus old. However, the losses just calculated still are meaningful in that they represent the drop in value of existing capital <u>relative</u> to the value such capital would have had, had the additional tax benefits of ACRS applied to all capital.

IV. The Simulation Model and Its Parameters

The Auerbach-Kotlikoff simulation model calculates the equilibrium growth path of an economy consisting of government, household, and production sectors. The life cycle version of the model used in this study incorporates expensing of new capital and costs of adjusting the level of the capital stock. In addition to expensing, the government's policy instruments include capital income, consumption, and wage taxes, the level of government consumption, and the choice of a deficit policy.

The household sector consists of fifty-five overlapping generations, with the total population growing at a constant rate. The fifty-five period life span corresponds roughly to the life span of an adult. In each generation there is a single, representative individual, and generations differ only with respect to their opportunity sets. The production sector is characterized by firms maximizing the present value of their profits by choosing both annual levels of labor input and annual rates of investment.

Each household chooses life cycle labor supply and consumption by maximizing an intertemporally separable CES utility function (Auerbach, Kotlikoff, and Skinner, 1983) with a constant static elasticity of substitution between consumption and leisure at a point in time and a constant intertemporal elasticity of substitution between consumption at different points in time, leisure at different points in time, and consumption and leisure at different points in time. The simulation presented below incorporates a one percent population growth rate, a static elasticity of substitution of .8, and an intertemporal elasticity of substitution of .25. These elasticities are suggested by recent empirical studies of saving and labor supply.[5]

The production function used here is Cobb-Douglas, with capital's income share equal to twenty-five percent. The costs associated with investment are quadratic as in the simulation model of Kotlikoff, Leamer, and Sachs (1981), that is, the marginal cost of a new dollar of capital, including installation costs is:

$$(16) \qquad \phi(I) = 1 + b(\frac{I}{K})$$

where I is investment and K is existing capital. The term b is the adjustment cost coefficient. Larger values of b imply greater marginal costs of new capital goods for a given rate of investment.

The government choice of policy instruments is constrained by an intertemporal budget that holds over infinite time. This budget constraint requires that the present value of government capital income, wage, and consumption tax receipts be sufficient to pay for the present value of government consumption, the present value of expensing deductions, and the value of existing government net debt. The assumption that government debt (surplus) per capita cannot grow infinitely large is sufficient to generate this constraint on the time path of government policies.

The constraint implies that government policies are necessarily interdependent. A corollary is that certain deficit policies are not feasible. For example, the government cannot permanently change its expensing policy and permanently meet the consequent change in its receipts by simply altering its issue of debt. Such a policy would lead, over the long term, to either an infinite debt or an infinite surplus per capita. The probability that the change in the present value of tax receipts exactly equals the present value loss in revenues from changes in expensing is zero. Hence, to meet its budget constraints, the government must eventually raise or lower a tax instrument or its level of consumption in response to changes in its expensing policy. The next section indicates that for certain expensing policies the government need never raise any tax rate and, indeed, must lower tax rates at some point in the future to bring government finances into long term balance. Investment incentives that require no increases in current or future tax rates or reductions in current or future government consumption are described here as self-financing.

V. Investment versus Savings Incentives - Illustrative Simulations

No single comparison of policies that do and don't discriminate against old capital can meaningfully summarize all differences in economic growth paths associated with investment versus savings incentives; the government's intertemporal budget constraint requires adjusting other government policies in response to these incentives in order to maintain a present value equality between its receipts and expenditures (including interest and principal repayments on debt). The differences in capital formation arising from the implementation of investment rather than savings incentives depends on the choice and timing of these other necessary policy adjustments.

Contrast, for example, two policies that begin with a proportional income tax, one introducing permanent, 100 percent expensing, and the other permanently removing the tax on capital income. The reduction or possible increase in revenues from either of these policies could be financed by immediate or future changes in the tax rate on labor income, current or future changes in government consumption, or some combination of changes in these and/or other available instruments. Given the range of possible concommitant adjustments in other policies, statements such as "investment incentives stimulate more capital formation than savings incentives" are meaningless. Comparisons of investment and savings incentives for explicitly specified policies of adjusting to the associated revenue changes do, however, permit meaningful conditional comparisons of investment and savings incentives.

The first simulation we present involves of a permanent removal of capital income taxes, with debt policy used to maintain the wage tax rate at thirty percent for five years, and wage taxes adjusted thereafter to maintain a constant level of debt per capita. This simulation also assumes that there are no adjustment costs involved in changing the capital stock.

The initial steady state is characterized by a capital-output ratio of 3.04 and a gross interest rate of 8.22 percent. The specified policy leads to a 7.35 percent reduction in capital per capita, and a greater reduction in labor supply, with the resulting drop of 8.90 percent in output per capita. The wage tax rises to 47.8 percent in the long run. The path of per capita capital stocks over the transition period is shown by the solid line in Figure 1.

The solid line in Figure 2 shows the welfare effects on transition cohorts of this deficit financed elimination of capital income taxation; the horizontal axis indexes the cohort's year of birth (relative to the first transition year, 1), and the vertical axis measures the amount by which the cohort's labor endowment vector would need to be increased (or decreased) under the old regime to allow the achievement of the same utility level as that attained under the new regime. The long run welfare loss is 8.7 percent, but, in the short run, older generations gain relative to their <u>ex ante</u> prospects. This pattern of gains and losses is similar to that occurring under a policy (examined in Auerbach <u>et al.</u>, 1983) of switching immediately to wage taxation without running deficits, represented by the dotted line in Figure 2. However, both the short run gains and the long run losses are larger when debt policy is used, because of the further shifting of tax liabilities onto future generations. The impact on capital formation is another difference associated with the use of deficits to finance savings incentives; the dotted line in Figure 1 shows the path of capital per capita arising from a balanced budget switch from income to wage taxation. Rather than falling, the capital stock rises in the long run.

The next policy we consider is a move to immediate expensing of all investment, with the income tax held at 30 percent for five years and deficits used to

CAPITAL INCOME TAX REMOVAL

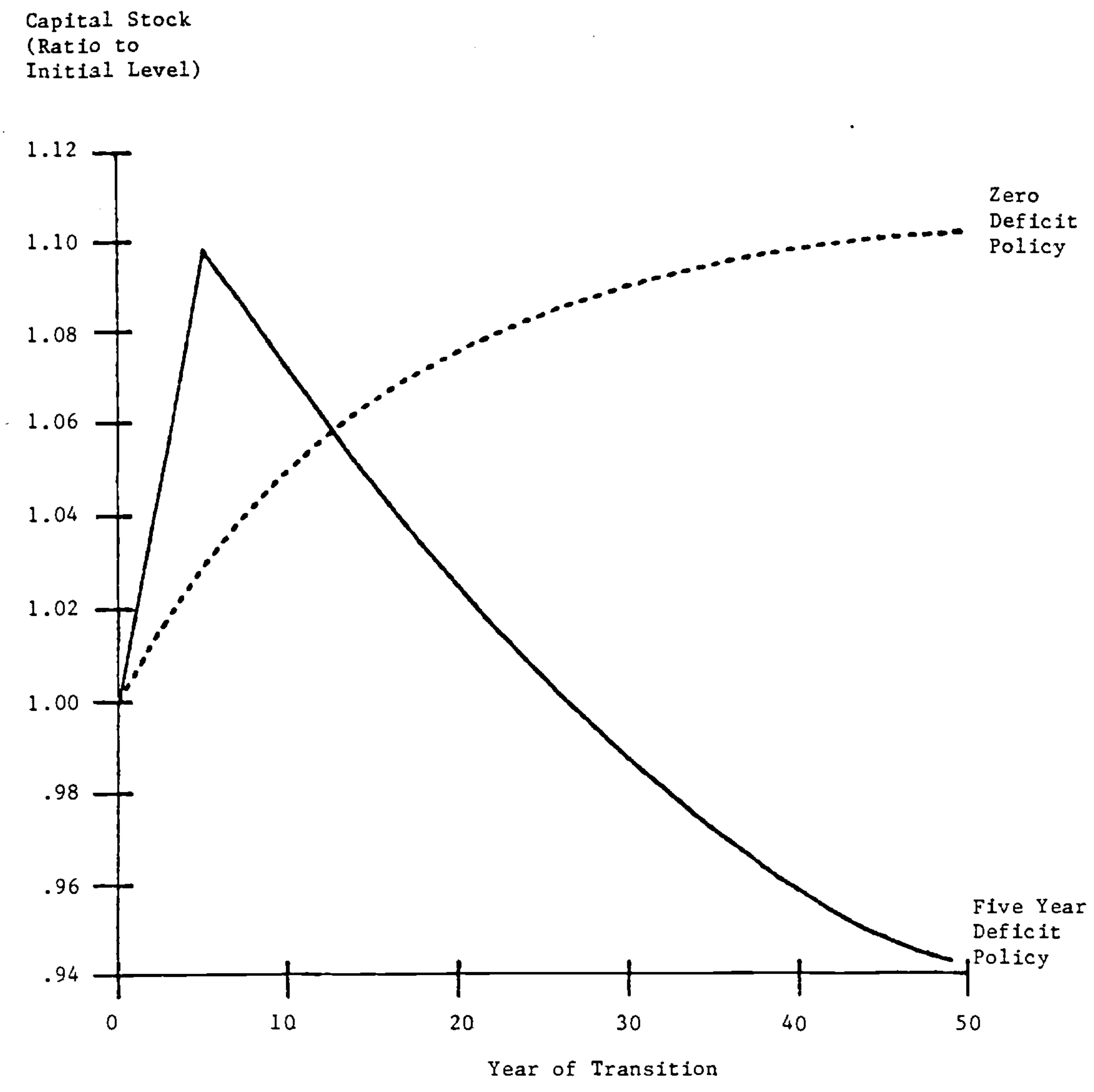
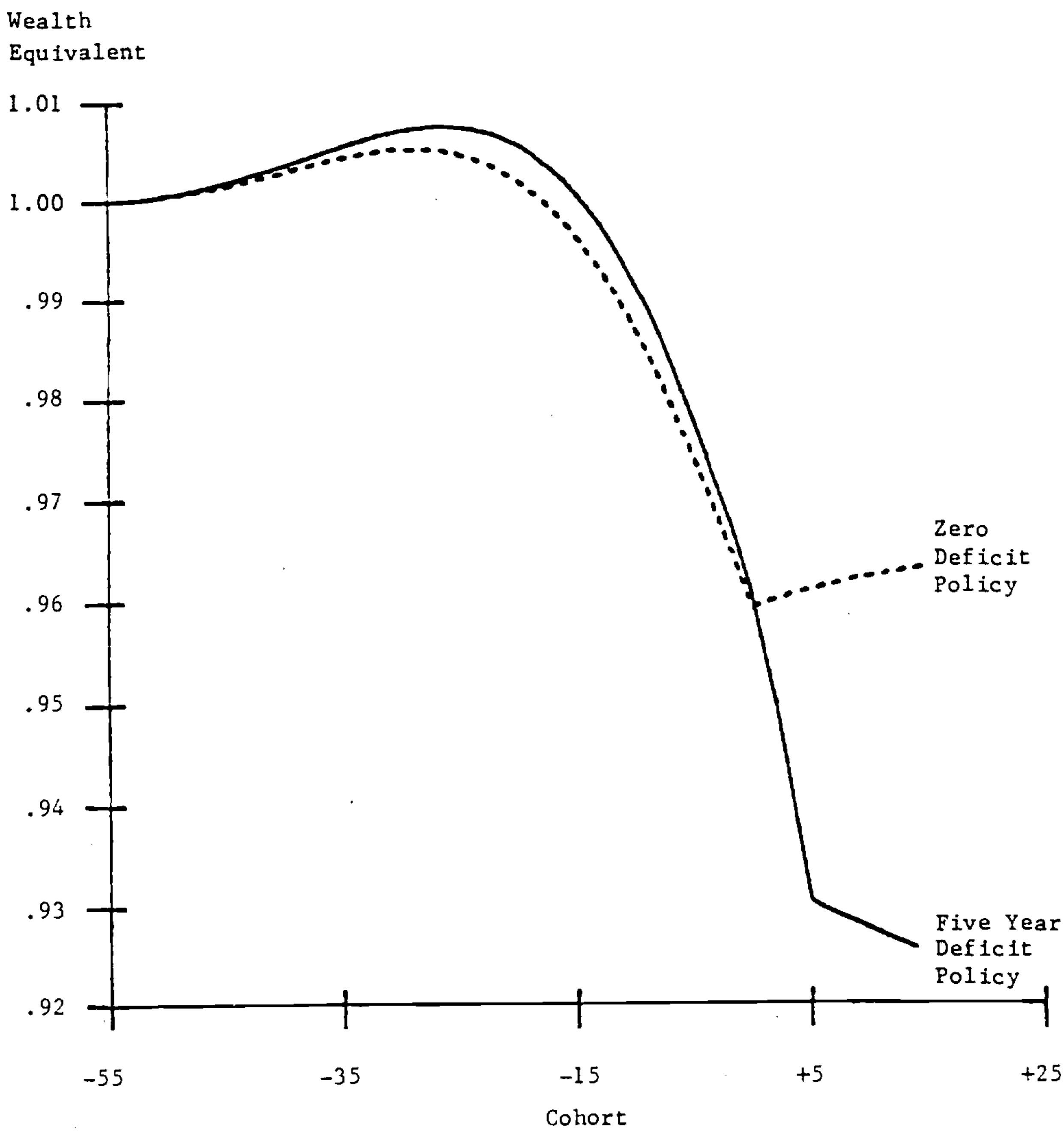


FIGURE 2

WEALTH EQUIVALENTS
CAPITAL INCOME TAX REMOVAL



finance the loss in revenue. After five years, income taxes rise to maintain a constant level of debt per capita. The capital stock and welfare transitions are shown by the solid lines in Figures 3 an 4, with corresponding paths under immediate balanced-budget expensing (as discussed in Auerbach et al., 1983), shown by the dotted lines. The effects of the implicit wealth tax on the original owners of capital is evident in both diagrams. The utility of older transition cohorts is decreased, and capital accumulation enhanced by the reduction in their consumption.

The five year delay in allowing tax rates to rise again leads to a lower long-run capital stock, but to a much smaller degree. The reason for this is that the deficits created by the policy during its first five years are much smaller. The long-run level of debt to capital is just 2.13 percent, compared to 13.8 percent in the case of the first simulation. In fact, the long run rate of income taxation is 28.9 percent -- lower than the value that obtained before the creation of the debt.

Thus far in our simulations, we have ignored the possibility that the short run supply curve for capital goods may slope upward. That is, attempts to increase quickly the amount of capital in response to an increased investment or savings incentive may result in a higher price of capital goods relative to consumption goods. If this is true, then our results may overstate the capital loss borne by holders of existing capital arising from an investment incentive such as expensing.

Setting the adjustment parameter b (see (16)) equal to the empirically plausible value of 5 (see Blanchard, 1981) for the simulation of a transition to expensing with a five year deficit policy yields the following results. First, the drop in capital stock values by the full value of expensing is not immediate, because of the offsetting effect of the increasing supply price of new

FIGURE 3

CAPITAL PATHS (PER CAPITA)
FULL INVESTMENT EXPENSING

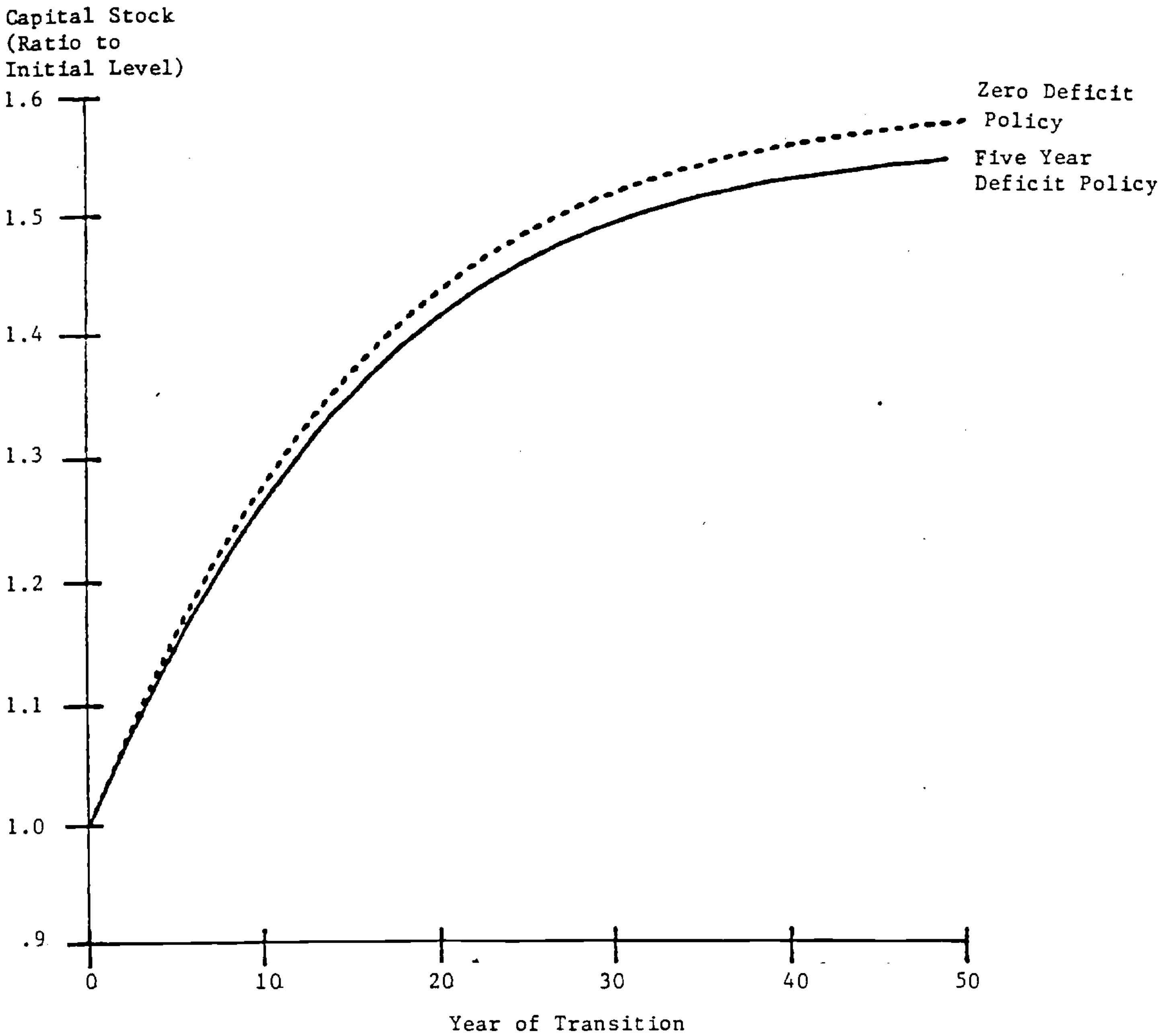
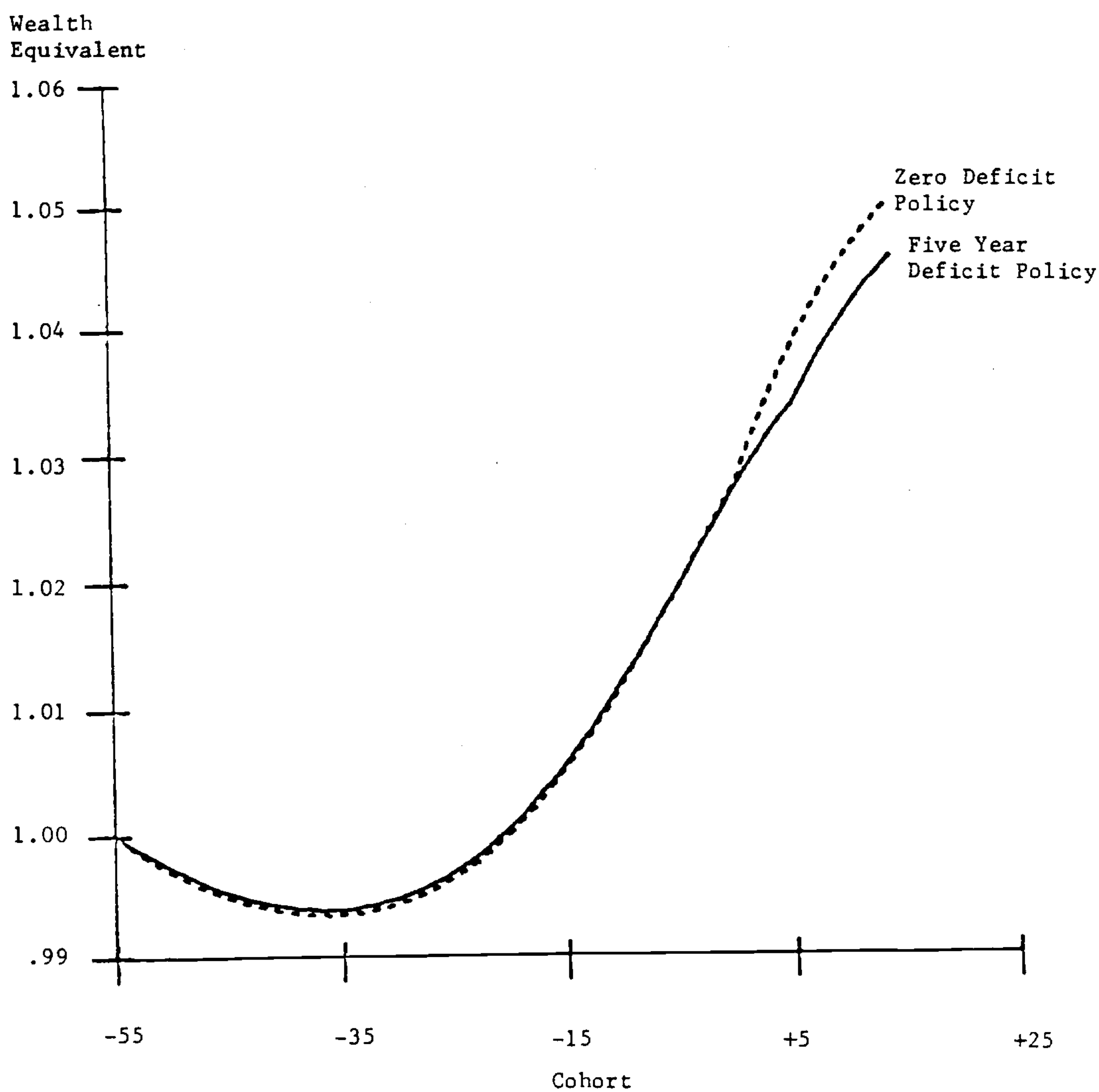


FIGURE 4

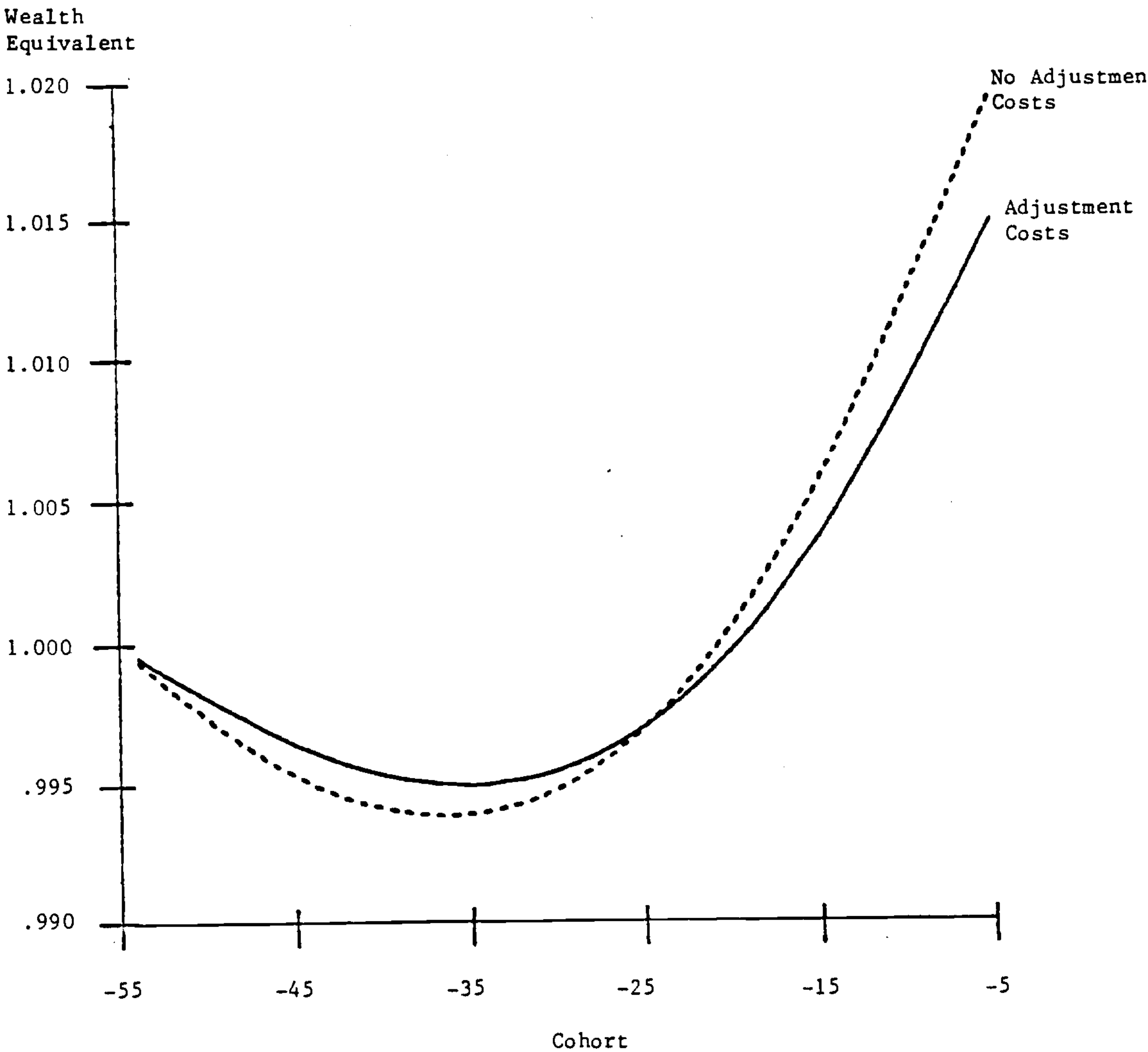
WEALTH EQUIVALENTS
FULL INVESTMENT EXPENSING



capital goods. The price drops by 22.5 percent in the first year of the transition rather than 30 percent. Second, the welfare loss of older transition cohorts is smaller and the long-run gain also smaller (5.92 percent) than in the simulation without adjustment costs (6.29 percent). The welfare paths are compared in Figure 5. Finally, the capital stock grows by a smaller amount, because not all of the demand induced by the investment incentives translates into increased output of capital.

FIGURE 5

WEALTH EQUIVALENTS
THE IMPACT OF ADJUSTMENT COSTS
(SWITCH TO EXPENSING UNDER FIVE YEAR DEFICIT POLICY)



VI. Dealing with Deficits

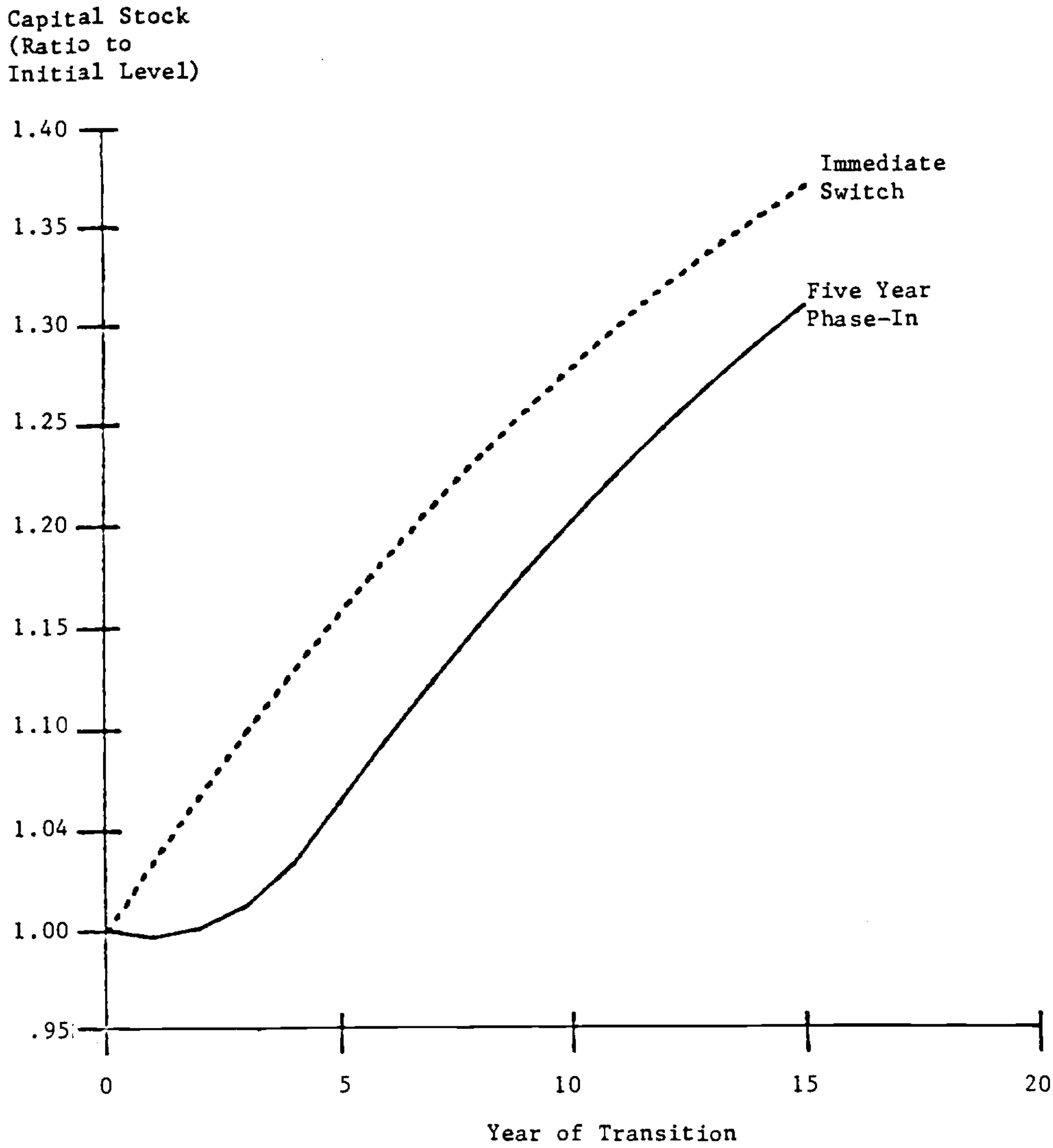
Various strategies have been offered to reduce short run deficits associated with tax cut policies. In this section, we present three simulations that bear on the feasibility and advisability of avoiding short run deficits while increasing the incentive to invest.

A typical solution to short-run revenue losses is a phase-in of investment incentives. This characterized the Economic Recovery Tax Act of 1981, which called for the acceleration of depreciation allowances to increase in 1981 and again in 1985 and 1986.[6] The problem with policies of this kind is that they induce capital losses gradually over the phase-in period. The awareness of potential investors of such future losses discourages investment in the short run, defeating the entire purpose of the legislation. This can be seen in the next simulation, which measures the effects of a five-year phase-in of expensing without deficits, with the expensing fraction rising linearly from .2 in the first transition year to 1 in the fifth. Deficits are avoided by the adjustment of the income tax.

Though investment eventually expands under this policy, the short run impact is to discourage investment. Figure 6 compares per capital capital stocks for the first twenty years of this policy with those arising from an immediate balanced budget switch to full expensing. The short-run disincentive to invest is also reflected by the drop in interest rates. The initial steady state interest rate is 8.22 percent. Under the investment phase-in policy, the gross interest rate (the yield that bonds would have to offer to provide the same after tax return as capital, inclusive of capital gains and losses) is negative until the phase-in is completed, and then jumps to over 12 percent. Thus, such a policy would sharply increase the slope of the yield curve.

FIGURE 6

CAPITAL PATHS
EXPENSING WITHOUT DEFICITS



A more successful way of avoiding deficits recognizes that investment incentives can often be achieved by raising rather than lowering capital income taxes. Recall that under a policy of full expensing that is effectively restricted to new capital the effective tax rate on capital income is zero. While the return on savings is not taxed at the margin, the increase in the statutory capital income tax rate increases the implicit wealth tax on existing capital. This reduces the consumption of wealth holders, permitting an expansion of national saving and investment. In addition, the extra revenue from the capital income tax allows the government to lower other taxes. Starting from an initial steady state with full expensing and a 30 percent income tax, raising the capital income tax rate to 50 percent allows an immediate drop in the wage tax rate to 26.5 percent (falling eventually to 21.6 percent) and an eventual increase in capital per person of 34.6 percent.

Finally, investment incentives may be self-financing in the long run, requiring no current or future increase in statutory tax rates to achieve a more capital intensive long run steady state with no debt. As an example, from an initial steady state with no expensing consider a policy of moving directly to 50 percent fractional expensing, with the income tax held constant at 30 percent for twenty years; while there are short run deficits, the expansion of the income tax base over time raises revenue sufficient to retire this debt. Indeed, in the twentieth year the debt-capital ratio is -.36 percent. This surplus permits a slight decrease in the income tax thereafter (to avoid an expanding surplus), to 29.2 percent in the twenty-first year and 29.0 percent in the long run. The per capita capital stock increases by 25.9 percent in the long run.

Part of the explanation of this result is that, while taxes on capital income and, eventually, labor income decline, existing capital owners face increased implicit wealth taxation under this same policy. Their welfare declines, thus distinguishing this policy from those offered by the "free lunch" theorists. A second aspect of this policy is that the economy has shifted to a more efficient tax structure, substituting lump sum taxes on initial wealth holders for distortionary income taxes on current and future generations. These efficiency gains also provide economic resources to "cut taxes and raise revenues."

While this policy of fractional expensing eventually leads to surpluses and tax rate reductions, a policy of full expensing (discussed at the beginning of the previous section) does not have this feature, indicating the presence of nonlinearities in the functions determining the economy's behavior. One such nonlinearity is associated with the well-known result that the excess burden of a tax rises at a rate proportional to the square of the tax rate itself. Thus, the initial reduction in the effective tax rate on saving induced by a policy of 50 percent expensing does proportionally more to reduce the distortion of savings behavior than does a policy of moving from 50 percent to full expensing.

VII. Summary

The key difference between savings and investment incentives in closed economies is the applicability of these incentives to old as well as new capital. Investment incentives discriminate against old capital; savings incentives do not. This discrimination reduces the market value of old capital and, therefore, the economic resources of owners of the existing capital stock. The reductions in the resources and welfare of initial wealth holders under investment policies are essentially identical to those arising from a one time wealth tax.

In life cycle economies, the remaining resources of the elderly are held primarily in form of non-human as opposed to human wealth. The effective wealth tax generated by investment incentives falls, therefore, most heavily on the elderly. For a given time path of government consumption and given characteristics of tastes and technology, extra taxes on the currently elderly imply offsetting receipts of resources by young and future generations. In life cycle economies, the elderly have a greater marginal propensity to consume than the young because of their shorter life expectancies; future generations obviously have zero current marginal propensities to consume. Hence, the intergenerational redistribution of resources away from the elderly, arising from investment incentives, leads to a major reduction in the economy's current consumption. The reduction in the consumption of the elderly effectively finances the "crowding in" of investment.

For certain ranges of investment policy instruments, the long term tax revenues arising from the increase in capital intensity are sufficient to finance the short run loss in revenue from these incentives. Hence, there is a range of investment incentives that are self-financing. In general, deficits associated with investment incentives are less injurious to capital formation than those associated with incentives.

In contrast to investment incentives, savings incentives such as permanent reductions in the taxation of profits at the corporate level typically redistribute towards rather than away from the elderly. The impetus to current consumption arising from this redistribution --the income effect -- is offset to some extent by the greater marginal incentive to save -- the substitution effect of a higher after tax rate of return. The net impact of savings incentives on capital formation depends on the use of deficits to finance these incentives. As demonstrated here, deficit-financed reductions in capital income tax rates can sharply lower national capital formation.

The policy most conducive to capital accumulation involves simultaneously increasing investment incentives and capital income tax rates. Such a policy could eliminate deficits, raise the after tax return to marginal saving, and produce income and substitution effects that both operate in the direction of stimulating capital formation.

Footnotes

1. For the government to maintain long term budget balance, it needs to choose a path of government consumption that equals $K_{t-1}(1 + F_{K_{t-1}}) \tau_r$ in present value.

2. After the effective date of the 1982 Act, this result would be altered by the application of a fifty percent basis adjustment for new credits taken.

3. U.S. Department of Commerce, Bureau of Economic Analysis, "Fixed Non-Residential Business and Residential Capital in the U.S., 1925-1975," PB 253 725, 1976.

4. Flow of Funds, "Balance Sheets for the U.S. Economy, 1945-1980," Board of Governors of the Federal Reserve System, Washington, D.C., 1981.

5. Auerbach; Kotlikoff and Skinner (1983) survey this literature.

6. The 1985 and 1986 changes have been repealed by the Tax Equity and Fiscal Responsibility Act of 1982.

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