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## ABSTRACT

After reviewing recent work on the feasibility of taxing capital gains on accrual or in an equivalent manner, this paper develops and presents simulations of a model of household behavior, aimed at assessing the efficiency effects of this and other tax reforms. The model accounts for the portfolio choice and intertemporal consumption distortions that capital gains taxes induce under current law.

Among the simulation results are:

1. Eliminating the "lock-in" effect through a revenue-neutral move to accrual taxation causes national saving to decline, as households face a lower tax on present consumption from appreciated assets and, by reallocating existing wealth more efficiently, need to save less for future contingencies. Despite reducing saving, however, such a reform increases economic efficiency.

2. A simple reduction in the rate of capital gains taxation reduces national saving even for very high intertemporal elasticities of substitution, because of the additional income effect associated with reduced taxes on previously accumulated gains and the more efficient reallocation of existing wealth. However, making the tax cut prospective, although increasing saving, delays portfolio rebalancing and need not improve efficiency.

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# On the Design and Reform of Capital Gains Taxation

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Capital gains taxes account for a relatively small share of U.S. tax collections, perhaps 10% of the revenue from the individual income tax and 4% of total federal revenue. Yet, reform of the capital gains tax has occupied a central place in recent tax policy discussions, and there has been considerable theoretical and empirical research on the effects of capital gains taxation on portfolio choice and capital accumulation. This paper reviews some of the recent discussions and offers some additional findings based on a simulation model of capital gains realization behavior.

## I. Capital Gains Taxation and Its Effects

Capital gains are taxed upon _realization_ rather than _accrual_. By paying taxes on accrued gains only when an asset is actually sold, the taxpayer benefits from interest-free tax deferral, an advantage enhanced by the fact that capital gains held until death are not taxed at all. Hence, the "effective" tax rate on accrued capital gains is well below the statutory rate, which may be (and was, until 1986) well below the tax rate on other income.

It is customary to measure the effective tax rate on capital gains as the tax rate that, applied to actual gains as they accrue, would yield the same present value of revenue as the existing tax on realizations. However, this estimated rate might considerably understate the full economic burden of the tax, because of its distortion of portfolio decisions (see Daniel Kovenock and Michael Rothschild 1987). I return to this question below.

The lower effective tax rate produced by the deferral advantage comes at the cost of an economic distortion -- the "lock-in" effect that causes investors to hold onto assets, with gains, that they might otherwise wish to sell, and to sell assets, with losses, that they might otherwise continue to hold. If investors can replicate one asset's characteristics with those of another, the lock-in effect's distortions may be minimal, but the possibilities for tax arbitrage enhanced; for example, an investor can take long and short positions in similar assets, bearing essentially no risk, and realize immediately whichever investment goes down in value (see, e.g., Joseph Stiglitz 1983). In this case, the capital gains tax imposes little direct distortion to underlying investor decisions (as opposed to superficial portfolio shifts), but it may cause a reduction in overall government revenue and necessitate an increase in other distortionary taxes.

Observing that portfolio behavior is sensitive to changes in capital gains taxation, therefore, tells us little about the direct distortions imposed by the capital gains tax or the overall revenue effects of changes in the capital gains tax. This problem has not prevented the appearance of numerous empirical studies (reviewed in Auerbach 1988), which have focused primarily on the elasticity of capital gain realizations with respect to the concurrent tax rate on capital gains. In rare cases, investigators have considered the changes in underlying behavior that would be necessary to produce estimated response elasticities (Auerbach 1989, Jane Gravelle 1991), but it would be useful to consider the underlying attitudes of households toward saving and risk-taking that would, in turn, lead to such behavioral changes.

## II. Accrual Taxation and its Alternatives

The lock-in effect and arbitrage possibilities associated with capital gains taxation arise from the taxation of gains upon realization. Neither would plague a system that taxed capital gains upon accrual, because an investor's tax liability would not depend on the realization decision. Accrual taxation would not be difficult to impose in the case of liquid, marketable assets such as common stock, but there would be two problems in other cases. First, investors might encounter difficulty raising the funds to pay taxes on assets they have not sold (the "liquidity" problem). Second, the values of an asset may be hard to determine until the asset has been sold (the "valuation" problem).

A solution to the liquidity problem was proposed by William Vickrey (1939) as part of his "cumulative averaging" scheme for income taxation, which would base taxes on gains as they accrued but allow deferral of payment of these taxes, with interest, until the date of actual realization. By charging interest, the government would remove the deferral advantage but still collect the tax at realization. Unfortunately, the cumulative averaging approach does not fully overcome the valuation problem, for it requires knowledge not only of the total gain, but the pattern of the gain's accumulation over time: taxes on gains accrued earlier in the asset's holding period should be charged more interest.

Even this problem can be overcome, however, if the government imposes a tax not on the gain the investor actually reports, but on an imputed gain based on some normal rate of return, adjusted for risk. To be more explicit, suppose that the sale price of an asset held for s years is $A_s$. If the investor had received the risk-free rate of return, i, in each year the asset was held, its initial price would have been $A_s e^{-is}$. If one starts from this imputed initial value (not the actual initial purchase price), imputes income in each year, again using the risk-free rate, and then applies Vickrey's scheme to tax this pattern of imputed gains, with interest, upon realization, then the resulting tax burden is:

$$(1) \qquad T_s = (1 - e^{-its})A_s$$

where t is the desired capital gains tax rate. As shown in Auerbach (1991), this scheme of "retrospective taxation" provides the same incentives, *ex ante* as a system of accrual taxation: there is no lock-in effect, and accruing gains are taxed at an effective rate equal to t.

The additional flexibility provided by cumulative averaging and retrospective taxation makes imposing a tax on accrued capital gains more feasible. But whether a move to accrual taxation is *desirable* is a more difficult question, because the lock-in effect is not the only distortion associated with capital gains taxation. Taxes on capital gains also drive a wedge between current and future consumption, distorting the saving decision.

Taxing gains on accrual imposes a greater tax burden by eliminating the deferral advantage present under the current system, and would therefore worsen this intertemporal distortion. While this increased burden may be offset by lowering the tax rate on accrued gains, the two systems will still be different, for the system of accrual taxation eliminates the lock-in effect. But it is not clear how removing this distortion influences the distortion to saving that remains. It is possible, for example, that the lock-in effect forces additional saving, as consumers not able to balance their existing portfolios are compelled to provide balance through additional asset accumulation -- a sort of precautionary saving forced by the inability to dampen risks.

One must also keep these two distortions, and their interactions, in mind when considering a more commonly proposed tax change, a simple reduction in the rate of capital gains tax. It has been argued that an immediate reduction in capital gains taxes is inefficient, because it provides windfalls to existing assets. If one views the capital gains tax as a distortion of the savings decision, this is a valid critique: lowering the tax on new gains would, for a given loss of tax revenue, target the tax reduction more toward marginal saving decisions. However, excluding preexisting gains from a tax reduction would also delay the elimination of the lock-in effect. It is not obvious which of these factors is more significant.

## III. Modelling Realization Behavior

To address the several questions identified above requires a model in which capital gains realizations occur in the context of household saving and portfolio decisions, determining the consumption of commodities at different dates and in different states of nature. I have constructed and simulated such a model which, although embodying simplifying assumptions, is informative about the questions raised.

In the model, a household with an initial, first-period endowment finances consumption over three periods. After using some of this endowment for first-period consumption, the household saves the rest in an asset whose return is treated as a capital gain. This asset's rate of return in the second period is the safe rate, say r.

To consume in the second period, the household must sell some of this appreciated asset, realizing capital gains. It also may realize gains in order to reallocate the wealth that remains after second-period consumption, buying another asset which is also subject to capital gains tax treatment. I assume that the third-period returns on the existing asset are risky (yielding, with equal probability, $g_1$ in state 1 and $g_2$ in state 2, with $g_1 > r > g_2$), while the alternative asset's return is safe. Thus, taxes aside, the risk-averse household will wish to reallocate its portfolio to the point where the excess expected return on the initial asset just offsets the risk it imposes. In the third period, in whichever state occurs, the household consumes its entire wealth, paying capital gains taxes on the total accumulated appreciation of the first asset and the new appreciation on the asset purchased in the second period.

Though simple, this model is capable of addressing each of the questions raised above. The two periods of savings decisions provide the element of deferral that is crucial to measuring the accrual-equivalent tax rate and the impact of the deferral advantage on saving. One may compare the efficiency of immediate and prospective capital gains tax cuts by considering a second-period tax reduction to one announced in the second period but applying only to gains accrued in the third period. Since the capital gains tax affects both saving and portfolio choice decisions, one may compare the overall efficiency effects of the current tax system and a tax on accruing gains.

## IV. Parameterizing the Model

If one views each period as lasting for 25 years, then a safe rate of return of 1.0 (4 percent per year) seems reasonable. I set the capital gains tax rate in the second period equal to .6. This high number is meant to reflect the taxation of both real and nominal capital gains -- at an annual inflation rate of 6 percent, this translates into a tax on nominal gains at the rate of 25 percent. Because of the fact that some gains carried into old age are held until death and not taxed, I set the third-period tax rate at the lower value of .45. For the third-period returns on the risky asset, I let $(g_1,g_2) = (2.9,-.1)$. This translates into an annual mean return of about 6 percent, and (assuming independent returns over time) an annual standard deviation of .28. This is about twice as large as the standard deviation of stock market returns observed over the period 1948-83 (see James Poterba and Lawrence Summers, 1986). However, such an adjustment is necessary to offset the use of a high capital gains tax rate, since in the real world the taxation of nominal gains raises the mean tax burden but does not dampen fluctuations in real returns.

Finally, it is necessary to choose the parameters of the household's utility function. To consider the impact of preferences on the portfolio choice and saving decisions separately requires a utility function that does not constrain the relationship between the intertemporal elasticity of substitution and the degree of risk aversion. I assume that the household's utility function over consumption at dates 1 and 2, $C_1$ and $C_2$, and in the two third period states, $C_3^1$ and $C_3^2$ has the form:

$$(2) \quad U(C_1, C_2, C_3^1, C_3^2) = [C_1^{-\beta} + C_2^{-\beta} + (.5C_3^{1-\alpha} + .5C_3^{2-\alpha})^{\beta/\alpha}]^{-(1/\beta)}$$

where $\sigma = 1/(1+\beta)$ and $\delta = 1/(1+\alpha)$ are the elasticities of substitution across dates and states, respectively (and $1/\delta$ equals the coefficient of relative risk aversion). For $\alpha = \beta$, preferences obey the expected utility axioms, although the recent literature suggests that these parameters may be different (see, for example, Larry Epstein and Stanley Zin 1991). Based on this literature, I let $\sigma$ and $\delta$ range separately from .1 to .9 in most simulations.

## V. Simulation Results

It is useful to summarize the results in the form of answers to the questions raised above.

### A. The Accrual-Equivalent Tax Rate

As an alternative to the standard measure (that rate of tax which, if applied to the existing pattern of accrued gains, would yield the same present value of tax payments), one may calculate the rate of accrual taxation that, if actually imposed, would yield the same level of household utility, given changes in behavior.

In all simulations, this alternative measure exceeds the standard one, because of the deadweight loss associated with the lock-in effect. However, the difference is not that large; the equal-utility accrual tax rate exceeds the standard measure by at most 14 percent (at $\sigma = \delta = .9$).

B. The Efficiency Gains from Accrual Taxation

In all cases, a move from the present tax system to an equal-yield accrual tax raises household utility. (Here, and below, I calculate present values of taxes using the state- and date-contingent prices implied by the social rates of return r, $g_1$ and $g_2$.) The equivalent variation of the welfare gain ranges from 1.0 percent of initial wealth for $(\sigma,\delta) = (.1,.9)$ to 1.7 percent for $(\sigma,\delta) = (.9,.1)$. However, the rate of national savings (before-tax income minus consumption) falls in both first and second periods.

The fall in savings results from a combination of two factors. First, by eliminating the deferral advantage, the shift to accrual taxation raises the price of third-period consumption relative to second-period consumption. This causes a shift between these two periods' consumption toward second-period consumption, reducing second-period saving. Second, the elimination of the lock-in effect reduces the need to provide resources for third-period consumption: through increased portfolio rebalancing, the household provides additional consumption in the unfavorable third-period state, without additional saving. This results in an increase in first-period and second-period consumption, and a decline in first-period and second-period saving. These declines in saving, it must be stressed, do not translate into declines in welfare. The shift to accrual taxation leads, in all cases, to an efficiency gain.

C. Tax Cuts, Realization Elasticities, and Capital Formation

Suppose that, in period 2 (after period 1 consumption and saving have been determined), the capital gains tax rate is reduced permanently by 10 percent. What is the short-run (i.e. second-period) and long-run (second- plus third-period) response in terms of realizations, tax revenues, and saving?

For all parameter values, revenue declines in the second period. However, the magnitude of this loss is quite sensitive to parameter assumptions; it equals 97 percent of the static (i.e. no behavioral response) revenue loss for the least elastic case ($\sigma = \delta = .1$), but just 13 percent of the static revenue loss for the most responsive parameter values ($\sigma = \delta = .9$). The long-run revenue loss is much larger, and much less sensitive to parameter assumptions; it ranges from 95 percent of the static revenue loss to 80 percent, respectively, in these same two simulations.

This smaller long-run elasticity results from two factors. First, as is commonly understood, some of the second-period tax collections result not from a permanent increase in realizations, but a shift in timing, due to increased portfolio rebalancing: a greater share of gains accrued in the second period are taxed immediately. Second, saving declines, so that there are fewer new gains accrued in the third period.

One would expect saving to decline with such an uncompensated increase in the after-tax rate of return, given that $\sigma$, the intertemporal elasticity of substitution, is less than 1. However, this decline is magnified by two additional factors. First, there is an extra income effect due to the cut in taxes on existing assets. Second, there is less need for precautionary saving.

Given the latter two effects, it would take an extremely high value of $\sigma$ to cause second-period consumption to decline. (Further tax-cut simulations with values of $\sigma$ up to 1.9 failed to produce an increase in saving.) However, as the decline in saving accounts for only a small portion -- between 10 and 17 percent -- of the total long-run revenue loss, increases in saving of comparable magnitude would still leave a considerable decline in revenue.

D. Immediate versus Prospective Tax Cuts

Suppose that, instead of an immediate cut in capital gains taxes, the tax rate on all gains accrued in the second period (regardless of when they are realized) is kept at its original level, with only gains accrued after the enactment date (i.e. in the third period) given a reduced rate of tax. As indicated in the discussion above, this would target marginal saving and do more to reduce the deadweight loss resulting from the intertemporal distortion. In every simulation, the use of an equal-revenue prospective tax cut causes a smaller reduction in national saving than an immediate cut. The difference in saving increases with the intertemporal elasticity of substitution, $\sigma$, as one would expect.

But, as emphasized above, an increase in saving does not guarantee an increase in welfare. Delaying the tax cut reduces portfolio rebalancing. Though also increasing saving (through the precautionary motive), this causes a reduction in utility that must be weighed against the utility gain from a smaller intertemporal distortion. When $\delta = .1$, and portfolio distortions are relatively small, the prospective tax cut leads to a higher level of utility than the immediate tax cut (for all values of $\sigma$); the reverse is true when $\delta = .9$. Though it produces more saving than an immediate tax cut, the prospective tax cut is not necessarily more efficient.

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Footnotes

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