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ABSTRACT

This paper attempts to bring theoretical and empirical research on capital gains realization behavior closer together by considering whether investors who appear to engage more in strategic tax avoidance activity also respond differently to tax rates. We find that such investors exhibit significantly *smaller* responses to permanent tax rate changes than other investors. Put another way, a larger part of their response to capital gains tax rates reflects timing, consistent with their closer adherence to tax avoidance strategies emphasizing arbitrage based on tax rate differentials. This finding holds for two alternative specifications of realization behavior, one of which suggests larger permanent responses to capital gains tax rates than those of previous panel studies.

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The literature on capital gains realizations reflects an inadequate integration of theory and empirical research. While theory has emphasized strategies to convert ordinary income into capital gains, to minimize capital gains realizations, and to generate capital losses, empirical research has utilized simple models to relate capital gains realizations to capital gains tax rates, finding large responses that are difficult to interpret in light of theoretical predictions. One step toward integration has been to distinguish long-run responses from the timing responses to short-term tax rate variation, with estimates based on aggregate time series (Auerbach 1988) and panel data (Leonard Burman and William Randolph 1994) identifying the latter as the primary source of responsiveness. Still, we are far from understanding the determinants of capital gains realizations. In our own study of a panel of taxpayers (Auerbach, Burman, and Siegel 2000), we found that only a relatively small group – concentrated among the wealthy and "sophisticated" (as described below) – appeared to be engaged in tax-avoidance strategies, evidenced by generating net capital losses in a persistent manner. Here, we attempt to bring theory and evidence closer together by considering whether these investors also respond differently to tax rates. In particular, we find that they exhibit significantly *smaller* responses to permanent tax rate changes than other investors. Put another way, a larger part of their response to capital gains tax rates reflects timing, consistent with their closer adherence to tax avoidance strategies emphasizing arbitrage based on tax rate differentials.

I. Empirical Model

Taxpayers do not decide to realize capital gains directly, but rather make decisions to sell capital assets, each of which has embedded a taxable gain or deductible loss. While a more direct modeling of this sale decision is desirable, this approach has not been generally feasible with available data. In this paper, we follow the prior research by estimating a reduced-form equation for net capital gains. We use the empirical model of Burman and Randolph (1994), which specifies the semilog relationship:

(1) $$E\log G = \mathbf{X}\gamma_{\mathbf{0}} + \gamma_1\tau_p + \gamma_2(\tau_t - \tau_p) + \gamma_3(\tau_t - \tau_{t-1})$$

where *E* is the expectation operator and *G* is a taxpayer's net long-term capital gains at time *t*. The vector **X** consists of non-tax variables, τ_p is the long-run (or "permanent") marginal tax rate on gains, and τ_t is the current marginal tax rate on capital gains. Equation 1 decomposes the response of gain realizations to tax rates into three parts: a long-run relationship to the level of rates and two transitory timing effects. The long-run marginal tax rate can be thought of as what the taxpayer expects his marginal tax rate to be in a typical year, independent of transitory circumstances. The deviation of the current tax rate from that long-run expected rate relates to the tax cost of timing a realization in the current year versus waiting to sell in a later year. If either of these two tax rates affects realizations, then prior tax rates will have influenced the stock of unrealized gains available for current year realization, and thus merit inclusion.

The vector **X** includes several variables that may also affect realizations, including current-year income and an estimate of permanent income, an imputed measure of taxpayer wealth, measures that capture the composition of wealth, and the few demographic variables available in our data – age, marital status, and family size. We also use annual dummy variables, which remove changes in realizations that arise from capital market returns, economic conditions, and tax law changes that are common to the sample. Thus, we measure responses to tax rate changes only to the extent that these changes are not common across individuals. Finally, we include dummy variables for four geographical regions as controls for possible differences in economic conditions and portfolio characteristics.

To estimate the parameters of equation 1 with actual tax return data, we must allow for the possibility that some taxpayers with accumulated gains find it optimal or necessary to realize no gains at all in a given year (or to realize net losses, which are not taxed symmetrically to gains). As all of the variables that affect the level of gains realizations, including tax rates, potentially affect whether the taxpayer decides to sell any accumulated net gains, we model the decision to realize net gains together with the decision of the level to realize as follows[1]:

(2) $$R^* = \mathbf{X}\boldsymbol{\alpha}_\mathbf{0} + \alpha_1\tau_p + \alpha_2\tau_t + \alpha_3\tau_{t-1} + \varepsilon_1$$

(3) $$\begin{aligned} \log G &= \mathbf{X}\boldsymbol{\beta}_\mathbf{0} + \beta_1\tau_p + \beta_2\tau_t + \beta_3\tau_{t-1} + \varepsilon_2 && \text{if } R^* > 0 \\ G &= 0 && \text{otherwise} \end{aligned}$$

where R^* is a latent index determining whether net gains are realized, ε_1 and ε_2 are normally-distributed error terms, and the tax rate terms have been algebraically rearranged from equation 1 to enter directly.

The expected long-run tax rate on gains, τ_p, is not directly observable. The choice of a proxy for that expectation is the crucial assumption for decomposing the tax response of realizations into its transitory and long-run components. In our first specification, we follow the same method utilized by Burman and Randolph (1994). Their primary means of identifying cross-sectional differences in long-run rates was to use the variation of income tax rates across U.S. states, under the reasonable assumption that taxpayers generally expect to remain in their current state of residence somewhat permanently. The expected long-run rate is fitted by the regression of τ_t on the exogenous variables in the model and τ_{st}, the combined maximum federal and state marginal tax rate on gains in the taxpayer's state. Although not all taxpayers will regularly be in the top state tax bracket, almost all state tax schedules reach their maximum rates at modest taxable income levels, and the interstate variation in top rates summarizes most of the overall variation in state rates. The tax system's progressivity makes the marginal tax rate on the last dollar of capital gains, τ_t, a function of current gains realizations as well as other endogenous income and deduction items. This endogeneity of τ_t necessitates an instrumental variables approach. We use as an instrument the "first-dollar" rate, τ_{0t}, the rate that applies on the taxpayer's first dollar of net gains before accounting for current realizations or other endogenously determined income and deduction items.

Our estimation follows a four-step procedure based on the methodology pioneered by James Heckman (1976) and further developed by Lung-Fei Lee, G. S. Maddala, and R. P. Trost (1980): i) fitted values for τ_p are estimated from a regression of τ_t on τ_{st}, $\mathbf{X}$, and $\tau_{t\text{-}1}$, while fitted values for τ_t are estimated by regressing τ_t on τ_{0t}, τ_{st}, $\mathbf{X}$, and $\tau_{t\text{-}1}$; ii) using the fitted values from step i, the criterion function in equation 2 is estimated on the full sample by probit maximum likelihood; iii) the fitted values for τ_p and τ_t are reestimated as in step i for the subsample of taxpayers realizing gains, including the estimate of the inverse of the Mills ratio from step ii as an additional regressor; iv) using the fitted values from step iii, equation 3 is estimated on the subsample of realizers by ordinary least squares, using the inverse of the Mills ratio from step ii as an additional regressor. Burman and Randolph (1994) showed that the tax parameters are consistently estimated by this procedure, even though fitted values are substituted for τ_t and τ_p in the criterion function as well as the level equation. Since the precise asymptotic variance of this estimator is unknown, we estimate standard errors using bootstrap resampling methods.

II. Data

The data are from the Internal Revenue Service's 1985-based Sales of Capital Assets (SOCA) panel. Nearly 13,000 tax returns were sampled from 1985 IRS records, and followed over the subsequent years until 1994. We pooled all observations with one-year lagged and one-year future records available, leaving a sample of 81,283 from 1986 to 1993. In addition to complete records of income and deduction items from Form 1040, the taxpayer's year-of-birth was merged from social security records. The data set includes detail from schedule D and other forms on individual assets sold.[2] The initial IRS sampling was stratified to over-represent high-income and wealthy taxpayers. Over 40 percent of the sample have imputed wealth above $1 million in 1982 dollars; close to 14 percent have wealth above $10 million. These individuals may be quite different from the population at-large in their realization behavior. But they realize a large fraction of the capital gains observed nationally, and are thus an important population to understand when examining gains realization behavior.

This time period is particularly useful for identification of the long-run tax response, which relies on interstate tax rate variations. The Tax Reform Act of 1986 increased federal marginal tax rates on capital gains for most taxpayers by eliminating the partial excludability of gains from taxable income. This also caused increases in the effective state tax rate on gains in the many states that used federal definitions of income. Furthermore, several states increased taxes in 1991, as they were experiencing diminished collections during recession. One result of these changes was an increased variation in capital gains tax rates across states, particularly since several states remained without income taxes at all through the period. Overall, the mean sample-weighted top state tax rate on gains increased from 3.0 to 5.3 percent from 1986 to 1993, and the standard deviation of those rates increased from 2.1 to 3.8.

Tax rates for each taxpayer in each year were calculated using a detailed federal tax calculator built for use with this data set. As state tax rate calculators were not available, we appended effective top marginal capital gains tax rates by state to all positive marginal federal rates. The first-dollar tax rate instrument, τ_{0t}, was computed with the calculator after first setting to zero all potentially endogenous sources of income and deduction items.[3] The maximal rate on capital gains, τ_{st}, is the sum of federal and state rates on gains for a taxpayer with $5 million in taxable income.

Current income is defined as positive income from exogenous sources. To measure permanent income, we first regressed each taxpayer's panel average of positive constant dollar income[4] (including capital gains) on the taxpayer's 1985 level of income other than gains, share of income from capital, and demographic characteristics. For each observation, we combined lagged values of the same regressors with the estimated coefficients to fit a value for permanent income. We imputed current year wealth by capitalizing capital income flows for the previous year. The capitalized-dividends portion of wealth is also separately defined as stock wealth and included in the estimations. This measure may underestimate the wealth of taxpayers with business and rental property that generate schedule E losses but accumulate returns as capital gains. For this reason, lagged schedule E losses are included in the estimations, with the definition of these losses adjusted to include disallowed passive losses after 1986. All dollar denominated variables, including net long-term capital gains, enter as logarithms of their constant-dollar values.

III. Estimation Results – Primary Specification

Estimates of the criterion function in equation 2, and the level equation 3, are listed in the first two columns of Table 1, with the coefficients of elements of the vector **X** suppressed to save space. Note that since the current and lagged tax rates enter the equations directly, the estimated coefficients must be transformed to obtain the parameters that define the types of tax response in equation 1. In particular, the long-run response parameter γ_1, equals the sum of the coefficients on the long-run, current, and lagged tax rates. The combined transitory response, $\gamma_2 + \gamma_3$, equals the coefficient on the current rate alone.

The coefficients on the current tax rate in both equations imply that taxpayers will be much more likely to realize gains, and realize in higher amounts, when their tax rates are below long-run and prior levels. The coefficient on the lagged tax rate is comparatively small in both equations but still significant at the 95 percent level, and the positive sign indicates the expected effect. The coefficients on the long-run rate are positive and almost as large in absolute value as those on the current rate, indicating that most of the measured response is attributed to temporary timing, rather than sensitivity to long-run levels. This finding is qualitatively similar to those of two previous studies based on nearly the same methodology but different data: Burman and Randolph (1994), who used a different IRS panel for 1980-83; and Cathleen Koch and Christopher Giosa (1999), who used the same SOCA data as ours for 1986-89.

Long-run and transitory effects of tax rates on both the propensity to realize and the level of gains can be summarized by the elasticity of expected capital gains with respect to the tax rate.[5] The estimated long-run elasticity is -0.34, with a standard error of 0.13. The precision of this elasticity estimate is greater than for those in the aforementioned similar studies, in part a benefit of a larger sample size and the sample period's wider spread of state tax rates. We can reject with a very high confidence level that the long-run elasticity is zero, but we also can exclude values much above -0.5. The estimated transitory elasticity is a substantial -4.9. The coefficient on the Mills ratio is positive and significantly different from zero. This suggests that it is important to account for the sample selection in this model, and that the error terms in the two equations are positively correlated.

IV. An Alternative Instrumental Variables Specification

A potential criticism of the approach taken above is that distinguishing permanent from transitory components of tax response is accomplished by restricting the information set used to predict long-run rates. In particular, the current first-dollar tax rate on gains, which is an instrument for the current rate, is excluded as a predictor of the long-run rate. A taxpayer with a current tax rate below our estimate of his expected long-run level may be there because of temporary circumstances, but also may be there because we have overestimated his expected long-run rate. In the latter case, the current first-dollar tax rate τ_{0t} would provide information about the long-run rate, and by excluding it the from the prediction equation of τ_p, we may be labeling as "transitory" a response that is in part not. Another shortcoming is that the expected long-run tax rate is fitted by an equation that predicts current, rather than future marginal tax rates. This imposes the assumption that taxpayers are not aware of systematic changes that will affect tax rates in the future. Aggregate evidence from 1986 would seem strongly to refute this assumption, and indeed it may make sense to assume that all statutory changes are anticipated in advance.

Working with panel data, we can respond to these criticisms. On the left side of the regression used to estimate fitted values for the expected long-run rate, we replace the current marginal rate, τ_t, with the one-year-ahead marginal rate, τ_{t+1}. This also allows us to include the current first-dollar tax rate, τ_{0t}, among the predictors of the long-run rate, since we no longer have τ_t on the left side of both prediction equations in the first stage. We also add the one-year-ahead maximum statutory rates (τ_{st+1}) to the taxpayer's information set. This new specification is an unrestricted instrumental variables estimator, where τ_{t+1} and τ_t are each regressed on the all of the exogenous variables in the model, as well as all of the excluded instruments: τ_{0t}, τ_{st}, and τ_{st+1}.

This constitutes a major change in the way we are predicting the expected long-run rate, and corresponds more closely to the time series specification adopted in Auerbach (1988). Otherwise, estimation follows the same four-step process outlined above.

Estimates in this second specification look quite different from the first, and are presented in the second set of columns of Table 1. The coefficients on the current tax rate remain negative, and large in absolute value, but the coefficient on the long-run rate is much smaller than before. This suggests that a larger part of the observed sensitivity to tax rates is, in fact, response to the overall long-run level, and not just current deviation from that level.[6] This conclusion is apparent in the estimate of -1.73 for the long-run elasticity. The measured transitory elasticity is somewhat lower than before, at -4.35.

The difference between these estimates and the prior ones highlight that the information set assumed known in predicting the expected long-run rate is crucial for determining how much of the tax rate response is assigned as long-run. Which approach is preferable, though, is not clear. Using current variation in state tax rates to identify permanent tax rate variation may be too restrictive, but tax rates from one year ahead may also not adequately capture long-run conditions. Circumstances that lead to temporary changes in tax rates – such as business losses, medical and charitable deductions, and capital losses – may often change rates for more than one year, especially if various carryover provisions are used. We found similar results to these when we used the average rate for the future two years in place of the next year's rate, but that horizon may also be subject to the same caveats. Given our uncertainty, we consider each specification when examining the behavior of the population subgroups of interest here.

V. Examining Important Subgroups

The wealthiest taxpayers are likely to be the most savvy about strategies to avoid or reduce tax liability, especially regarding capital gains. They also may be less subject to liquidity constraints than other taxpayers, may face lower transaction costs for buying and selling assets, and may plan to consume a different proportion of their assets during their lifetime. In sum, they may behave quite differently from most others with regard to capital gains realizations.

The first panel of Table 2 presents mean elasticities from our two model specifications, estimated for taxpayers with imputed wealth above $10 million. For both specifications, the hypothesis that these taxpayers obey the same model as the non-wealthy is easily rejected at the 99 percent level. In the first specification, the overall responsiveness of realizations to current tax rates is much greater for the wealthy, but this response is entirely transitory, with the long-run elasticity estimated close to zero. A hypothesis that wealthier taxpayers have a long-run elasticity as negative as other taxpayers is rejected at the 90 percent level.[7] For the alternative, full IV specification, we also find that the wealthy group has a lower long-run response than others, rejecting the same hypothesis at the 99 percent level.

An individual taxpayer's ability strategically to avoid realizing capital gains may depend on an ability to use short sales and other sophisticated hedges. Familiarity with such transactions may also indicate a more general sophistication about the techniques of tax avoidance. The SOCA data have coded the asset type of each gain or loss, including options, commodities, futures, and short sales of stock. As shown in Auerbach, Burman, and Siegel (2000), the identifiable group of people who engage in these transactions are much more likely to conform to the theoretical predictions of models of tax avoidance.

The lower panel of Table 2 presents estimates of the model for these "sophisticated" investors only. These are the taxpayers that report the sale of at least one option, commodity, or futures contract, or engage in a short-sale transaction at any time during the panel years. This is a much larger group than the wealthy taxpayers just examined, and includes almost 45 percent of the observations in the sample. We find the sophisticated group to have a long-run elasticity close to zero for the primary specification, and reject at 90 percent that their elasticity is as high as other taxpayers. In the alternative specification, we also find the sophisticated investors to have a long-run elasticity well below other taxpayers, and reject at 99 percent that they are as responsive to long-run rates, although this response is still quite large at -0.97.

VI. Conclusions

We have not succeeded in identifying the "right" model of capital gains realizations. Indeed, we have cast some doubt on the elasticities identified in previous work. However, we have also shown that, regardless of the specification used, groups more likely to adhere to the theoretical predictions of the tax avoidance literature – in particular, to generate net capital losses and remain in such a state over time – also have a lower long-run response to tax rate changes, exercising relatively more timing for those capital gains realized. This connection, we hope, is the first step in a process that will bring greater integration of the theoretical and empirical strands of the capital gains literature.

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Notes

[1] More efficient estimates would result if we excluded certain regressors from either equation, but we are unable to justify any such exclusion, either theoretically or econometrically.

[2] Further detail on the characteristics of this data set can be found in Auerbach, Burman, and Siegel (2000).

[3] Endogenous tax return variables include capital gains, losses, and loss carryovers, interest, dividends, schedule E losses, ordinary gains and losses, and deductions for charitable contributions, investment interest, and state taxes.

[4] The income concept used everywhere in this paper includes all the positive components of income reported on a tax return, and is designed to be invariant to changes in tax law. It is similar to the IRS's 1979 income concept, except that, in an effort to more closely approximate economic income, negative components in income such as capital losses and schedule E losses are excluded.

[5] The long-run elasticity, from Burman and Randolph (1994), is $\tau_{pi}\left[\beta_1 + \beta_2 + \beta_3 + (\alpha_1 + \alpha_2 + \alpha_3)\cdot \lambda(h_i + \sigma_{12})\right]$, where $\lambda(x)$ is the inverse Mills ratio function, h_i is the expected value of the criterion function (equation 2) for individual i, and σ_{12} is the covariance of the error terms in the two equations (and is estimated by the coefficient on the inverse Mills ratio in the last-step regression). The transitory elasticity has a similar form, with β_1, β_3, α_1, and α_3 excluded. As each elasticity varies across individuals, the table reports the sample mean elasticities.

[6] Gerald Auten and David Joulfaian (1999) report similar findings.

[7] Taxpayers with wealth below $10 million have an estimated long-run elasticity of -0.451 and a transitory elasticity of -4.933.

Table 1. Determinants of Net Long-Term Gains Realized
Panel Sample, 1986-1993

Identification of Permanent Tax Rate	(1) Current tax rate, with Exclusion Restrictions (Burman-Randolph)		(2) Future Tax Rate (Full IV)	
Mean Elasticities				
Long-Run	-0.335		-1.725	
	(0.130)		(0.137)	
Transitory	-4.907		-4.352	
	(0.270)		(0.730)	
	Criterion Fn.	*Level Eqn.*	*Criterion Fn.*	*Level Eqn.*
Marginal Tax Rates				
permanent	0.011	0.189	-0.003	0.019
	(0.005)	(0.015)	(0.006)	(0.031)
current	-0.020	-0.219	-0.016	-0.188
	(0.002)	(0.012)	(0.006)	(0.031)
lagged	0.008	0.015	0.013	0.094
	(0.002)	(0.007)	(0.001)	(0.006)
inverse mills ratio		4.520		6.825
		(0.380)		(0.307)
No. observations	81283	41470	81283	41470

Bootstrap-estimated standard errors in parentheses.

Table 2. Mean Elasticities: Key Subsamples
Panel Sample, 1986-1993

Specification:	(1)		(2)	
Wealth > $10 million				
Long-Run	0.047		-1.171	
	(0.314)		(0.323)	
Transitory	-11.315		-6.016	
	(4.429)		(2.323)	
No. observations	10988	8609	10988	8609
"Sophisticated"				
Long-Run	-0.071		-0.996	
	(0.152)		(0.253)	
Transitory	-5.111		-5.235	
	(0.415)		(1.121)	
No. observations	37913	26580	37913	26580

Bootstrap-estimated standard errors in parentheses.