The Bunching of Capital Gains Realizations

Timothy Dowd and Robert McClelland

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ABSTRACT

We describe a simple model of taxpayer decisions to realize or delay their capital gains and losses. Investors will delay their realizations if the after tax rate of return is sufficiently high. As the holding period for the asset approaches a year and a day (after which capital gains are taxed at a lower rate), taxpayers will tend to harvest their losses and delay their gains. Next, we use a unique data set of capital gains transactions to investigate the behavior of taxpayers with respect to the preferential tax rate for long term capital gains. Our data allows us to examine the shifting of gains across time periods, but eliminates the effect of the large pool of accrued gains that enlarge previous estimates. We find strong evidence that taxpayers respond to the preferential rate by reducing the realizations of gains in the weeks leading up to the point when that rate applies. However, the magnitude of the elasticities is small: We estimate a short-term gains elasticity of -0.52 and a long-term gains elasticity of 1.0. We find that high income taxpayers are more responsive with elasticities of -0.75 for short term gains and 1.5 for long term gains. We also find evidence that taxpayers minimize their tax liability by timing their gains and losses in the same week.

Tim Dowd is a Senior Economist at the United States Congress Joint Committee on Taxation and Robert McClelland is a Senior Fellow at the Urban-Brookings Tax Policy Center.

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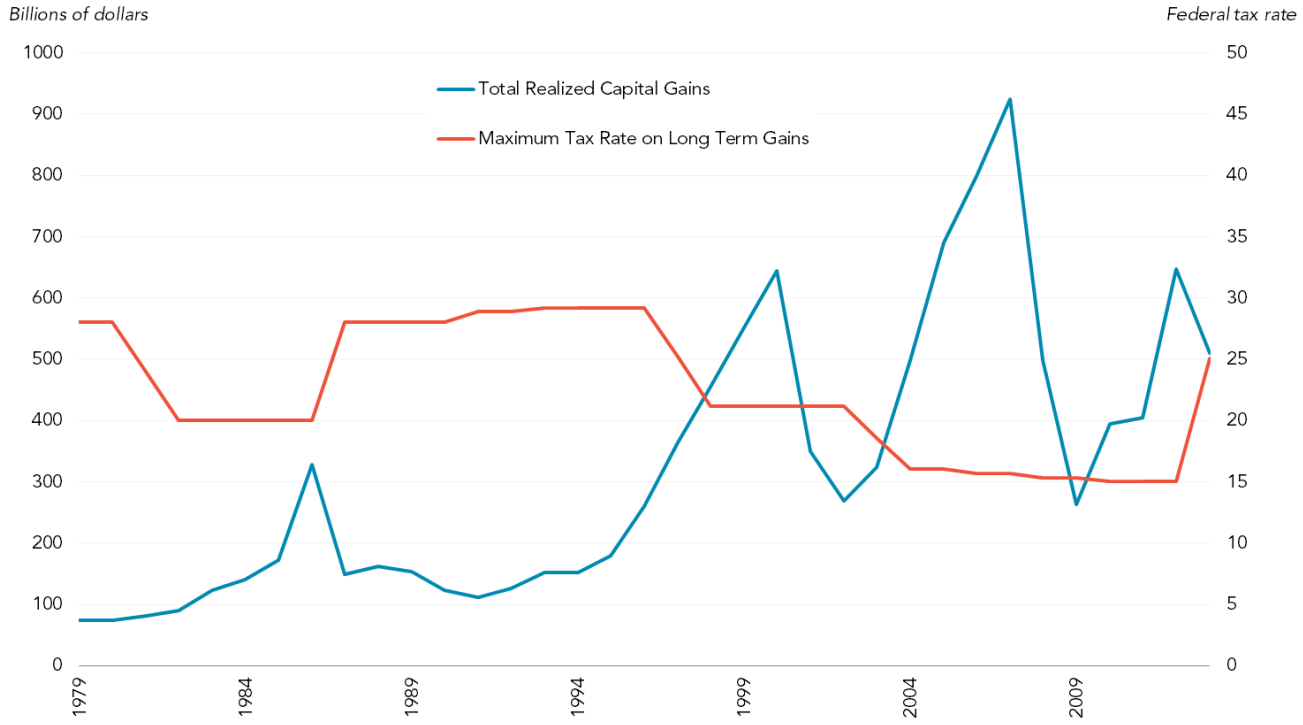
INTRODUCTION

On October 22, 1986, President Ronald Reagan signed into law the Tax Reform Act of 1986. Among many reforms enacted that day, the taxation of capital gains was dramatically increased for many taxpayers from a top statutory rate of 20 percent in 1986 to 28 percent for 1987. In anticipation of the increased tax rate, realizations surged 60 percent in tax year 1986. As Figure 1 makes clear, 1986 stands out because of the increased realizations over trend. A similar, but smaller, increase in realizations of more than 40 percent can be seen in 2012 in anticipation of the increased maximum tax rate from the 15 percent maximum rate in 2012 to the approximately 25 percent that would apply in 2013.

FIGURE 1

Realized capital gains and federal tax rates

1979-2013



Source: Department of the Treasury (2016).

Predicting the effect of a change in the capital gains tax rate depends crucially on understanding those short run changes as well as the changes in the long run. Using annual data researchers have estimated the permanent or persistent tax elasticity of capital gains, with Dowd, McClelland, and Muthitacharoen (2015) (DMM hereafter) estimating it to be approximately -0.7. The 1986 and 2012 spikes represent a more immediate response as taxpayers adjust the timing of their realizations to the timing of the rate change. That short-run effect involves taxpayers rebalancing the timing of their planned sales to correspond to the

timing of tax rates. The spikes also include realizations that occur to take advantage of what has become a temporarily low tax rate. Those realizations are taken from pools of accrued gains that possibly were not going to be realized in the near future, and may represent nothing more than assets sold and immediately repurchased. Because those pools are much larger than the gains realized in a given year, comparing gains drawn from those pools to gains realized in a given year exaggerates the short run impact of tax changes.

In this paper, we use daily transaction level data on capital gains realizations aggregated to a weekly holding period to analyze the timing of realizations within a year in response to permanent differences in tax rates. We do this by examining the bunching of transactions that occurs just after those realizations become eligible for the lower, long-term tax rate that applies after taxpayers have held the asset for a year and a day. Our approach both allows us to examine behavior over a very short time horizon and limit the influence of the large pool of accrued gains. Although we are unaware of previous attempts to measure these elasticities, they are most similar to the "short-term elasticity" defined in Gravelle (2010) as the "short-term response to a permanent change" in tax rates.

Our results show that taxpayers delay their realizations of gains to take advantage of the preferential rate, with a sharp increase in gains the first week in which the long-term rate is available. In spite of the sharp increase, our elasticity estimates are relatively low. For example, a 10 percent difference in tax rates leads to a 15 percent increase in the long-term gains of high-income taxpayers, but leads to a 2.2 percent decline in the short-term gains for all taxpayers. We also estimate the elasticity of gains from several classes of assets and gains realized by several income classes. Finally, we examine the relationship between realizations of gains and losses.

The paper proceeds as follows. In section II, we discuss the literature on the tax elasticity of capital gains, highlighting how our estimates fits in that literature. In section III, we lay out a model of taxpayer behavior that leads to several conclusions about responses to the preferential rate and holding periods. In section IV, we describe our data and provide graphical evidence of bunching. In section V, we estimate several different elasticities. In section VI, we perform several sensitivity tests and investigate apparent transaction frictions. In section VII, we conclude.

TAX ELASTICITY OF CAPITAL GAINS

The tax elasticity of capital gains is an important variable of interest to policy makers and is used to help economists estimate the effects of capital gains tax rate changes on government revenues. When thinking about taxpayer responses to changes in the tax rate on capital gains, much of the profession's thinking is colored by the events surrounding the Tax Reform Act of 1986. Between 1985 and 1986 there was an almost doubling in capital gains realizations as taxpayers realized gains in 1986 to avoid the anticipated increase in the capital gains tax rate for 1987 and thereafter. This massive unlocking of realizations in 1986 is often pointed to as the poster child for transitory effects. Once taxpayers knew that the tax rate in the future was going to be persistently higher, they viewed the current tax rate as temporarily lower and responded with significant realizations.

Early studies estimated a combined elasticity with elasticity estimates often in excess of 1.0 (Feldstein, Slemrod, and Yitzhaki 1980). Research through the 1980s and 1990s included time-series estimates and increasingly cross-section or panel data. Research in these later studies typically broke the elasticity into a temporary response and a permanent response. Burman and Randolph (1994) argued that the wide disparity in estimated elasticities between time series analysis and cross-section panel studies was the different treatment of transitory and permanent effects. More recently, DMM argue that their specification estimates the permanent or persistent elasticity with much more precision than the transitory elasticity. In their specification, the persistent elasticity is measured as a change in the tax rate that is expected to persist into the next few years. While the transitory elasticity is the effect of a change in the tax rate that is expected to disappear in the following year. DMM estimate the persistent and transitory elasticity for the period between 1999 and 2008. Their estimate of the transitory elasticity is much lower than prior estimates and is not stable across a variety of specifications.

Two recent papers look at the change in realizations in 2012 in response to the 2013 increase in tax rates: Saez (2016) and Auten, Nelson, and Splinter (2016). Both studies find transitory elasticities of shifting well in excess of 1, with particularly strong responses at the top of the income distribution of over 3 for the top 0.1 percent. Like 1986, the changes implemented in 2013 were anticipated, allowing taxpayers to realize in 2012 gains on assets that may have been held for many years.

Gravelle (2010) defines two types of transitory elasticities. The first is similar to those estimated by Saez (2016) and Auten, Nelson, and Splinter (2016) as measures of "the response to a temporary tax increase or decrease." The second type is a short-run elasticity that is the "short-term response to a permanent change". It is important to disentangle the two effects because once a previously unanticipated law raising tax rates has passed, the existing rate becomes a transitory rate. The rush to sell assets that may have been held indefinitely, or to simply sell and

re-purchase assets, is a response to that transitory rate. That rush exaggerates the short-run response of taxpayers rebalancing their holding period or shift realizations from one period to the next.

Here we estimate several elasticities that solely measure the shifting of realizations from one period to the next in response to a permanent difference in tax rates. There are several aspects to our approach that make it well suited to estimating the short-run elasticity. First, at the time of investment, the taxpayer is aware of the rate that is applicable for assets held for less than a year and those that are held for over a year. So, as in the 1986 reform, the rate change is fully anticipated. However, unlike the 1986 reform, the rational taxpayer should design a portfolio that takes these rate differences into account when initially investing in capital assets. Second, unlike the rate changes that are applicable to assets possibly held for many years, our estimate applies only to assets held less than a year. This eliminates the variability caused by long-held accrued gains. In addition, short-term gains will very likely be held for only a short time after the lower long-term rate applies rather than be put off into the indefinite future. Finally, there is no incentive to sell assets simply to realize a gain and re-purchase the asset.

To calculate an elasticity we need to estimate the number of sales that would have taken place at or beyond the first week the long term rate applies even without a preferential rate for long-term gains. The elasticity calculation then uses the difference in sales due to the long term rate divided by the counter-factual estimated sales. That elasticity estimates the effect on long-term sales but we can equally estimate the effect on short-term sales and long-term and short-term gains. For these elasticities we use the methodology described in Kleven and Waseem (2013), described in more detail below.

A SIMPLE MODEL OF TAXPAYER BEHAVIOR

A taxpayer's elasticity of capital gains with respect to tax rates can be measured as her willingness to defer the realization of putatively short-term capital gains until long-term tax rates apply. How much is deferred depends not only on the difference between short-term and long-term tax rates, but also on the (expected) rates of return of the investments and the taxpayer's discount rate. In this section we describe a simple model that relates the sale of capital assets to tax rates, the rate of return, and the discount rate. To focus on those relationships, we ignore transaction costs and assume that at each point in time the rate of return and the discount rate is fixed and known. Because the rates of return are known, the effect of risk is subsumed under the discount rate. To isolate the effects of discount rates and rates of return on investor behavior, we first analyze investor decisions when only ordinary tax rates apply.

SALES WITH SHORT-TERM TAX RATES

Each week taxpayers evaluate their portfolios and can choose to continue holding their assets, or to sell an existing asset and use the resulting funds to purchase another asset or use them in some other way. For simplicity we consider a taxpayer in week t holding one asset with selling price P_t that was purchased in week 0 for price B. Without loss of generality we set B=1 so that P_t may be thought of as P_t/B.

If the taxpayer sells at time t, the after-tax price is

$$P_t^s = P_t - \tau_s(P_t - 1) \quad (1a)$$

or

$$P_t^s = P_t(1 - \tau_s) + \tau_s \quad (1b)$$

where the tax τ_s is the short-term rate equal to the tax rate on ordinary income. The 1 in equation (1a) represents the subtraction of the basis so that only gains are taxed, which appears as τ_s in equation (1b). If $P_t > 1$ when the taxpayer sells the asset, the taxpayer realizes a gain and incurs a tax liability of $\tau_s(P_t - 1)$. If $P_t < 1$ when the asset is sold, the taxpayer realizes a loss.

Rather than sell the asset, the taxpayer can choose to hold it for a period, represented by m, and then sell. If the pre-tax rate of return while holding the asset is r, at time $t+m$ the pre-tax price of the asset P_{t+m} is $(1+r)^m P_t$. The after-tax price is then

$$P_{t+m}^s = (1+r)^m P_t(1-\tau_s) + \tau_s = (1+r)^m P_t - \tau_s((1+r)^m P_t - 1) \quad (2)$$

At time *t* if the taxpayer decides between selling immediately or waiting *m* periods, she compares the after-tax price at *t* in equation (1) to the after-tax present discounted value of selling at *t+m*

$$PDV_t(P^s_{t+m}) = \frac{1}{(1+d)^m} P^s_{t+m} \quad (3a)$$

or

$$PDV_t(P^s_{t+m}) = \left[\frac{1+r}{1+d}\right]^m [P_t(1-\tau_s)] + \frac{\tau_s}{(1+d)^m} \quad (3b)$$

where *d* is the discount rate assumed to be positive. That discount rate represents the next best use of the funds embedded in the asset. That could be an alternative investment or simple consumption, and the discount rate can be greater than, equal to, or less than the rate of return.[1] She will sell the asset at time *t* if

$$\left[\frac{1+r}{1+d}\right]^m [P_t(1-\tau_s)] + \frac{\tau_s}{(1+d)^m} < P_t(1-\tau_s) + \tau_s \quad (4a)$$

or

$$PDV_t(P^s_{t+m}) < P^s_t \quad (4b)$$

From equation (4) we have the following implications:

I. If $d>r$, the return from immediately selling the asset is greater than the present discounted value of selling the asset at any future date. This follows from the fact that for all positive *m*, $[(1+r)/(1+d)]^m$ is less than 1 and $\tau_s/(1+d)^m$ is less than τ_s.

II. The taxpayer will prefer to immediately sell the asset even if $r>d$, if *r* is not too much larger than *d*. It is clear that if *r* is equal to *d*, the taxpayer is better off immediately selling the asset to recover the untaxed basis τ_s. By continuity, the same logic applies for some *r* that is only slightly larger than *d*. In other words, because the present discounted value of not being taxed on the basis at *t+m* is less than the value at *t*, the taxpayer will only wait if the rate of return on the asset is sufficiently larger than the discount rate.

By implications I. and II. taxpayers defer sale into the future if the rate of return is sufficiently high. But they can be induced to wait even with a low rate of return if the after-tax rate of return is sufficiently high. This can occur if the tax rate in the future is lower than the tax rate at time t.

SALES WITH SHORT-TERM TAX RATES AND LONG-TERM TAX RATES

Under present law, the capital gains from the sale of assets held for at least a year and a day are taxed at a preferential rate τ_L.[2] If we assume that the short-term tax applies at time *t* and that the rate decline occurs at *T=t+m*, the taxpayer compares the value of selling the asset P_t^s to the present discounted value of holding the asset until *T*. The taxpayer sells at *T* if

$$P_t(1-\tau_s) + \tau_s < \left[\frac{1+r}{1+d}\right]^m [P_t(1-\tau_L)] + \frac{\tau_L}{(1+d)^m} \quad (5)$$

The only difference between equation (4) and equation (5) is the lower preferential tax rate on long-term capital gains. As in equation (4) this inequality may be satisfied if r>d. However, it may also hold when r<d as long as τ_L is sufficiently lower than τ_s. Estimating the elasticity of capital gains taxes involves estimating the number of sales for which the investor defers sale only because of the lower tax rate on long-term gains. That occurs when

$$PDV_t(P_{t+m}^s) < P_t^s < PDV_t(P_{t+m}^L) \quad (6)$$

where P_{t+m}^L is the price at *t+m* and after long-term tax rate τ_L. The model now implies the following:

III. As *t* approaches *T*, *m* approaches 0 and the right hand side of equation (5) approaches $P_t(1 - \tau_L) + \tau_L$. Comparing this expression with the left hand side of equation (5), if P_t is greater than 1, meaning the asset is sold for more than its basis, the long-term rate is preferable. But for any positive *m* there exists a discount rate high enough to encourage an immediate sale at the short-term rate. If P_t is less than 1, so that the asset is sold at a loss, the short-run rate is preferable. As *t* draws closer to *T*, for any given discount rate taxpayers will tend to harvest losses at the short-run rate but sell assets with capital gains at the long-run rate. This result occurs because the taxpayer prefers to recover their basis at the higher tax rate, τ_s.

IV. If *d>r* and there is some time t^* and waiting time m^*, $t^*+m^*=T$, such that the taxpayer is indifferent between immediate sale and selling in m^* periods, then for all periods between t^* and *T* the taxpayer will wait to sell the asset at the long-term rate while for all periods before t^* the taxpayer will sell immediately. That is clearly true when *d>r* because the right hand side of equation (5) declines monotonically in *m*. Thus if equation (5) holds with equality for some m^*, for all $m<m^*$ the right hand side exceeds the left hand side and vice versa for all $m>m^*$.

From implication III. we would expect that there are few gains realized on assets held just less than one year. Implications III. and IV. describe the key idea that taxpayers will only shift realizations a finite amount of time. This is a short-run response to changes in tax rates rather than the sale of assets purchased years in the past. For given tax rates, the length of time taxpayers will wait varies with *d* and *r*.

So far we have considered the tax effect of a single sale. In fact, before calculating taxes the taxpayer subtracts total losses from total gains from all sales that year. If the taxpayer's short-term losses are greater than her short-term gains she may subtract her net short-term losses from any long-term gains. If the losses exceed the gains, up to $3,000 of losses can be used to offset ordinary income. Losses in excess of $3,000 can be carried forward into future years.

If the taxpayer also has a short-term loss K_t, the taxable capital gain can be reduced by that loss. Then equation (1b) becomes

$$P_t^* = \begin{cases} P_t(1-\tau_s) + \tau_s(K_t+1) & \text{if } K_t < P_t - 1 \\ P_t & \text{if } K_t \geq P_t - 1 \end{cases} \quad (7)$$

and equation (3b) becomes

$$PDV_t(P_{t+m}^*) = \begin{cases} \left[\frac{1+r}{1+d}\right]^m [P_t(1-\tau_s)] + \frac{\tau_s(K_t+1)}{(1+d)^m} & \text{if } K_t < P_t - 1 \\ \left[\frac{1+r}{1+d}\right]^m \times P_t & \text{if } K_t \geq P_t - 1 \end{cases} \quad (8)$$

This leads to two more inferences:

V. If K_t is less than P_t-1, the loss reduces the tax on capital gains but does not eliminate it. In that case the decision-making calculus for selling or waiting is similar: because the present discounted value of the basis and tax loss at *t+m* is less than the value at *t*, the taxpayer will only wait if the rate of return on the asset is substantially larger than the discount rate.

VI. If K_t is at least equal to P_t-1, the tax is eliminated and so it plays no role in the decision to sell or hold. The taxpayer will then continue to hold the asset if the rate of return *r* exceeds the discount rate *d*.

DATA

The basic unit of observation for our analysis is a single transaction. The data are capital gains realizations for directly held assets reported on Form 8949 for tax year 2012 compiled by the Statistics of Income division of the IRS.[3] Taxpayers are included in the sample if they are also included in the individual income tax sample, a stratified random sample of taxpayers that oversamples high income taxpayers.[4]

Taxpayers must report the purchase and sale price as well as the date of acquisition and disposition on Form 8949 for each asset sold during the year. We match this data to the taxpayers Form 1040 to include information regarding marital status, income, size of household, and state of residence. The SOI Form 1040 data also includes information about the age of the primary and secondary taxpayer obtained from Social Security records.

Because many states also have income taxes and tax capital gains, the divergence between the ordinary tax rate on short term capital gains and the long term capital gains rates could be substantially different than the Federal rate difference. To better control for these divergences, we calculate the combined Federal and State tax rates using the taxable income recorded on the 1040 and the applicable Federal and State statutory tax rate for that taxpayers filing status.

The data on transactions from Form 8949 starts with over 4 million transactions, representing $386 billion in gains. We place several restrictions on the data. First, we drop approximately 120,000 observations that have a zero or negative basis. Next, we drop 417,043 observations that have a holding period of less than 24 days, and 1,441,282 observations that have a holding period in excess of 742 days. This leaves 2.4 million transactions and $45 billion in gains. Next to address possible end-of-year effects, all transactions from the first week of January (85,475 observations representing $1.9 billion in gains) and the last two weeks of December 2012 (122,707 observations representing $4.1 billion in gains) are dropped. We drop several strange executive compensation records. Finally, we drop observations for which we do not observe an acquisition date, a disposition date, the basis, or sales price. All of these restrictions leave us with an estimation sample of 2.1 million transactions representing $39.4 billion in gains.

Table 1 shows some summary statistics for the remaining sample of returns. The first column reports the unweighted sample statistics, and the second column shows the weighted statistics. In general, because the sample design oversamples high income taxpayers, the weighted statistics result in lower average tax rates and higher population weighted numbers of transactions and dollars of gains and losses. State tax rates tend to be less progressive than the Federal rate structure and as a result the reduction in state rates for the weighted sample is less

pronounced. Concentrating on the weighted sample for the transactions panel, transactions sold for a capital gain make up 61 percent of the transactions (Gains Transactions/Total =46.9/76.8) and those sold after holding for less than a year make up 65 percent of the transactions (Short Transactions/Total =49.8/76.8). Taxpayers with Adjusted Gross Income (AGI) in excess of $1 million had 13 percent of the transactions. Finally, sales of corporate equity made up 58 percent of the total transactions.

TABLE 1

Summary of Statistics Sale of Capital Assets 2012

	Unweighted	Weighted
Average Tax Rates (percentage point)		
Federal Ordinary Tax Rate	31.30	24.50
Federal CG Tax Rate	13.10	10.20
State Ordinary Tax Rate	4.10	3.30
State CG Tax Rate	3.90	3.20
# Transactions (millions)	2.10	76.80
Gains Transactions	1.20	46.90
Loss Transactions	0.90	30.00
Short Transactions	1.30	49.80
Long Transactions	0.80	27.10
AGI>$1 million	1.50	10.10
Corporate Transactions (millions)	1.60	44.70
Gains Transactions	0.90	26.10
Loss Transactions	0.70	18.60
Tax Exempt Bonds (millions)	0.02	1.50
Gains Transactions	0.02	1.40
Loss Transactions	0.00	0.13
Total Gains (Billions $)	5.25	39.40
Short Gains	1.96	19.10
Long Gains	3.29	20.30
AGI>$1 million	4.68	14.40
Total Losses(Billions $)	(3.27)	(29.30)
Short Losses	(2.11)	(18.40)
Long Losses	(1.17)	(10.90)
AGI>$1 million	(2.23)	(7.63)
Corporate Gains (Billions $)	3.50	25.50
Short Gains	1.20	12.10
Long Gains	2.30	13.30
AGI>$1 million	3.15	9.56
Tax Exempt Bonds (Billions $)	0.04	0.47
Short Gains	0.02	0.18
Long Gains	0.02	0.29
AGI>$1 million	0.03	0.11

Source: Author calculations from Statistics of Income (2016)

Short and long term gains accounted for approximately half of all gains held for less than 2 years. Although the average long term gain was $749 compared to an average short term gain of $383. Capital gains are even more concentrated at the top of the income distribution with 37 percent of the capital gains owing to taxpayers with AGI in excess of $1 million.

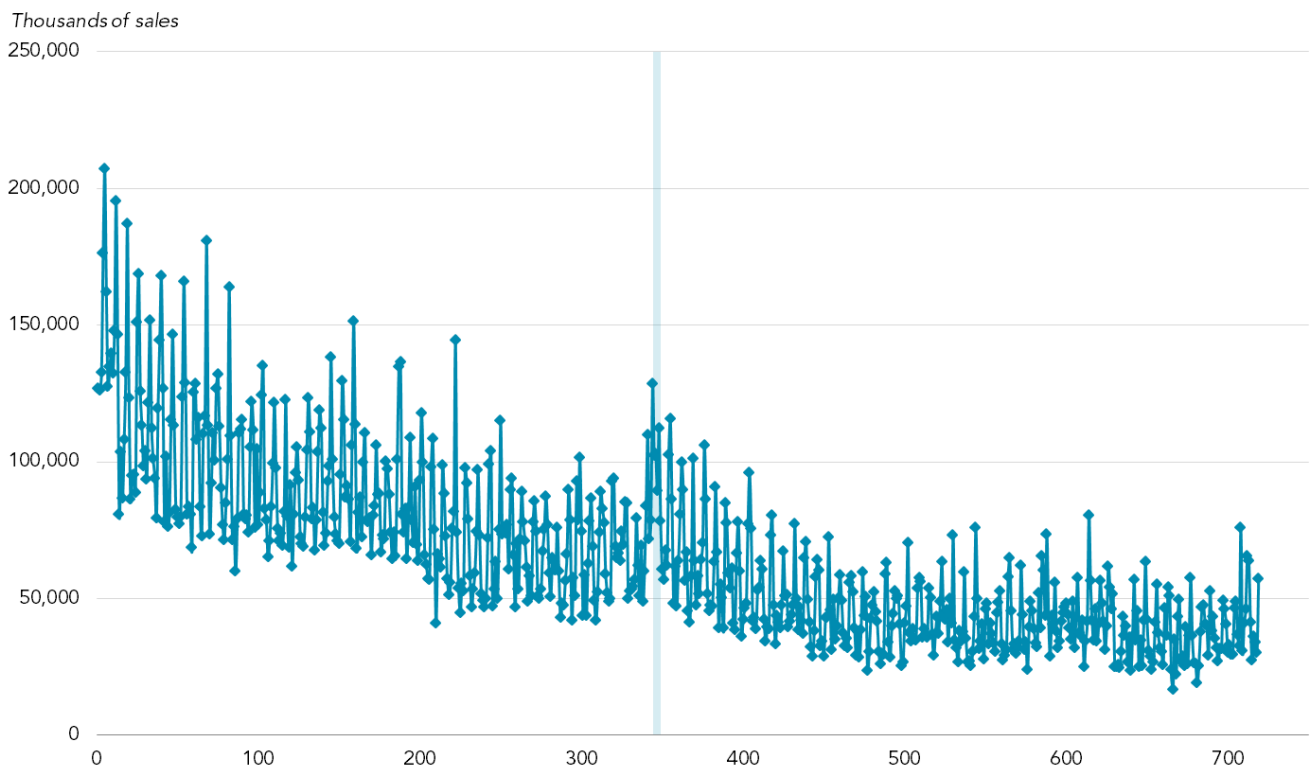
Capital losses are much more concentrated in short term holding periods with 63 percent of the losses accruing to assets held for less than a year. For capital gains 37 percent of the gains accrued to taxpayers with AGI in excess of $1 million, and 26 percent of losses accrued to this high income group.

SALES AND GAINS

In this section we plot the pattern of sales and capital gains in event time.[5] Aggregating sales to a weekly level, total sales and total gains fall as taxpayers hold assets for longer periods. During the 53rd week the long-term tax rate on gains applies and there is a spike in both sales and gains. Subsequently, sales and gains continue to decline and ultimately level off, although average gains after week 52 are roughly 80 percent larger than those before week 52.

FIGURE 2

Sales of capital assets
by number of days held, 2012



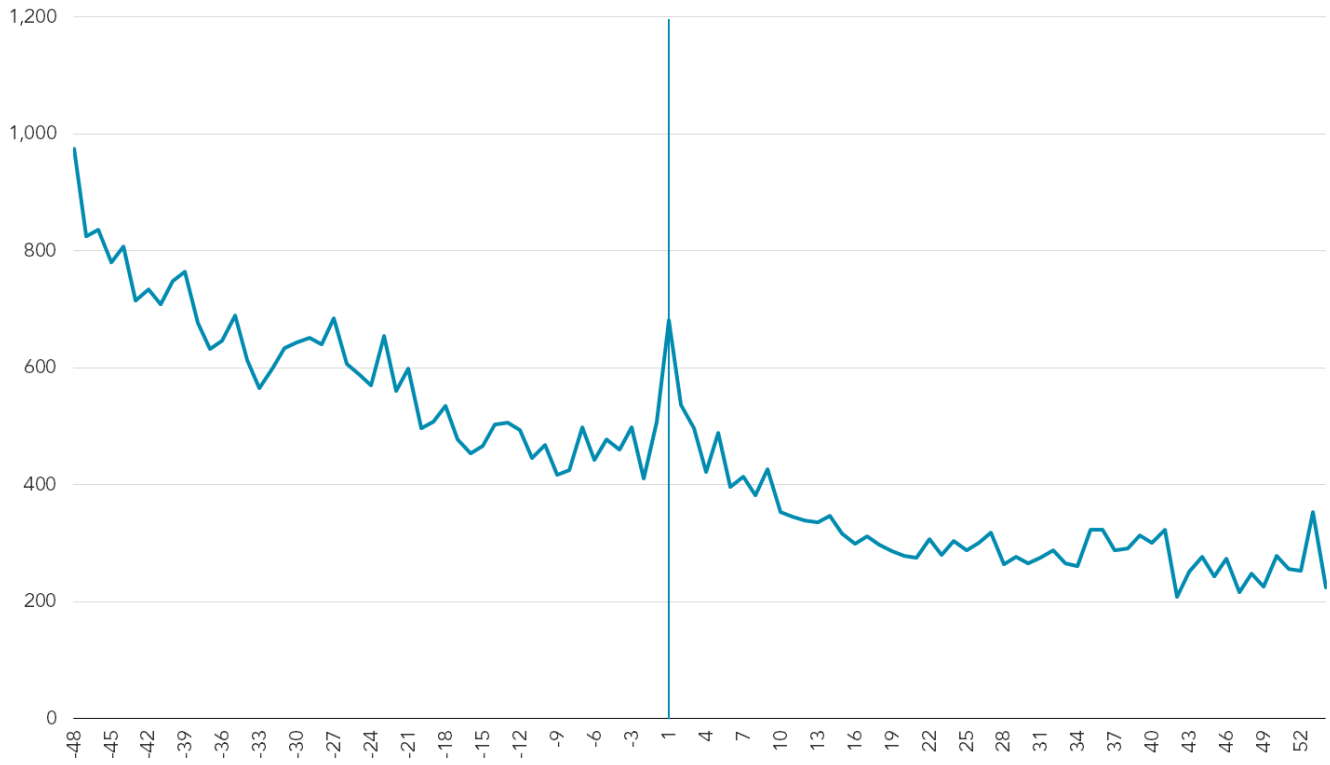
Source: Authors calculations from IRS, Statistics of Income (2016) data.

Our data contain transactions recorded by day, but we aggregate those transactions to a weekly level. The reason for this is evident in Figure 2, which presents total gains transactions by the number of days the asset was held. Overall, there is a decline in sales as assets are held for longer periods. Once assets have been held for more than one year (which because 2012 is a leap year corresponds to those held for either 365 or 366 days, depending on their purchase date) there is a sharp upward spike in sales, as taxpayers make use of the lower tax rate on long-term capital gains. The increase continues for several days, and sales are highest for assets held for 367 days, at which point there were over 128,000 transactions. The local spikes occur on a seven-day cycle, but are not related to sales occurring on a particular day of the week.[6] While intrinsically interesting, for the purpose of studying the effect of taxation on capital gains realizations, the weekly cycle represented in Figure 2 is a distraction.

FIGURE 3

Sales of capital assets

2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

The time trend and the response to the change in rates are much more visible when the data are aggregated at the weekly level (see Figure 3). The horizontal axis is the number of weeks at which the long-run tax rate applies (starting with week 1) or the number of weeks before the rate applies (ending with week -1). At week -48 there are nearly 1 million sales of capital assets. As the holding period increases, total sales decrease to just over 410,000 sales two weeks before

the long-term rates apply. Some of the decline is due to taxpayers delaying sales until the long-run rate applies, although it appears that most sales are not delayed. In fact, the decline in sales appears to level off at about week -10.

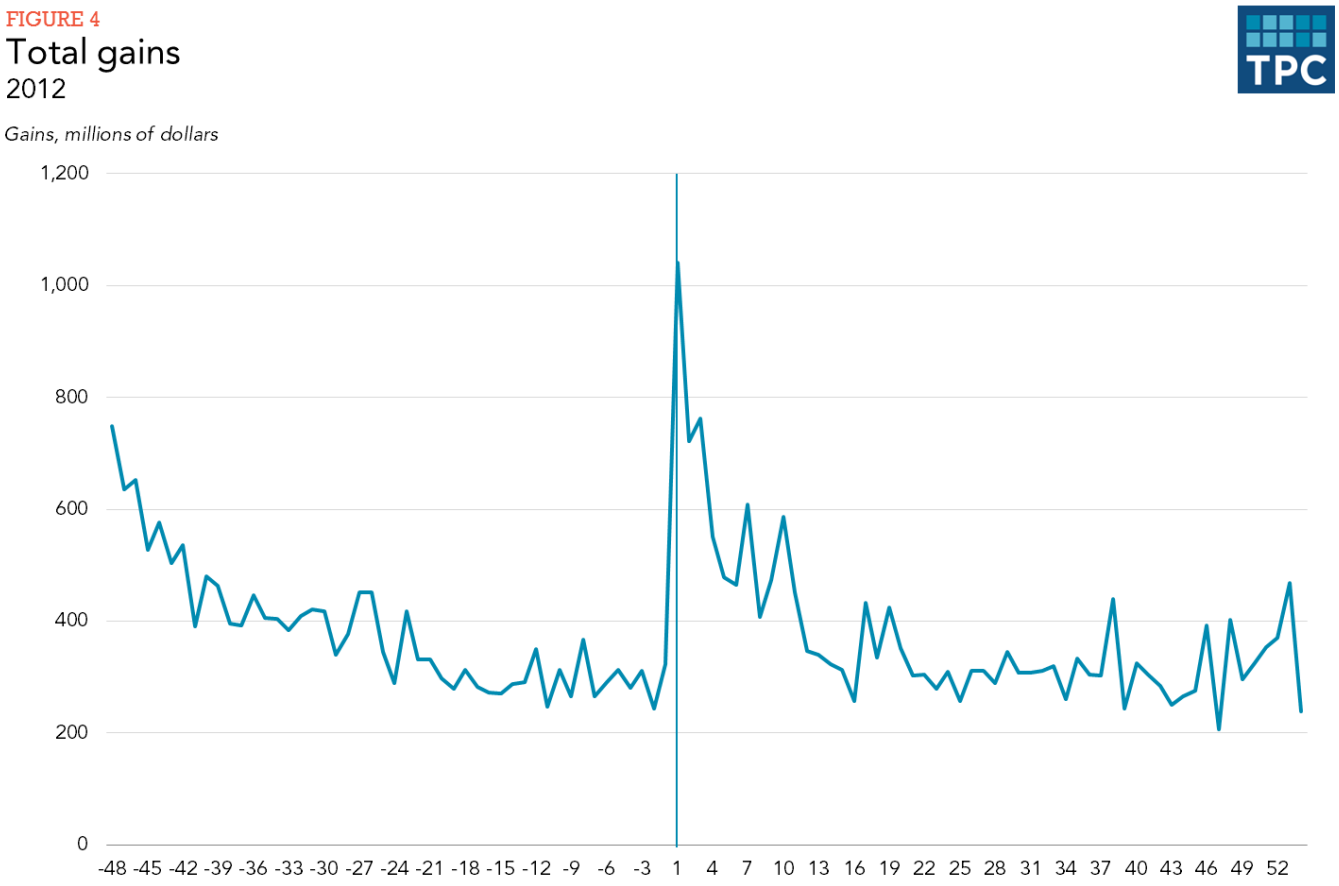
One remarkable aspect of Figure 3 is the number of sales occurring at the short-term rate, just weeks before the long-term rate applies. It seems reasonable to believe that most taxpayers, having waited for 50 weeks, would be willing to wait two more weeks to substantially reduce the tax rate on realized gains. Yet in week -2 there are over 400,000 sales and in week -1 there are over 500,000 sales. We discuss this further when estimating the elasticities of sales and gains.

At week 1 the number of sales increases from 508,000 to 681,000. By week 3 sales have fallen to 537,000 and by week 4 they have fallen to 422,000. Sales then continue the general decline in sales that existed before the change in rates and eventually flatten at about week 22. The sales in the first few weeks represent those for which equation (5) holds: assets sold because the after-tax value of realizing a gain at or later than week 1 exceeds the after-tax value of realizing a gain earlier.

FIGURE 4

Total gains

2012



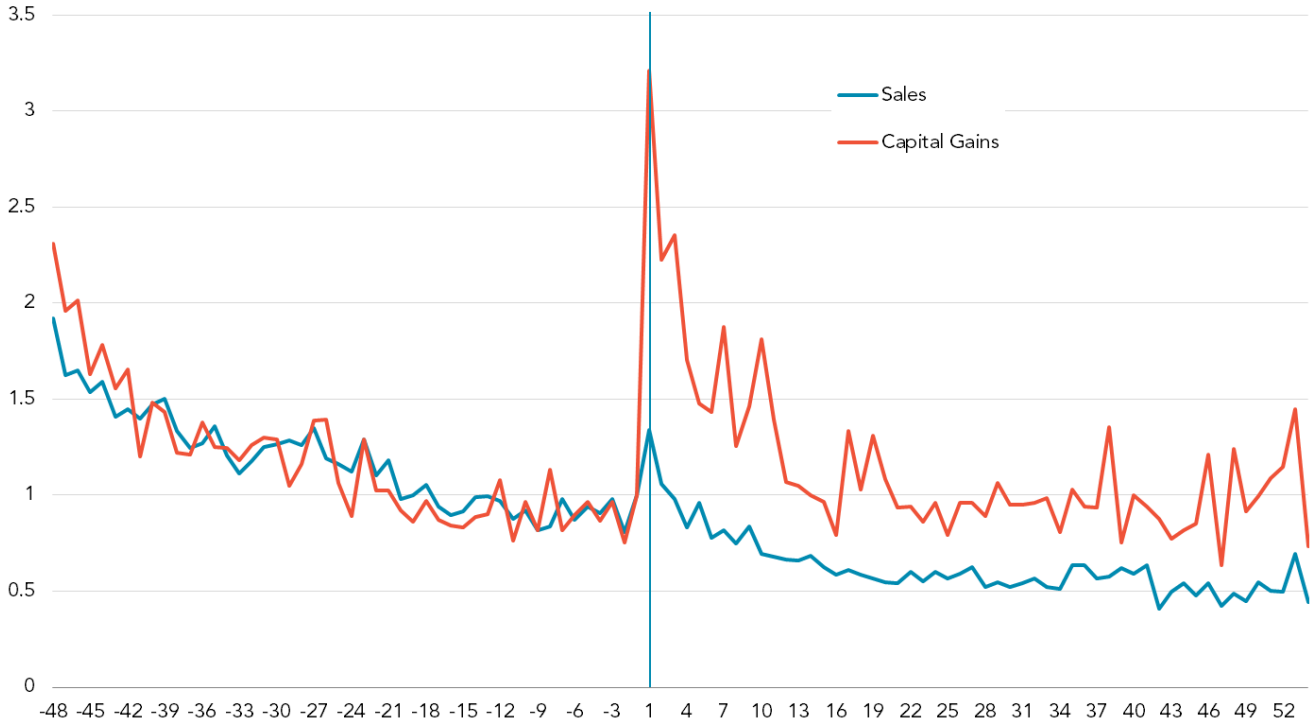
Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

The holding period pattern for capital gains realizations from the sale of assets follow a similar but more striking pattern, shown in Figure 4. Gains in week -48 are $750 million and decline over time until event time week -1, when they are $324 million. In the first week in which the long-term rates apply they increase to over $1 billion. Gains then decline and the decline flattens out at about week 22, when they are $305 million. To compare the response of sales and gains to the long-term tax rate, we plot both weekly gains and weekly sales divided by the amounts in week -1, the final week in which short-term rates apply (see Figure 5). In this manner the curves for both gains and sales equal unity in week -1 and the values in week 1 represent the proportionate increases in the week the long-term rate first applies.

FIGURE 5

Sales and gains

Relative to week -1, 2012



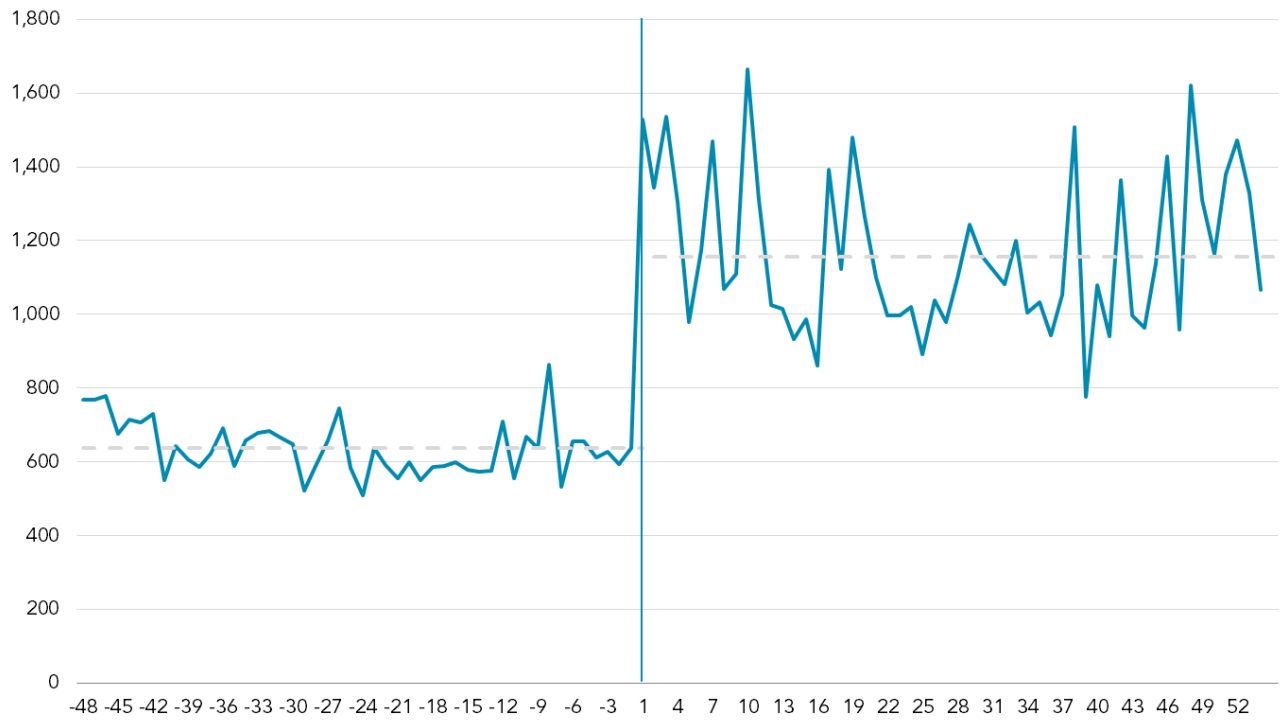
Note: The horizontal axis is the number of weeks before and after the one-year holding period. The data are normalized to equal one in week -1.
Source: Authors calculations from Statistics of Income (2016) data.

Figure 5 clearly shows that in the weeks during which the short term rates apply, gains and sales track each other very closely, up to week -1, with a correlation coefficient of 0.93. After assets have been held long enough to qualify for long-term rates, sales spike up by 34 percent. Gains spike up much more sharply than sales, increasing by 220 percent, implying that gains per sale are much larger in week 1 than in prior weeks. Subsequently, gains and sales fall off and after several weeks they again follow a common pattern, although gains are much higher than are relative sales. The correlation in the second half of this series falls to 0.83, due in good part to the greater volatility of gains after week 1.

FIGURE 6

Average weekly gains

2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data .

The tight relationship between gains and sales in the weeks of short-term rates also suggests that average gains per week are roughly constant. This is visible in Figure 6, in which average gains per week are plotted. When short-term rates apply, average gains vary around an overall mean of $638 with a standard deviation of $75. When long-term tax rates apply, average weekly gains vary around an overall mean of $1,157 with a much larger standard deviation of $212. The relative constancy of average weekly gains can be reconciled with the 220 percent spike in gains seen in figures 4 and 5 by noting that in week 1 sales increased 34 percent, the overall mean increased by 80 percent, and average weekly gains in week 1 are 32 percent above the overall mean (1.34×1.80×1.32≈3.20).

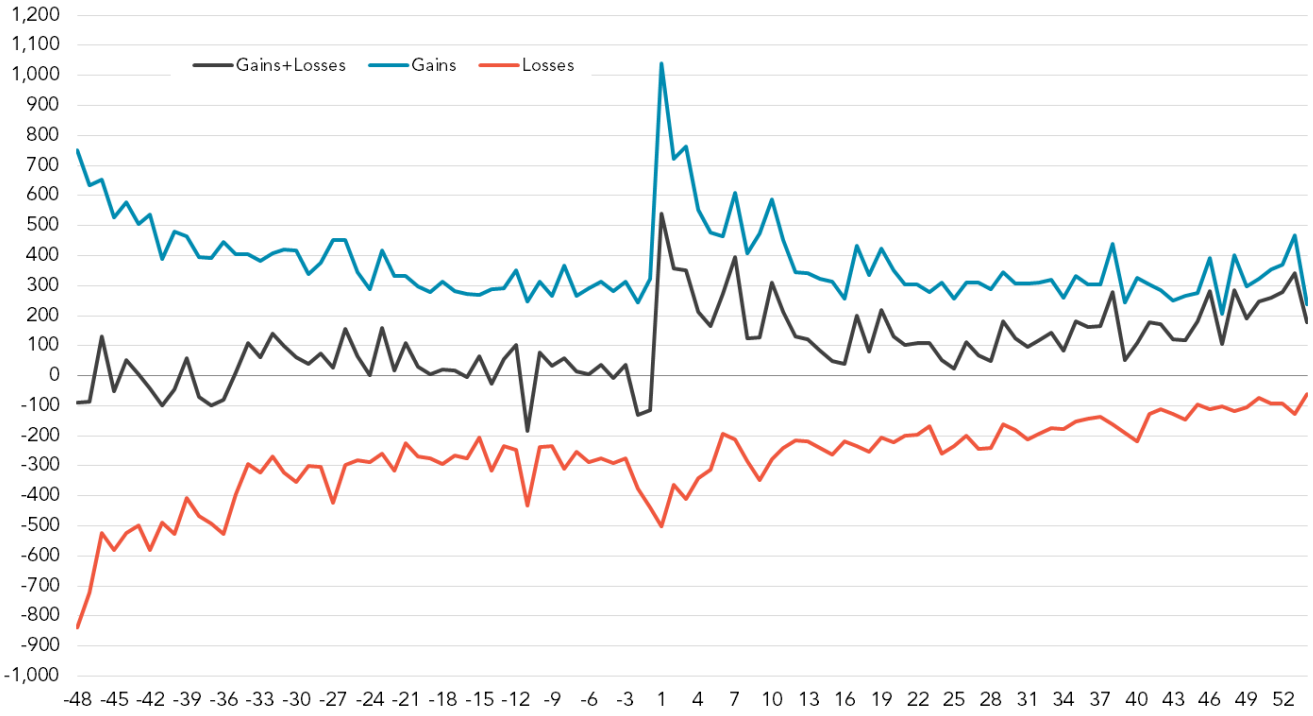
LOSSES

The ability to reduce taxable gains by realizing losses provides an incentive to match losses and gains. The rules are as follows: Short-term losses are subtracted from short-term gains and long-term losses are subtracted from long-term gains. If there is a net short-term loss it is first subtracted from net long-term gains. If there is a net long-term loss it is first subtracted from net short-term gains. If net losses exceed net gains, up to $3,000 of losses can be used to offset

ordinary income. If there are both net short-term losses and net long-term losses, short-term losses are first used to offset up to $3,000 of ordinary income and long-term losses can be used for any remaining offset. Beyond the $3,000, net short-term losses are carried over into the following year to offset future short-term gains, just as net long-term losses are carried over into the following year to offset future long-term gains.

FIGURE 7

Gains, losses, and the sum of gains and losses
2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

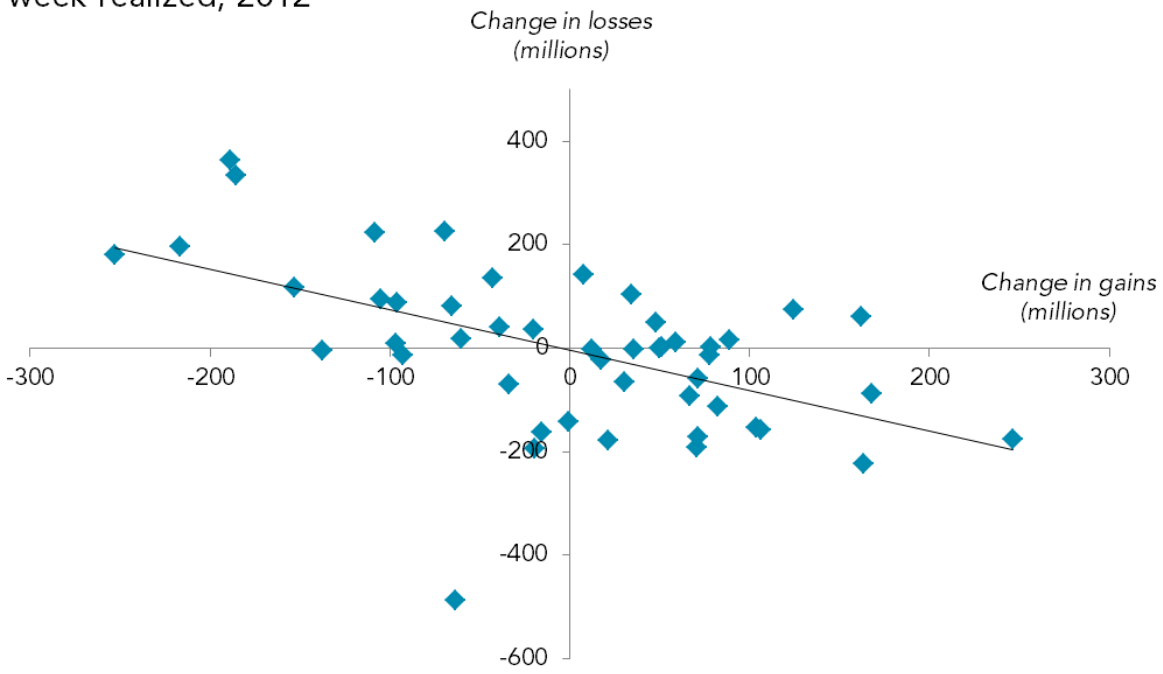
In Figure 7 losses and gains appear to balance each other week by week up to week -1. Just as gains exceed $700 million in week -47, declining to about $300 million in week -1, losses exceed $800 million in week -47 and decline to about $400 million in week -1. Consequently, the sum of losses and gains hovers around $14 million over those weeks. In weeks -2 to 1 losses increase sharply as gains spike upwards in week 1. The increase in losses in weeks -2 to -1 is explained by implication III.: it is better for taxpayers to realize short-term losses and long-term gains. The surprising spike in losses in week 1 is possibly due to the weekly matching of gains and losses. Beyond week 1 the losses and gains do not seem to closely track each other: gains stabilize around week 22 while losses decline until they reach about $60 billion in week 54. Nevertheless, short-term losses and gains do appear to follow a symmetric pattern that could be due to the matching of gains and losses on a weekly basis. Although taxes are based only on the

end-of-year net gain or loss, taxpayers may balance gains and losses on an ongoing basis if they are unsure about what their value will be at the end of the year.

FIGURE 8

Changes in short term gains and losses

by week realized, 2012



Source: Authors calculations from Statistics of Income (2016) data.

If taxpayers are balancing short-term gains and losses calendar week to calendar week, those gains and losses should vary together by calendar week. Departing from the event-time analysis, we plot gains and losses in a scatter plot. Because an augmented Dickey-Fuller test shows that each series contains a unit root, we difference the data before plotting (Figure 8). There is a clear negative relationship between the two series, so that large increases in realized gains are accompanied by large decline in realized losses. For example, the leftward-most point on the figure represents a decrease in gains of $253 million (from $660 million to $407 million) and a decrease in losses of $179 million (from -$360 million to -$181 million) while the rightward-most point represents an increase in gains of $246 million and an increase in losses of $176 million. The correlation between the two series is -0.54.

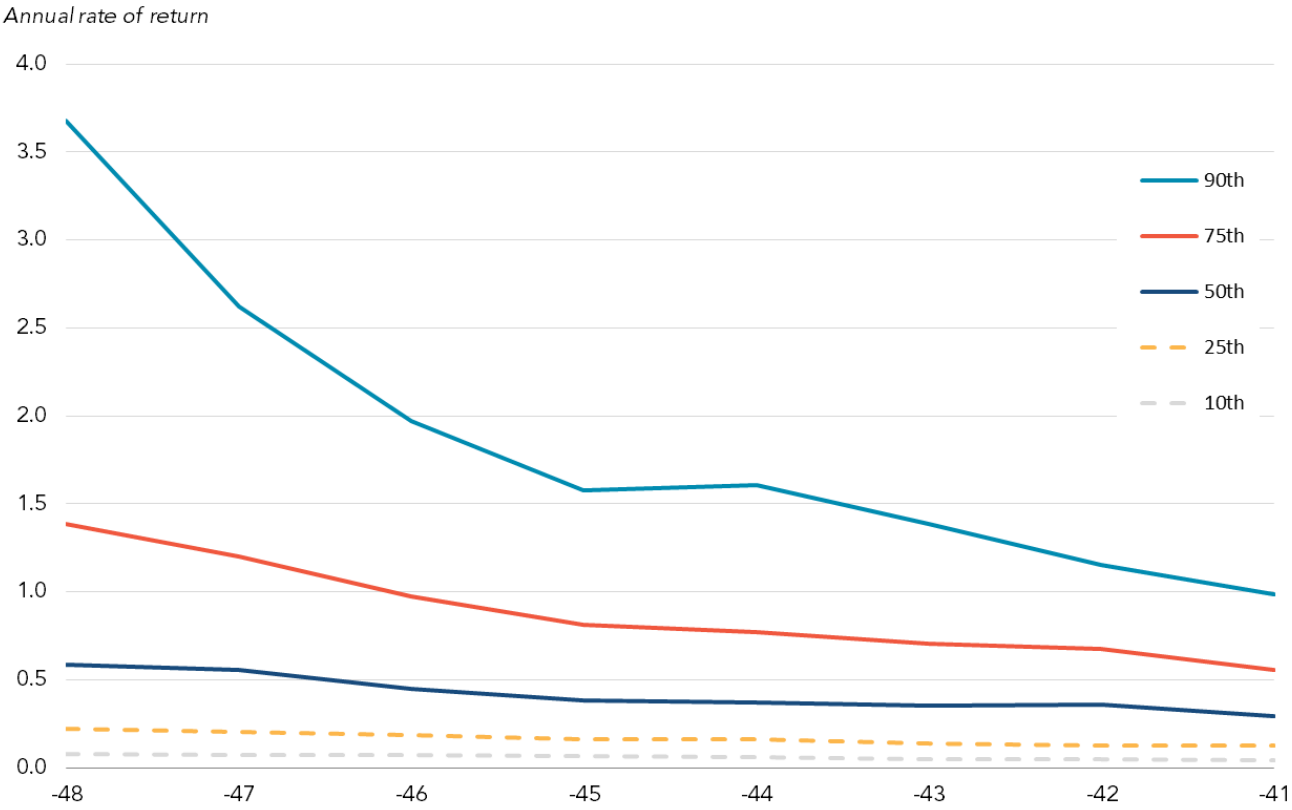
The outlier at the bottom of the figure is an increase of $486 million in losses and a $63 million drop in gains that occurred in calendar week 20 following a six percent drop in the S&P500 over the prior two weeks. That suggests that both gains and losses rise and fall with the stock market, which would attenuate the negative correlation between changes in gains and changes in losses. Removing the linear association between each series and the change in the

S&P500, the correlation grows to -0.62. Therefore there is good evidence that taxpayers time losses and gains on at least a weekly level.

FIGURE 9

Quantiles of annual rates of return on capital gains

week -48 to week -41, 2012

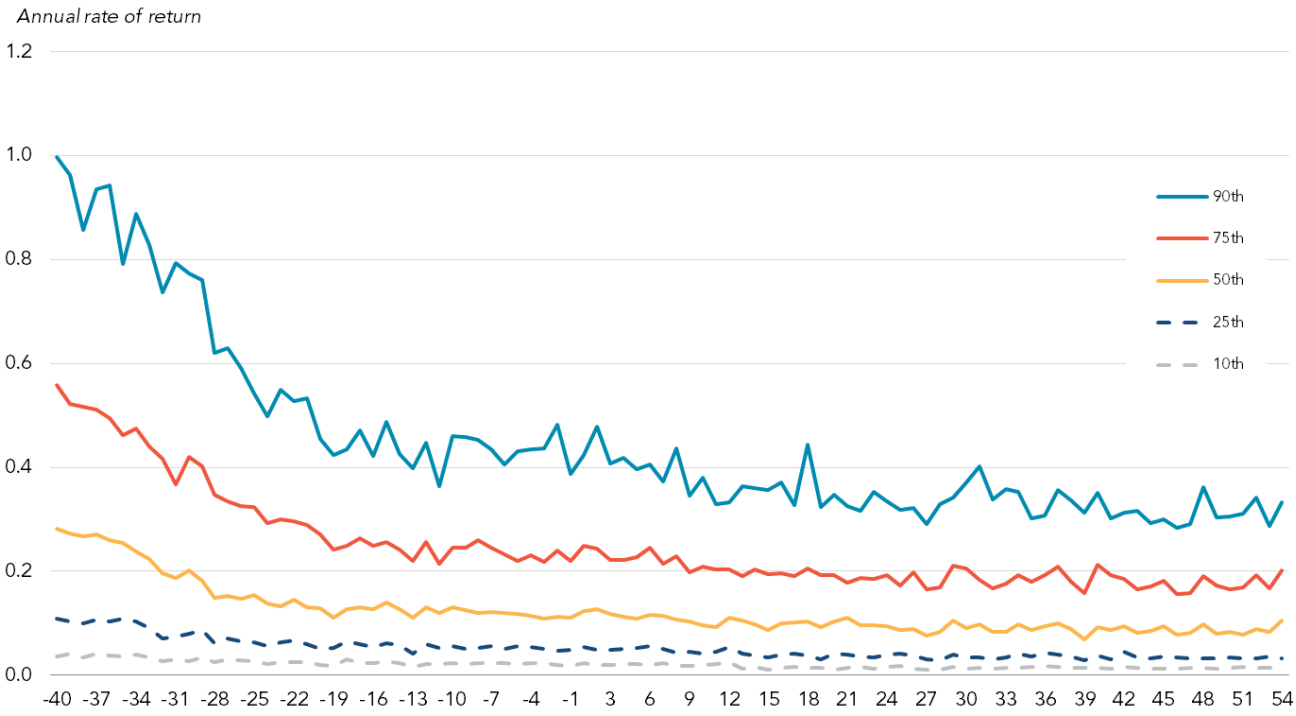


Note: The horizontal axis is the number of weeks before the one-year holding period. The vertical axis is the annual rate of return; a value of 1.0 indicates a 100% annual rate of return.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 10

Quantiles of annual rates of return on capital gains

week -40 to week 54, 2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period. The vertical axis is the annual rate of return; a value of 1.0 indicates a 100% annual rate of return.
Source: Authors calculations from Statistics of Income (2016) data.

But the symmetry of gains and losses in event time is also caused by similarity in the paths taken by the annual rate of return (ARR) and annual rates of loss (ARL) from week -49 through week 54. The ARR and ARL are defined here as the gain or loss divided by the basis, inflated or deflated to represent the return after 365 days. The longer assets are held, the lower the median ARR and the narrower the distribution of ARRs. To allow for details to be visible in the latter weeks, we create two separate figures, one for weeks -48 to -41 and another for week -40 to week 54 (See Figures 9 and 10). In week -48 the median ARR is nearly 60 percent, while the 10th percentile and 90th percentile are 7.7 percent and 368 percent, respectively. The interquartile range is 116.25. Over the following weeks the median declines, and the distribution shrinks as the higher percentiles decline faster and the lower percentiles decline slower than the median. By week -41 the median has declined to 29.34 percent, the 90th percentile is 99 percent and the 10th percentile is less than 5 percent. The interquartile range is now 42.96.

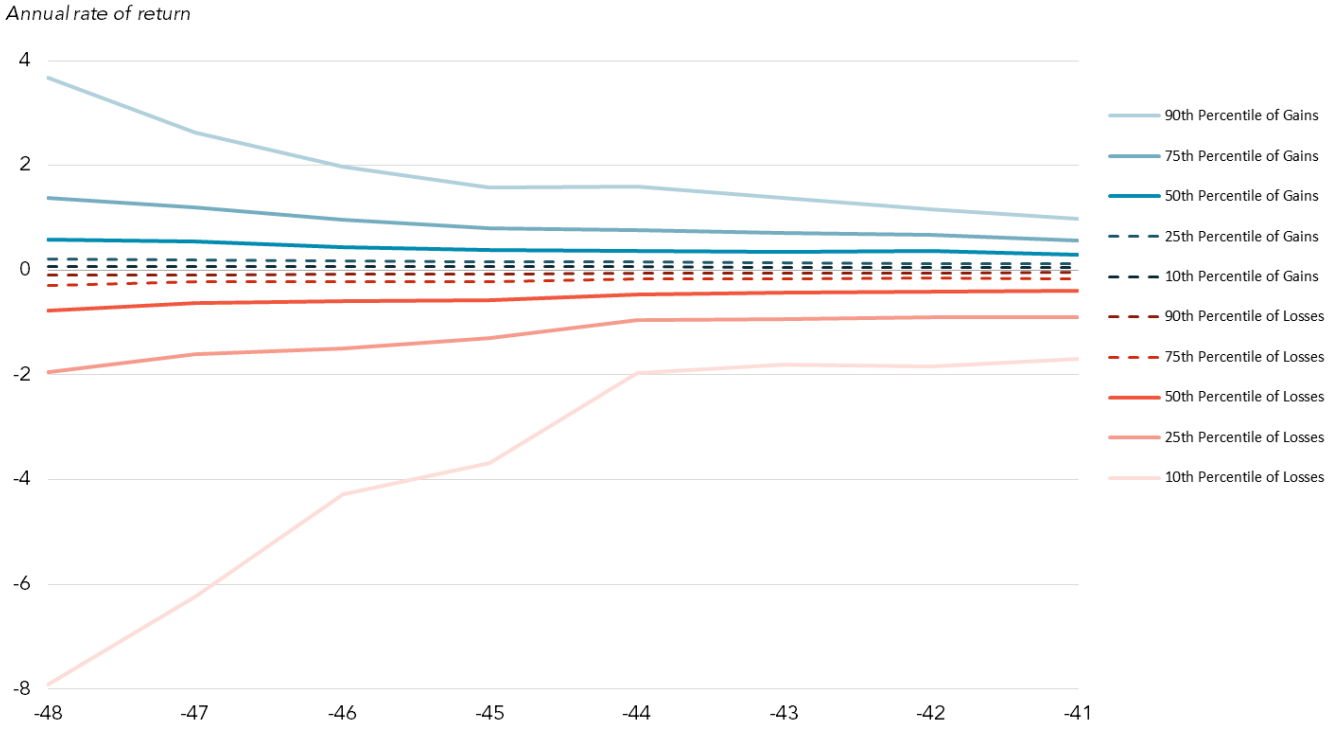
By week -20 in Figure 10 the median has fallen to 12.96 percent and at week 1 it is 12.36 percent. From that point on the rate of return flattens out and average about 8.4 percent for the remaining weeks. The 90th percentile is 45.45 percent in week 20 while the 10th percentile falls to 2.04%. The interquartile range is 21.97. The ARR in the 90th percentile continues to decline

but eventually evens out to about 30 percent while the interquartile range stabilizes at about 14 percent.

FIGURE 11

Quantiles of annual rates of return and loss

week -48 to week -41, 2012

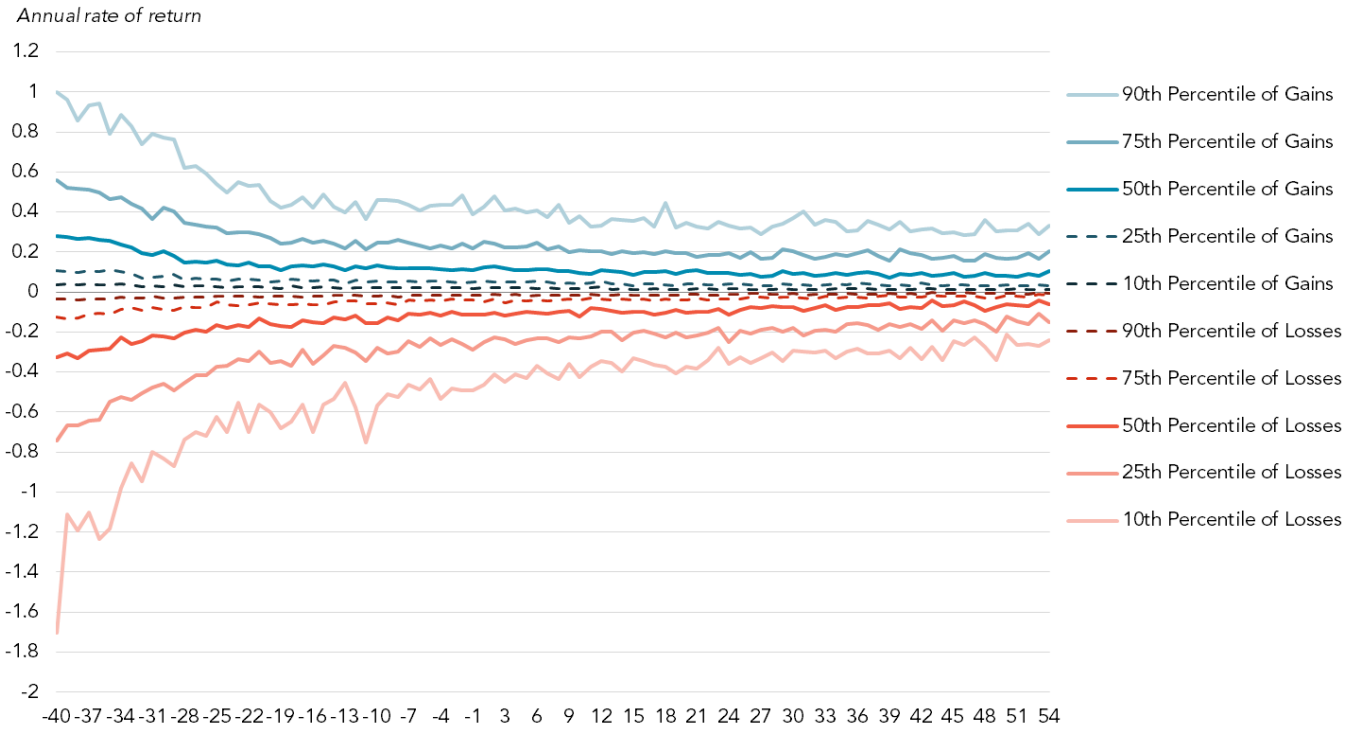


Note: The horizontal axis is the number of weeks before the one-year holding period. The vertical axis is the annual rate of return; a value of 1.0 indicates a 100% annual rate of return.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 12

Quantiles of annual rates of return and loss

week -40 to week 54, 2012



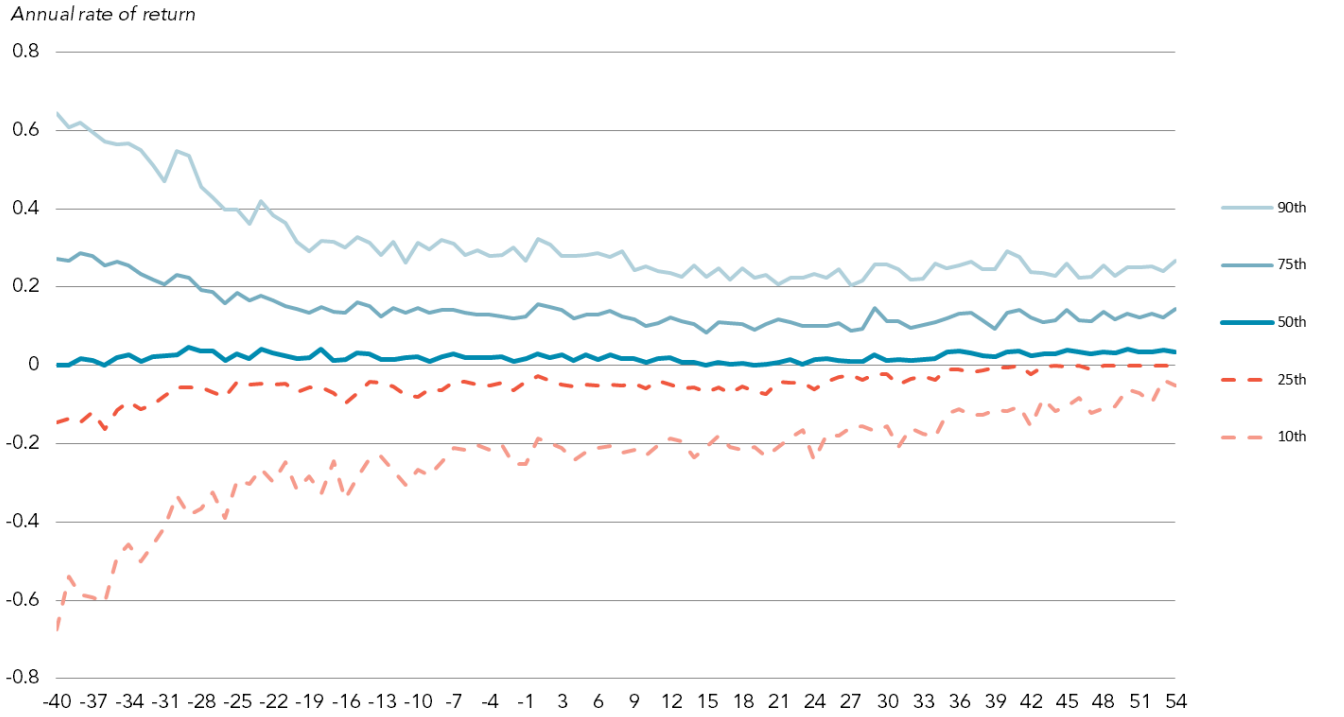
Note: The horizontal axis is the number of weeks before and after the one-year holding period. The vertical axis is the annual rate of return; a value of 1.0 indicates a 100% annual rate of return.
Source: Authors calculations from Statistics of Income (2016) data.

The change in the distribution of losses follows a similar pattern, although losses tend to be larger than gains. In Figures11 and 12 we add the quantiles of the ARL to the ARR quantiles in the previous figures. From Figure 11 it becomes clear that gains and losses are not symmetric: in week -48 the 10th percentile of gains is only 368 while the losses are about 620 percent. The asymmetry lessens as holding time increases, and by week 41 the 10th percentile of losses is -170 percent and the 90th percentile of gains is 99 percent. The median gains and losses are also asymmetric: in week -48 gains are 58 percent and losses are 78 percent. Eventually, however, losses decline faster than gains and by the last ten weeks the median loss is only 6.5 percent while the median gain is 8.7 percent.

FIGURE 13

Quantiles of annual rates of return and loss

all transactions, week -40 to week 54, 2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period. The vertical axis is the annual rate of return; a value of 1.0 indicates a 100% annual rate of return.
Source: Authors calculations from Statistics of Income (2016) data.

Taking all transactions, both gains and losses together, the distribution is roughly symmetric and for many weeks centered on 1.8 percent (Figure 13). This last result is surprising because the S&P 500 index rose more than 11 percent over 2012. However, over the final 20 weeks, the median rate of return rises to an average of 3.2 percent. The overall distribution contracts around the median, but stabilizes at about week 34: The interquartile range falls from 42 to about 13 for the final 20 weeks. Consequently, while the median equals zero in the first two weeks, the 25th percentile equals zero for the final few weeks.

The graphical presentation so far indicates that there is substantial bunching of capital gains realizations into week 1 and beyond. However, there is not nearly as much as one might have surmised. We also find evidence that taxpayers responses are dependent on the types of assets being sold as well as their overall gain and loss position in the calendar week of the sale.

To calculate an elasticity we need to estimate the number of sales that would have taken place at or beyond the first week the long term rate applies even without a preferential rate for long-term gains. The difference between actual sales realized and the counter-factual sales that would have taken place without the long-term rate are those for which equation (6) holds: Sales that occur after week 1 only because of the long-term tax rate. The elasticity calculation then uses the difference in sales due to the long term rate divided by the counter-factual estimated sales. That elasticity estimates the effect on long-term sales but we can equally estimate the effect on short-term sales. Short-term sales that did not occur because of the long-term rate can be found by estimating the amount of sales for which equation (4) holds (sales that take place prior to week 1 if there is no long-term tax rate) and subtracting those for which equation (5) did not hold (sales that take place prior to week 1 in spite of the long-term tax rate).

The first elasticity we calculate is the tax elasticity of short-term sales, which estimates the change in the probability of sale from a decrease in the preferential tax rate τ_L. For week sales in week *t* this elasticity is

$$\eta_t^{ss} = -\frac{d\Pr(PDV(P_T^*)<P_t)}{d\tau_L}\frac{\tau_L}{\Pr(PDV(P_T^*)<P_t)} \quad (10)$$

For short term sales we estimate this with

$$\widehat{\eta_t^{ss}} = -\frac{\frac{\Delta\#(short\ term\ sales)}{potential\#\ short\ term\ sales}}{\tau_S-\tau_L}\frac{\tau_L}{\frac{\#(short\ term\ sales)}{potential\#\ short\ term\ sales}} \quad (11)$$

The potential number of short-term sales is the number of sales that would take place if $\tau_L = \tau_S$. Equation (11) can be simplified as

$$\widehat{\eta_t^{ss}} = -\frac{\Delta\#(short\ term\ sales)}{\tau_S-\tau_L}\frac{\tau_L}{\#(short\ term\ sales)} \quad (12)$$

To calculate the total impact on short term sales we sum the effect on short-term sales in every week

$$\widehat{\eta^{ss}} = \sum_t \widehat{\eta_t^{ss}} \quad (13)$$

This elasticity is similar to a cross-price elasticity and a reduction in the tax rate on long-term capital gains should decrease the number of short-term sales. A related measure, the tax elasticity of long-term sales, is calculated by examining the change in long term sales from a decrease in the long-term rate. While the change in short term sales should equal the change in

long term sales, the two elasticities will differ because, as seen in Figure 3, there are more short-term sales than long-term sales. The absolute value of the percent change in sales will therefore differ even if the change in sales is the same.

These two elasticities are with respect to sales. We can also calculate elasticities with respect to capital gains realizations. Equation 14 below shows the calculation for the tax elasticity of short term capital gains realizations.

$$\widehat{\eta_t^{sg}} = -\frac{\Delta(short\ term\ gains)}{\tau_S - \tau_L}\frac{\tau_L}{(short\ term\ gains)} \tag{14}$$

An analogous equation where we swap out "short" for "long" would allow us to calculate the tax elasticity of long term capital gains realization, $\widehat{\eta_t^{lg}}$.

Rather than summing across all *t*, we only include weeks for which short-term gains are deferred. Our model predicts that if all taxpayers faced the same discount rates and rates of return there would be some waiting period *m* beyond which short-term gains were realized and beyond which no short-term gains at all were realized. If discount rates and rates of return are randomly distributed, there will be a distribution of waiting periods and some maximum time beyond which no taxpayer will wait.

We estimate the number of sales and value of capital gains that are deferred until the long-run tax rate applies by comparing the actual pattern of sales and gains to a counterfactual distribution estimated with the method described in Kleven and Waseem (2013). We use the same method for both sales and gains, but describe it in terms of sales. The method fits a sixth-order polynomial to the curve in Figure 3, but includes a dummy variable for each week in a window around week 1. This is shown in equation (15)

$$S_t = \sum_{i=0}^{6}\beta_i t^i + \sum_{i=lb}^{ub}\gamma_i I(t=i) + v_i \tag{15}$$

where S_t is the sales in week t, *lb* and *ub* are the lower bound and upper bound of window around week 1 and $I(\cdot)$ is an indicator function equal to 1 when the relationship holds and 0 otherwise. The counterfactual distribution is estimated as the predicted value from the estimated polynomial, but omitting the effect of the dummy variables.

$$\widehat{S_t} = \sum_{i=1}^{6}\widehat{\beta_i} t^i \tag{16}$$

It therefore follows the trend of sales over time, but predicts sales around week 1 using information on sales outside the window. The change in sales in week *t* induced by the tax change is $\widehat{S_t} - S_t$ and the total change in sales is the sum across all weeks. When estimating the elasticity, we only count actual and counterfactual sales inside the window around week 1.

To define the window we assume that short-term gains deferred to take advantage of the long-term tax rate, are realized in week 1 or soon after, rather than many months later. For that reason we set the upper bound to week 7.[7] The lower bound is initially set to week -7, and we proceed as follows: the model in equation (15) is estimated and the counterfactual distribution in equation (16) is calculated. The absolute value of the total change in sales up to week -1

$$\left|\sum_{t=-7}^{-1} S_t - \widehat{S_t}\right| \qquad (16a)$$

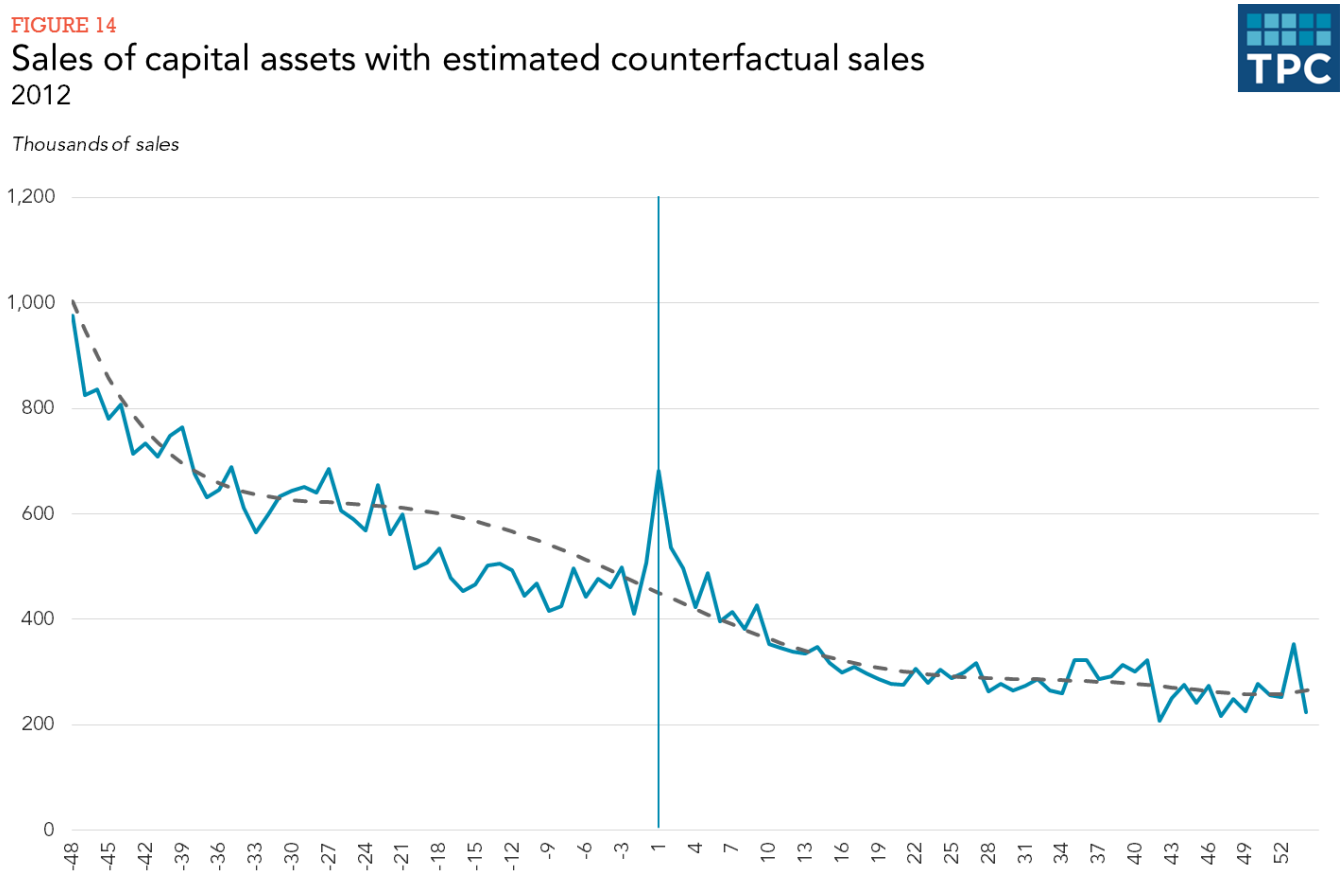
is compared to the total change in sales from week 1 forward

$$\sum_{t=1}^{7} S_t - \widehat{S_t} \qquad (16b)$$

If the total change in sales up to week -1 is less than the sales after week 1, the lower bound is reduced by one week and the process is repeated. When the total change in sales from the lower bound up to week -1 equals or exceeds the total change from week 1 to the upper bound, the process stops.

FIGURE 14

Sales of capital assets with estimated counterfactual sales
2012

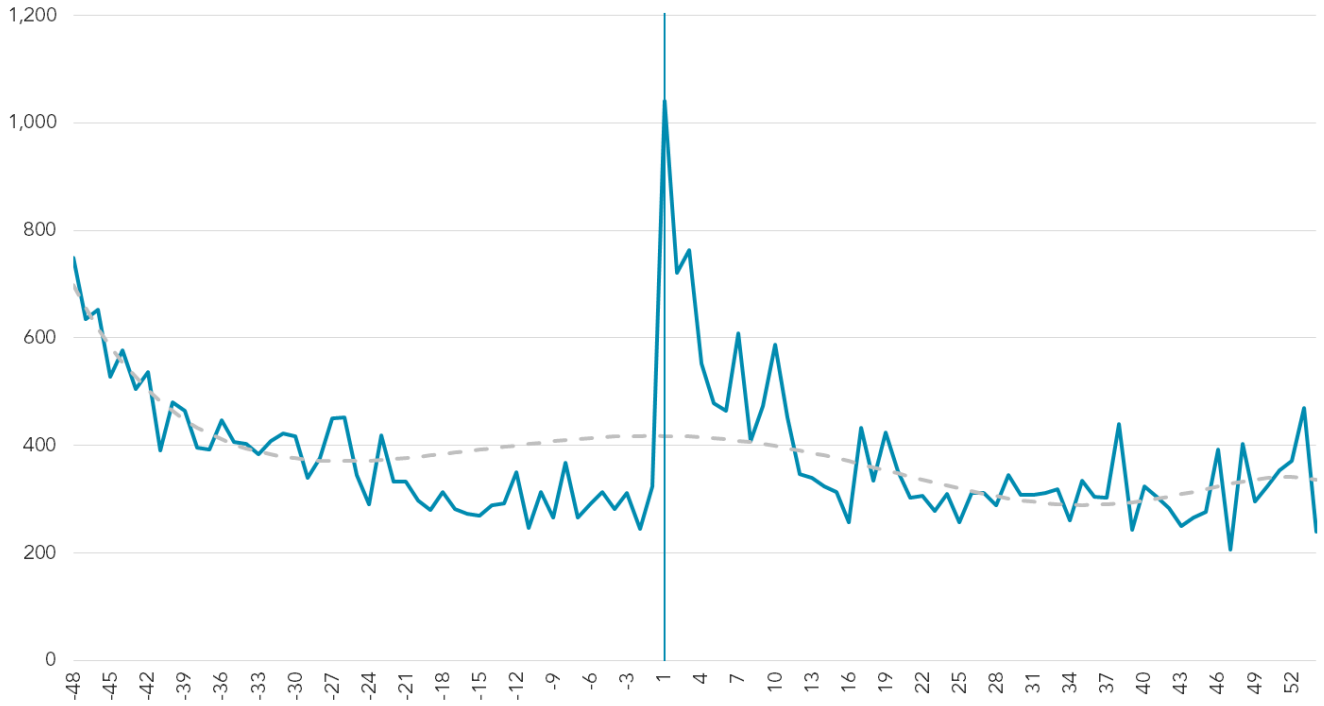


Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

The results for sales are shown in Figure 14. Predicted sales follow actual sales quite closely until week -24, at which point actual sales drop off below the counterfactual sales. The gap closes again near week -1 as actual sales level off. Implication IV. of the previous section points out that taxpayers will tend to defer gains for short periods to realize gains while selling losses immediately. For many taxpayers that clearly did not happen. A similar issue occurs in other studies of bunching at kink points and notches, and the lack of a sharp decline has been attributed to frictions (see Kleven 2016). We discuss this further in the next section.

FIGURE 15

Gains from sales of capital assets with estimated counterfactual sales
2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

The results for gains are shown in Figure 15. Similar to sales, predicted gains follow actual gains until week -24. Unlike sales, predicted gains shows an increase in weeks approaching week 1. Possible sources of this counterintuitive result are the use of a sixth order polynomial and the use of seven weeks to define the upper bound. Below we test the sensitivity of our elasticity calculations to those choices. As with sales, there are a surprising number of gains just prior to the weeks in which the long-term rate apply. After week 7, predicted gains follow actual gains, although in weeks 7 through 16 actual gains stray from predicted gains.

Table 2 reports the six different elasticities described above. The first column (i) reports the short-term sales elasticity described in equation (12). The first row reports that this elasticity

for all gains transactions is -0.22. Not surprisingly, given the graphical analysis above, short term sales are not particularly responsive to the preferential rate. Long term sales, column (ii) are somewhat more responsive with an elasticity of 0.35, and are much more responsive for taxpayers with adjusted gross income (AGI) in excess of $1 million. Corporate gains transaction display similar sales elasticities to all gains sales transactions.

TABLE 2

Estimated Tax Elasticities

	Sales		Gains		Average Gain	
	Short-term	Long-term	Short-term	Long-Term	Short Run	Persistent
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
All Gains	-0.223	0.351	-0.519	1.002	-1.059	-0.867
	(-0.033)	(-0.044)	(-0.049)	(-0.139)	(-0.07)	(-0.033)
Corporate Gains Transactions	-0.237	0.351	-0.602	1.243	-0.733	-0.737
	(-0.084)	(-0.042)	(-0.057)	(-0.159)	-0.036	(-0.047)
TP income > $1 million	-0.214	0.576	-0.725	1.529	-1.310	-1.015
	(-0.04)	(-0.026)	(-0.157)	(-2.285)	(-0.11)	(-0.058)

Source: Authors calculations from Statistics of Income (2016) data. Bootstrapped standard errors are reported in parenthesis.

Columns (iii) and (iv) report the tax elasticity of realized gains. Overall, gains appears to be much more responsive than sales. Short term gains have an elasticity of -0.52 and long term gains have an elasticity of 1.0. This response is even larger for corporate gains transactions and taxpayers with AGI greater than $1 million. However, this latter elasticity is less precisely estimated.

Comparing the results in Table 2 columns (iii) and (iv) to other transitory elasticity estimates, even the most responsive tax elasticity of realized gains from table 2 are significantly lower than those reported by either Saez (2016) or Auten, Nelson, and Splinter (2016). There are several reasons why we would expect these short-term elasticities to be lower than those other estimates. First, as noted above, the taxpayer is fully aware of the change in tax rate at the time of investment, and should take that into account in their portfolio. Whereas the elasticities estimated using anticipated newly legislated tax rate changes are events that may change a taxpayer's ideal allocation of their portfolio. Second, the elasticities that we estimate are with respect to short-term capital gains realizations that will either be realized today or in several weeks. Thus, they are based on the accrued gains in recently purchased assets. In contrast, the transitory elasticities estimated by the 2013 rate increase are potentially bringing in many years of accrued gains. Accrued gains are many multiples larger than long term capital gains realizations.[8] Consequently, if instead of using the realized gains as the base for calculating this

elasticity, rather the accrued gains were used as the base for calculating the elasticity, the estimated elasticity would be substantially smaller.

Although we focus on estimating the short-run elasticity in this paper, we can use the data in Figure 6 to calculate a persistent elasticity. It is persistent in the sense that it represents the difference in average gains associated with different tax rates, rather than how gains respond to changes, permanent or otherwise, in rates. We calculate this elasticity in columns (v) and (vi). The average combined federal and state tax rate for weeks -48 to -1 is 0.273 and for weeks 1 to 54 it is 0.133. The average gain in the early period is $644 and $1,180 in the later period. The arc elasticity is therefore

$$\frac{644-1{,}180}{\frac{644+1{,}180}{2}} \times \frac{\frac{0.273+0.133}{2}}{0.273-0.133} \approx -0.87$$

That estimate is qualitatively similar to the persistent elasticity estimate of -0.72 in DMM. As noted the average weekly gains in week 1 are 32 percent above the average over weeks 1 to 54. The short-term elasticity calculated using the average gains inside the shifting window around week 1 is correspondingly larger in magnitude: it is -1.06.

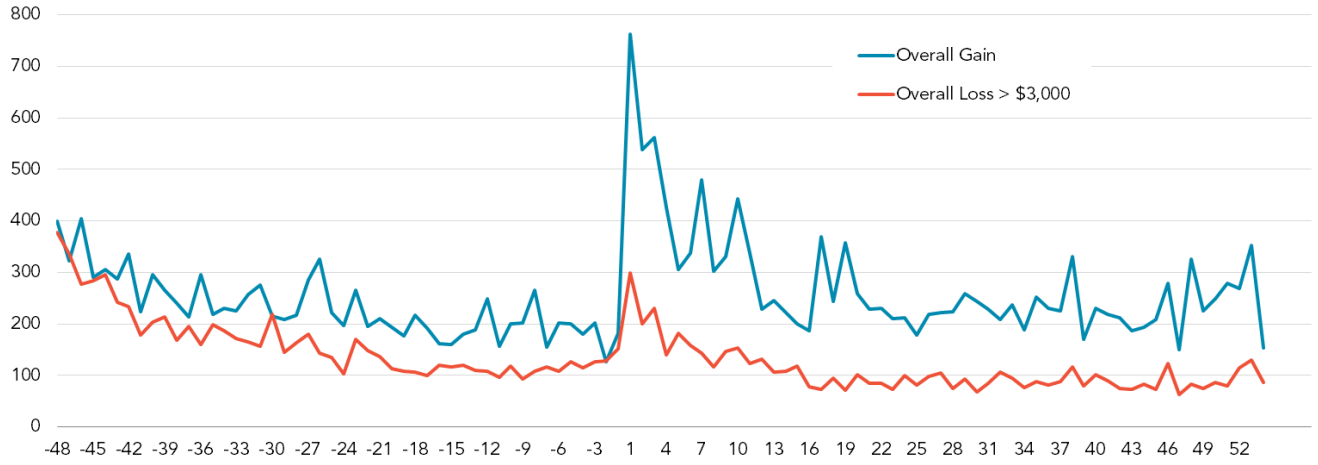
The surprisingly large amount of gains the week before long run rates apply is similar to clustering found in studies of other taxpayer behavior where the existence of economic activity on the 'short' side of a notch or kink has been attributed to frictions. Because it is unclear if there are frictions in the sale of assets that lead to large capital gains, we explore several alternative explanations.

TAXPAYERS OFFSET GAINS WITH LOSSES

Equation (8) suggests that some taxpayers might have business losses that can be used to offset any short term gain, effectively reducing their marginal tax rate on capital gains to zero. Similarly, taxpayers might have other capital losses incurred in the current year or carried forward from a prior year. Again, these losses would reduce the effective marginal tax rate to zero. To examine this possibility we separate the sample of gains into those with overall net losses in excess of $3,000 in 2012 and those with overall net gains in 2012. Figure 16 shows that those with overall net losses have a much smaller spike in gains in week 1, indicating that they are shifting fewer gains into week 1.[9] Further, Figure17 shows that the large increase in average gains that occurs among gains by all taxpayers does not occur among gains by taxpayers with losses in excess of $3,000. But Figure 16 also shows that taxpayers with overall net gains do not show a sharp drop in gains near week -1.

FIGURE 16

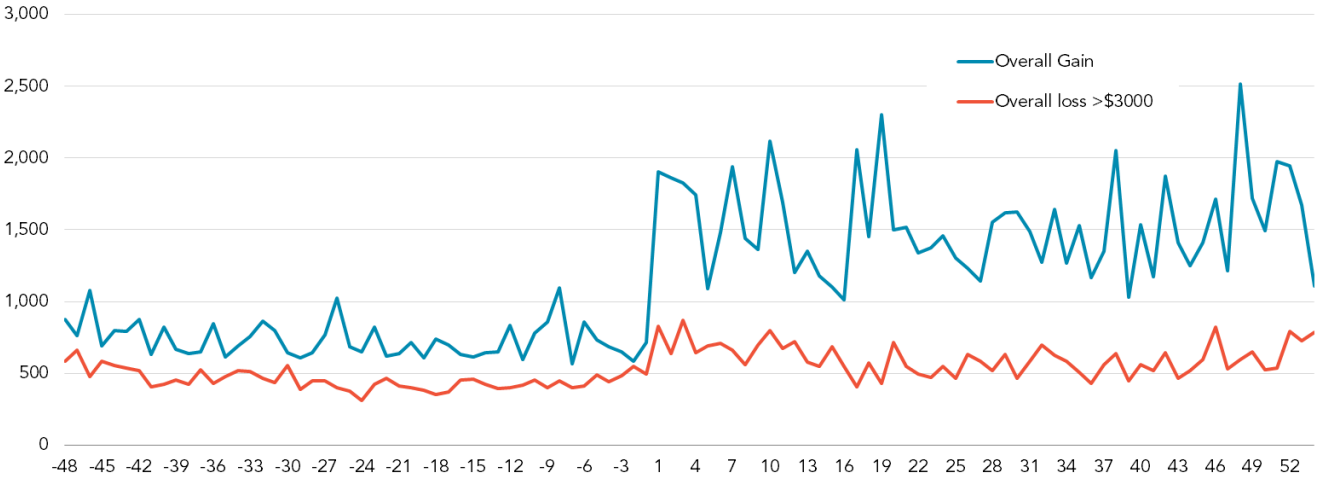
Capital gains by taxpayers realizing overall gains or losses greater than $3,000
2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 17

Average weekly gains by taxpayers realizing overall gains or losses greater than $3,000
2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

ELASTICITIES MAY VARY BY ASSET TYPE

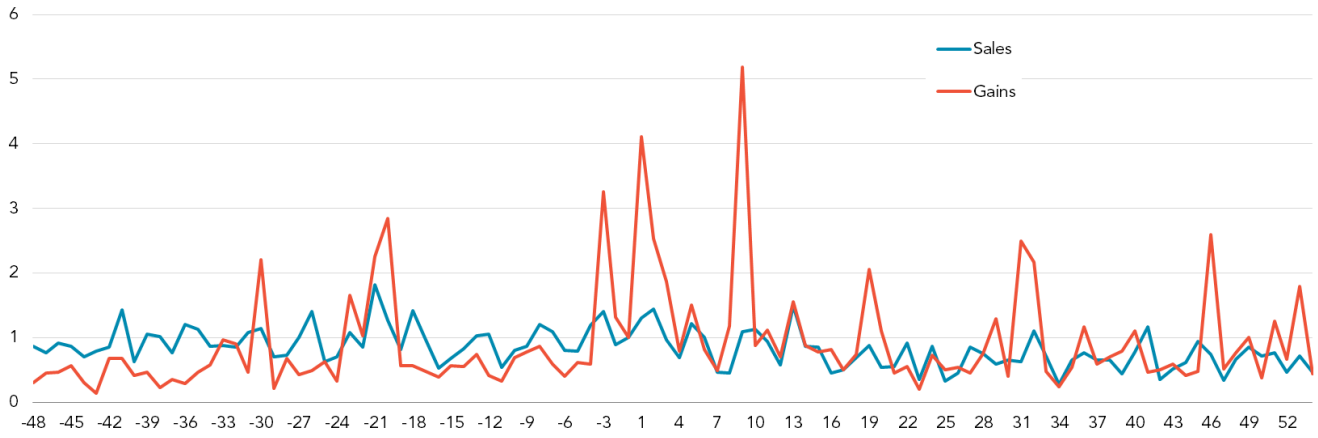
The sale of some assets may be less sensitive to tax changes than others. Tax exempt bonds, for example, should be less sensitive to the decline in tax rates at week 1 because most of the income generated is tax exempt, and any gain is the result of daily or weekly fluctuations in the market

interest rate. Sales and gains of tax exempt bonds, scaled to equal unity in week -1, are plotted in Figure 18. Although the large week-to-week variation blurs the pattern over time, there is nonetheless no evidence of shifting. Sales of corporate stock behave similarly to sales of all assets, which is not surprising because about one third of all assets sales are sales of corporate stock. Sales of taxable bonds, which represent one-twentieth the sales of corporate stock, shows a sharp spike at week 1, although this may be due to large week-to-week variation (Figure 19). Although gains from the sale of corporate stock follow a pattern similar to that from the sale of all asset classes, gains from the sale of bonds grow the longer the bonds are held, and show an even greater spike in week 1 than that of corporate stock (Figure 20.) Gains from all three assets fail to show a sharp drop in week -1.

FIGURE 18

Sales and gains of tax exempt bonds

relative to week -1, 2012

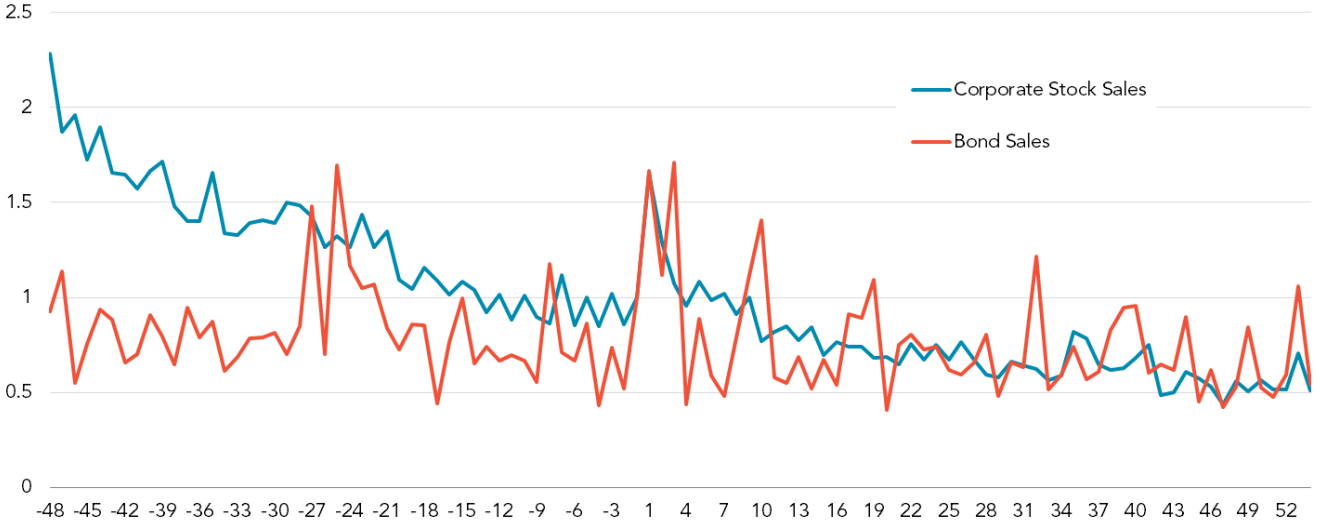


Note: The horizontal axis is the number of weeks before and after the one-year holding period. The data are normalized to equal one in week -1.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 19

Sales of corporate stocks and bonds

relative to week -1, 2012

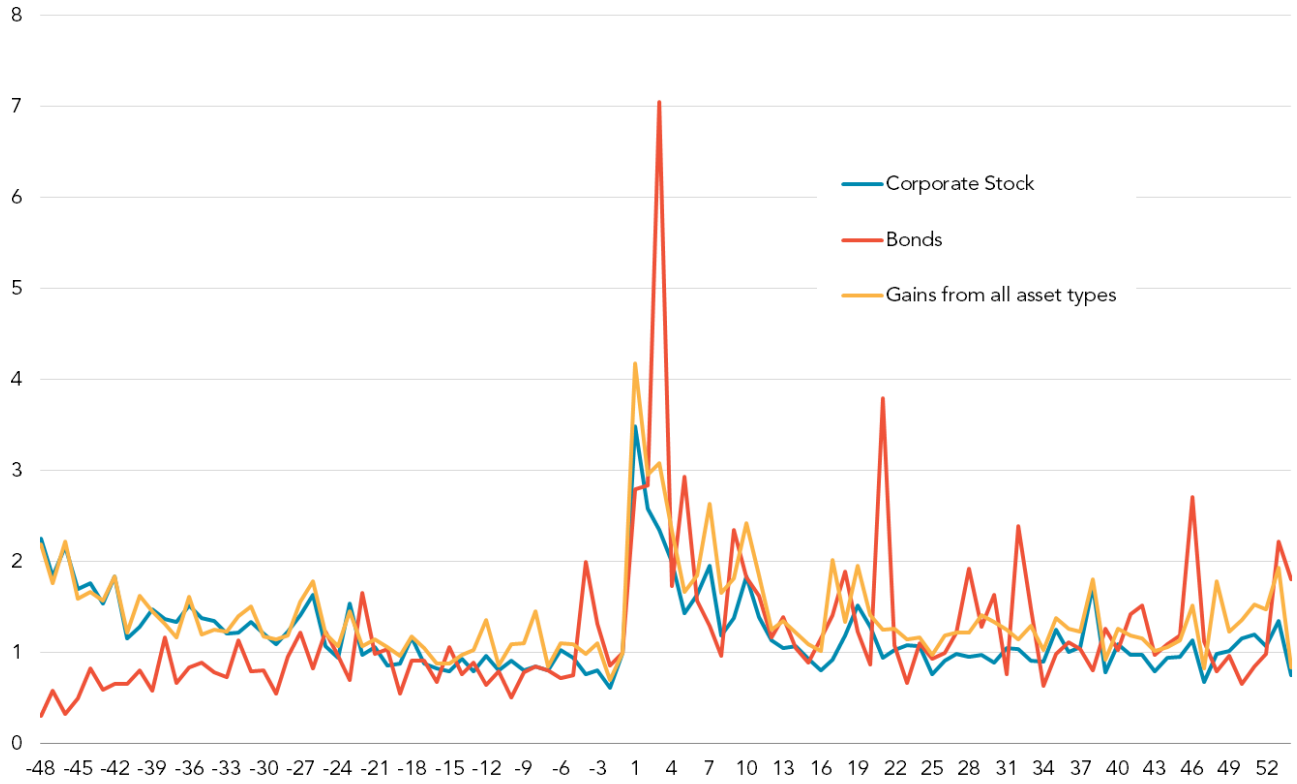


Note: The horizontal axis is the number of weeks before and after the one-year holding period. The data are normalized to equal one in week -1.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 20

Gains from corporate stocks and bonds

relative to week -1, 2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period. The data are normalized to equal one in week -1.
Source: Authors calculations from Statistics of Income (2016) data.

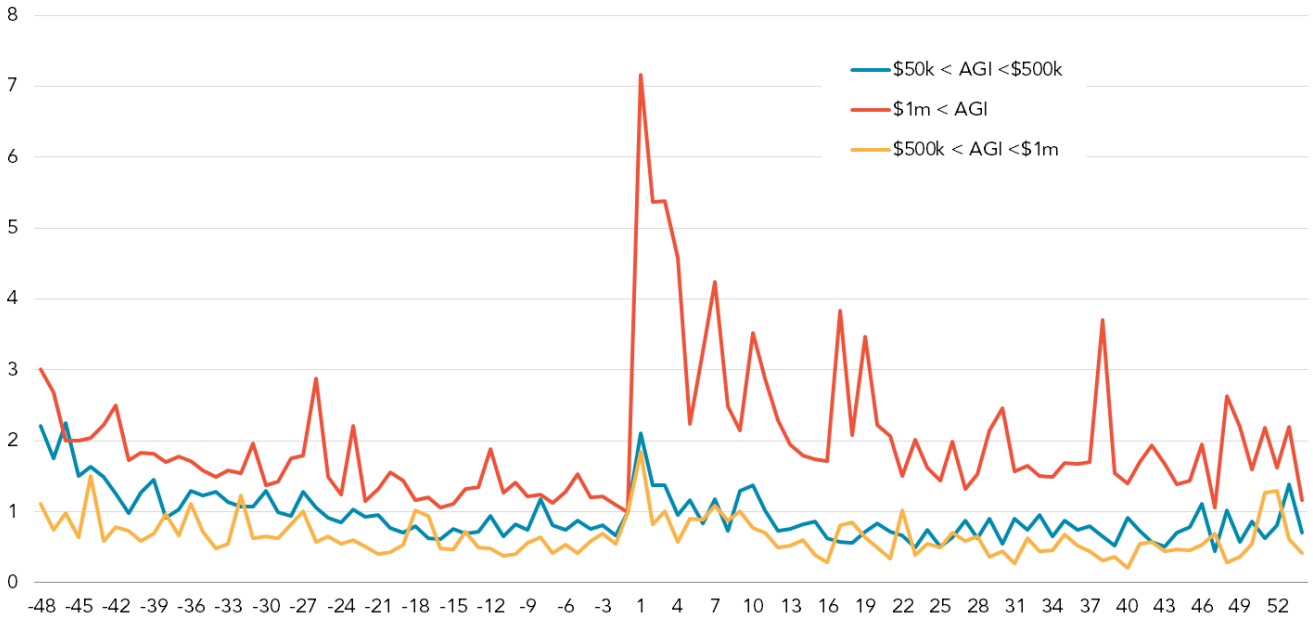
TAXPAYER CONFUSION ABOUT RATES

It is possible that some taxpayers do not understand the tax schedule. We test that possibility three ways. First, we compare gains for those with an AGI of at least $1 million (under the assumption that taxpayers with very large incomes can afford investment managers) to the gains of those with lower AGI. Second, we eliminate 'day traders', defined as those taxpayers who had 16 or more transactions of assets held for fewer than 24 days, under the assumption that they are less motivated by tax concerns.[10] Finally, we plot the gains of those who realized a gain in weeks 1 through 7, under the assumption that they are more likely to understand the tax implications of holding an asset for more than one year. The results are shown in Figures 21, 22 and 23. In none of the cases was there a substantial drop in gains just prior to week 1.

FIGURE 21

Gains by income class

relative to week -1, 2012

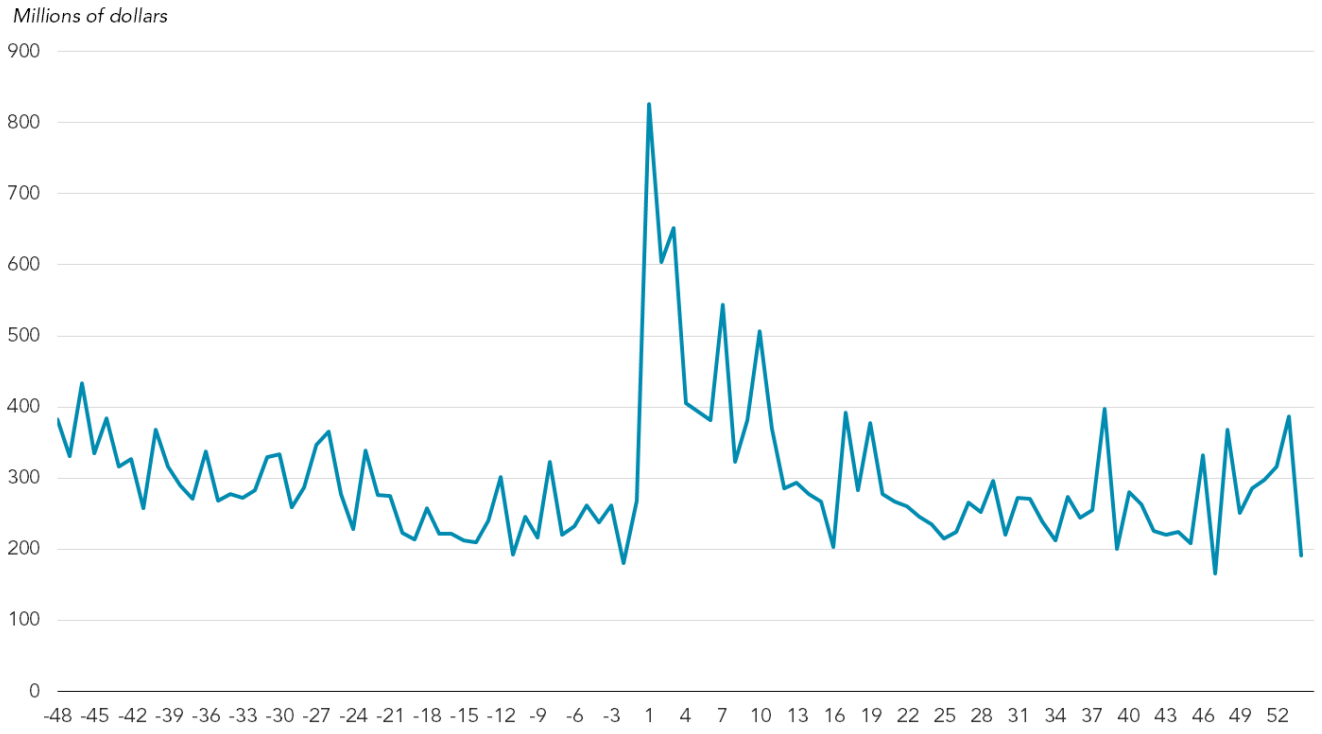


Note: The horizontal axis is the number of weeks before and after the one-year holding period. The data are normalized to equal one in week -1.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 22

Capital gains eliminating day traders

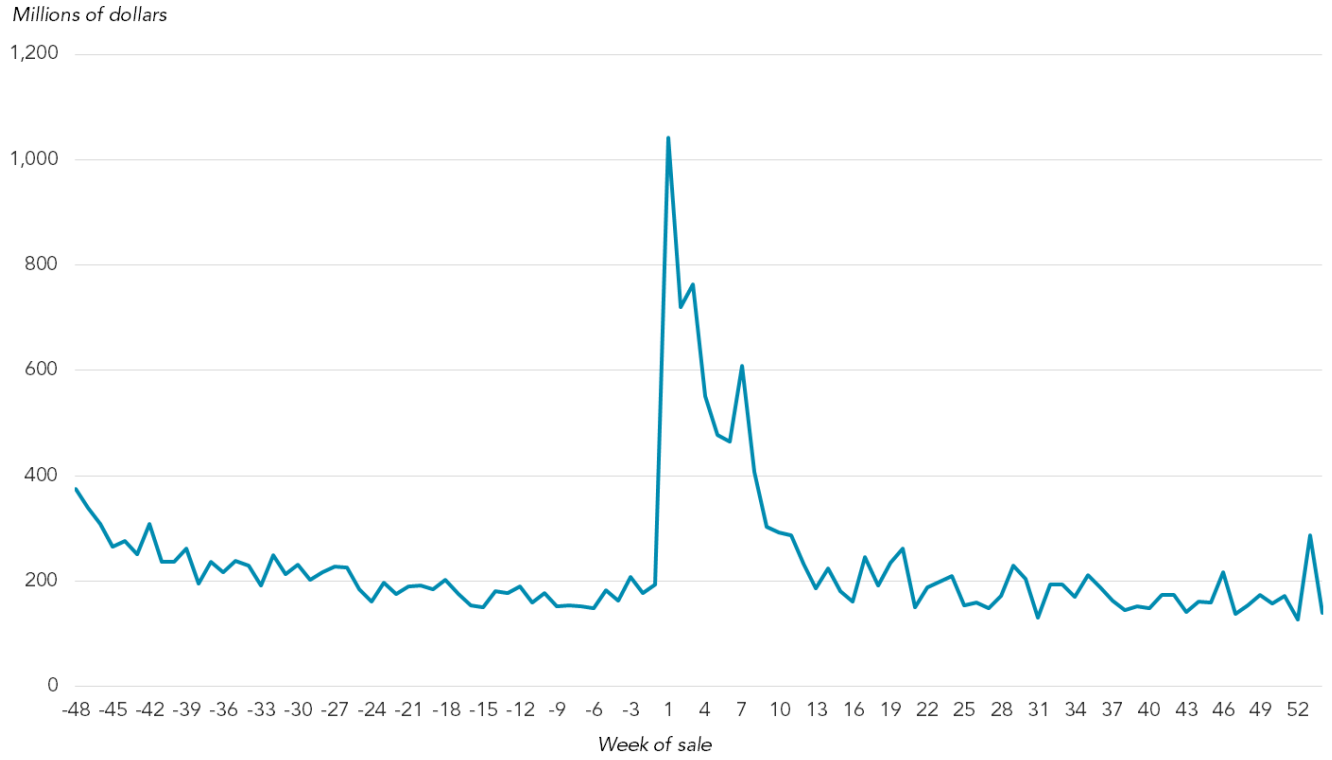
2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

FIGURE 23

Capital gains by taxpayers who realized a gain in weeks 1 through 7
2012



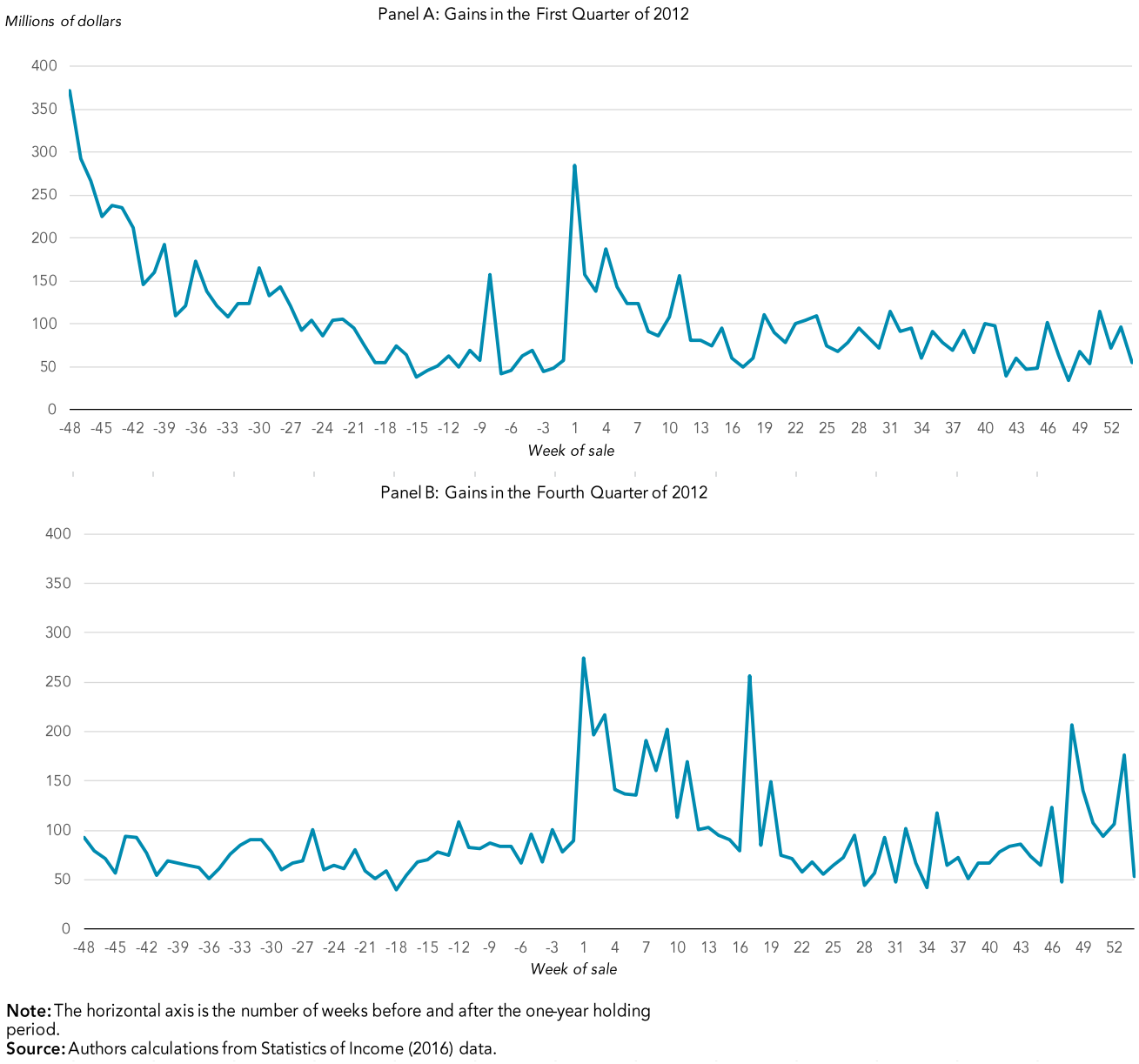
Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

LAST MINUTE SALES TO AVOID 2013 TAX INCREASE

It is possible that some taxpayers rushed to realize gains at the end of 2012 before higher rates took place. To test that we compare gains made in the first quarter with those made in the last quarter (not including the last two weeks of the calendar year). As shown in both panels of Figure 24, substantial gains just prior to week 1 are evident in both the first and last quarter of 2012.

FIGURE 24

Capital Gains in the First and Fourth Quarters
2012



Note: The horizontal axis is the number of weeks before and after the one-year holding period.
Source: Authors calculations from Statistics of Income (2016) data.

CONTRACTUAL OR OTHER NON-TAX-RELATED REASON FOR SALES

Investors might have non tax related reasons for realizing a gain just shy of the long term holding period. In particular, suppose that the taxpayer signs a contract to deliver product, or equity, in a year's time. In order to insure against market risk, the taxpayer could hedge their risk and lock in their prices. Investors or business persons can do this by purchasing an option to buy or sell at a specific price at a future date. We do in fact observe a spike in the sales of puts and calls after a holding period of 51 and 52 weeks. However, this type of activity is only about 10% of the sales that occur in the two weeks prior to the full year and a day holding period.

SENSITIVITY OF RESULTS TO CHOICE OF POLYNOMIAL AND UPPER BOUND ON WINDOW

Because the order of polynomial and the upper bound of the window are somewhat arbitrary, we test the sensitivity of the elasticity of all gains to those choices. We also test its sensitivity to the use of 48 weeks, rather than fewer weeks, leading up to week 1. The results are in Table 3, in which the first row reproduces the first row in Table 2. The next row lists elasticities based on a fourth-order rather than a sixth-order polynomial. Sales elasticities are somewhat lower than those calculated with a sixth-order polynomial, but gains elasticities are similar. Increasing the order of the polynomial has no effect. Lowering the upper bound from seven weeks to five weeks similarly lowers the elasticity of short-term sales. The elasticity of long-term sales, however, increases. Raising the upper bound by one week has almost exactly the same effect, suggesting that random variation in sales around week 7 has a strong effect on the elasticity estimate. Gains, on the other hand, remained quite similar regardless of variation in the upper bound. Calculating the elasticities using only weeks -36 forward reduces the elasticity of short-term sales and increases the elasticity of long-term sales. In both cases the effect is smaller than that created by changing the upper bound. The elasticity created by comparing average gains before and after week 1 are only slightly affected by the use of a shorter time period.

TABLE 3

Sensitivity of Estimated Elasticities

	Sales		Gains		Average Gain	
	Short-term	Long-term	Short-term	Long-Term	Short Run	Persistent
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
All Gains, Row 1 Table 2	-0.223	0.351	-0.519	1.002	-1.059	-0.867
All Gains, increase polynomial by 1	-0.223	0.351	-0.519	1.002	-1.059	-0.867
All Gains, reduce polynomial by 2	-0.150	0.300	-0.506	1.084	-1.059	-0.867
All Gains, reduce upper bound by 2 weeks	-0.156	0.459	-0.521	1.078	-1.062	-0.867
All Gains, increase upper bound by 1 week	-0.155	0.455	-0.542	0.941	-1.047	-0.867
All Gains, drop first 12 weeks of holding	-0.185	0.384	-0.486	0.978	-1.053	-0.911

Source: Authors calculations from Statistics of Income (2016) data.

CONCLUSION

We describe a simple model of taxpayer behavior and come to several conclusions about taxpayer decisions to realize or delay their capital gains and losses. Taxpayers will delay their realizations if the after tax rate of return is sufficiently high. As the holding period for the asset approaches a year and a day, taxpayers will tend to harvest their losses and delay their gains. Finally, if taxpayers have short-term losses in excess of their gains then they do not need to delay their realizations.

We use a unique data set of capital gains transactions to investigate the behavior of taxpayers with respect to the preferential tax rate for long term capital gains. We find strong evidence that taxpayers respond to the preferential rate by reducing the realizations of gains in the weeks leading up to the point when that rate applies. Yet there are a surprising amount of gains realized in the week immediately prior to that point. We estimate a short-term gains elasticity of -0.52 and a long-term gains elasticity of 1.0. These are substantially lower in absolute value than some other transitory estimates. We believe this occurs because our estimates are capturing the shifting of accrued short term gains rather than the realization of assets held for potentially long periods of time. Similar to Saez (2016) and Auten, Nelson, and Splinter (2016) we find that high income taxpayers are more responsive with elasticities of -0.75 for short term gains and 1.5 for long term gains. We also find evidence that taxpayers minimize their tax liability by timing their gains and losses in the same week. Finally, we find evidence that taxpayers in an overall loss position are less sensitive to the preferential rate.

NOTES

[1] Here we assume that taxes are paid when the gain is realized rather than in the following year.
[2] The federal tax rate on capital gains held for at least a year in 2012 was taxed at a maximum rate of 15 percent, while ordinary income had a maximum statutory tax rate of 35 percent.
[3] Indirectly held assets are those held by others on behalf of the taxpayer. Mutual funds, partnerships and S corporations are examples of entities that hold assets on behalf of others.
[4] See Statistics of Income (2014) for a description of the 2012 individual income sample, and Wilson and Liddel (2016) for a detailed description and summary statistics for the SOI Sale of Capital Assets study.
[5] We define event time to mean the holding period of the asset rather than the date during the calendar year that the asset was sold.
[6] Plotting sales by day of the week shows that they are evenly distributed, so the weekly cycle does not reflect concentrated sales on any one day.
[7] We test for the sensitivity of the elasticity estimates to this bound by increasing and decreasing the upper bound. The estimated elasticities are qualitatively similar to those in Table 2.
[8] The Federal Reserve Board estimates that the personal sector had financial assets worth approximately $54 trillion in 2012 (Table L.6 Derivation of Measures of Personal Savings). SOI reports that total taxable net capital gains realizations in 2011 and 2012 were $403 and $645 billion, respectively, representing approximately 1% of financial assets.
[9] The existence of any spike at all may be due to the shifting of gains by taxpayers who did not recognize they would have overall net losses by the end of the year.
[10] We chose sixteen because it represents the 90th percentile in the distribution of transactions by taxpayers for assets held for less than 24 days.

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