# How Does Capital Gains Realization Respond to Tax Rate Intertemporal Discontinuity?

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## Abstract

Relying on county-level capital gains realization data and state-level capital gains tax rates, we show that capital gains tax rate intertemporal discontinuity, the difference between short-term and long-term rates, reduces capital gains realization. More importantly, this negative association increases in adjusted gross income and taxpayer age, two prominent taxpayer characteristics that are associated with the reluctance to realize short-term capital gains. Further, taxpayer sophistication, as reflected in attention paid to capital gains tax and financial literacy, enhances the negative association between gain realization and rate discontinuity while risk-taking preference mitigates this association. We provides direct evidence of a negative effect of tax rate discontinuity on capital gains realization and demonstrate that the desire to delay a quick realization of capital gains varies consistently with taxpayers' characteristics and incentives.

**Keywords**: *capital gains tax; capital gains realization; tax rate intertemporal discontinuity; short-term rate; long-term rate; state tax; tax literacy*

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## 1. Introduction

In the U.S. tax system, the selling of an appreciated asset can trigger a capital gains tax. Further, a different capital gains tax rate applies to short-term or long-term realized capital gains. For example, at the federal level, the short-term capital gains tax rate is normally higher than the long-term capital gains tax rate. This difference is termed the capital gains tax rate intertemporal discontinuity (Shackelford and Verrecchia, 2002). A direct consequence of this discontinuity is that upon realization, long-term capital gains are preferred to short-term capital gains, especially when the holding period of a specific asset is approaching one year (Reese, 1998), causing investors to delay the realization of short-term capital gains. Our research provides the first direct empirical analysis on how capital gains tax intertemporal discontinuity shapes the aggregate capital gains realization in the United States.

The existing research has largely approached the effects and consequences of capital gains intertemporal discontinuity indirectly by observing price pressure or stock trading patterns upon certain events where taxpayers need to rebalance their portfolios. For example, Blouin, Ready and Shackelford (2003) provide evidence of a price increase and a reduction in equity float around earnings disclosures and additions to S&P 500 index when equity investors defer their sales to qualify for long-term gains. Li, Lin and Robinson (2016) show that IPO underpricing increases in discontinuity as initial investors hold out and demand a higher price when enticed to sell short-term in the secondary market. He, Jacob, Vashishtha and Venkatachalam (2022) demonstrate a real-activity consequence of discontinuity in promoting corporate innovation and long-term investments by encouraging long-term stock holding. While Hanlon and Heitzman (2010) suggest that the literature in capital gains taxation has had some success in documenting pricing and trading effects, we still lack evidence on how long-term and short-term capital gains tax rates, especially the tax rate discontinuity, directly affects actual capital gains realization. Identification-wise, with the exception of He, Jacob, Vashishtha and Venkatachalam (2022) who utilize an international setting in analyzing the effect of discontinuity on long-term investments, prior studies often rely on federal tax regime changes. As federal regime changes usually apply to all taxpayers, causality can remain an issue.

Taking advantage of state-level short-term and long-term capital gains tax rates (and their changes) and using county-level aggregate capital gains realization data, we establish a direct link between discontinuity and capital gains realization. The use of state tax rates and their multiple changes also affords us an opportunity to sharpen the identification of a causal effect of capital gains tax rate

intertemporal discontinuity on capital gains realization in both a generalized difference-in-differences analysis based on tax rates and a stacked difference-in-differences analysis based on changes in tax rate discontinuity that otherwise cannot be achieved adequately with federal tax regime changes.

We argue that the suppression of capital gains realization is mainly due to taxpayers timing their trading activities to avoid short-term gains realization when the short-term rate is higher than the long-term rate. Of course, they do this timing while balancing it with the value of short-term information innovation. If we imagine an economy where there is no difference between short-term and long-term capital gains tax rates, then tax-motivated portfolio rebalancing would only be caused by changes in the expectation of (or actual) capital gains tax rate, the arrival of random incidences of information innovation, changes in consumption-induced liquidity patterns, or some behavioral bias due to taxpayers oblivious of earlier capitalization of tax liabilities when purchasing the assets. The introduction of differential taxation of long-term versus short-term gains causes a distortion of the above trading incentive. Even in the absence of the above reasons, the presence of tax rate discontinuity would cause short-term gains to be delayed in the equilibrium of portfolio balancing.

In both an intensive margin analysis (amount of gains realization) and an extensive margin analysis (number of returns with gains realization), we show that state-level capital gains tax rate discontinuity reduces county-level taxpayers' capital gains tax realization, consistent with a general preference of taxpayers to avoid realizing capital gains short-term when the short-term rate is higher than the long-term rate. This supports the theoretical prediction but avoids relying on indirect measures such as price pressure to infer the extent of capital gains realization in empirical literature. In a relaxed model where we look at the effects of short-term and long-term capital gains tax rates simultaneously instead of their intertemporal discontinuity, we find that while the effect of short-term tax rate on capital gains realization is negative, the effect of long-term capital gains rate is positive. Evaluated at the sample means, the elasticity of capital gains realization to the short-term rate is -0.96 and that to the long-term rate is 1.10. They are both close to unity.

The positive effect of long-term capital gains tax rate on gains realization does not contradict the existing literature. While a reduction in long-term capital gains tax rate can cause an immediate increase in long-term gains realization for investors with accumulated long-term gains, this is an event-time one-off activity that enables taxpayers to quickly reach a new long-term capital gains equilibrium that balances the cost of capital gains taxation and optimal portfolio composition (Dai, Maydew, Shackelford and Zhang, 2008; Jacob, 2018). In a steady state, consumption-motivated investors will need to realize a certain amount of capital gains, potentially enabling a positive association between the long-term rate and capital gains realization (Hines and Schaffa, 2023). A positive association between the long-term rate and capital gains realization in a steady state does not preclude taxpayers from taking

in a windfall and release locked-in gains when a long-term rate cut actually occurs (Dai, Maydew, Shackelford and Zhang, 2008).

On the other hand, realizing short-term gains in the presence of a higher short-term rate will incrementally increase taxpayers' tax burden when they actually possess a waiting option that can help them avoid it. This will cause a delay in short-term capital gains realization which enables a negative association between short-term rate and short-term capital gains realization. This delay in information-motivated short-term realization is unlikely to be completely reversed when the gains qualify for long-term as the information would have been stale upon long-term qualification. Considered together, we observe a negative association between tax rate intertemporal discontinuity and capital gains realization. That is, the momentum to trade on information in the presence of short-term gains, when delayed, is at least partially lost, causing an overall negative association between short-term rate/intertemporal discontinuity and capital gains realization.

In addition to a generalized difference-in-differences model using state capital gains tax rates, we take advantage of opportunities afforded by the changes in state tax rate intertemporal discontinuity and conduct a stacked difference-in-differences analysis to enable added identification. We find that with an increase in discontinuity, capital gains realization decreases. This decrease occurs purely after the discontinuity increase event with a parallel pre-trend for treated and matched counties. However, capital gains realization is unaffected by a reduction in discontinuity. Therefore, the effect of tax rate discontinuity on capital gains realization is asymmetric – its increase reduces gains realization while its reduction does not increase gains realization. An asymmetric tax rate change effect is present in many empirical scenarios (Heider and Ljungqvist, 2015; Ljungqvist, Zhang and Zuo, 2017; Mukherjee, Singh and Zaldokas, 2017; Kang, Li and Lin, 2021; Fuest, Peichl and Siegloch, 2018) and researchers have provided various reasons. In our case, interdependent realization of gains and losses for tax efficiency and investors' behavioral reluctance to realize losses (Kahneman and Tversky, 1979; Odean, 1998) could potentially interact to cause this asymmetry.

We further argue that high-income taxpayers are more susceptible to capital gains taxation as they are more likely to have investments in securities or to own properties. We find that the negative effect of rate discontinuity on capital gains realization increases monotonically in adjusted gross income (AGI). We also recognize the fact that under the tax law, death removes capital gains liabilities, making the avoidance of short-term gains even more desirable in increasing the value of bequest as taxpayers approach death (Dammon, Spatt and Zhang, 2001). We find that the negative association between discontinuity and capital gains realization increases in taxpayers' age.

Finally, we look at how taxpayer financial sophistication and personal preferences moderate the association between tax rate discontinuity and capital gains realization. Financial sophistication (Lusardi

and Mitchell, 2014) should enhance this association, as it enables an appropriate timing of trading strategies to account for and mitigate the tax cost associated with short-term realization. Conversely, risk-taking preference should attenuate the tax effect as risk-taking is often correlated with frequent and impulsive trading (Dorn and Huberman, 2005; Barber and Odean, 2001). Consistently, we find that the negative association between discontinuity and capital gains realization increases in local financial literacy or Google search-based measure of attention for capital gains tax and attenuates in local risk-taking preference.

Overall, we show that the timing to avoid short-term capital gains taxation is responsible for the suppression of gains realization. Our research contributes to the tax and taxpayer behaviors literature by providing direct evidence of tax rate discontinuity delaying capital gains realization. Prior studies have relied on price pressure or trading patterns to infer this association (Blouin, Raedy and Shackelford, 2003; Li, Lin and Robinson, 2016). However, how intertemporal discontinuity directly impacts capital gains realization remains empirically unestablished. We show a direct association between the two, at the county-level. In addition, we infer the elasticities of capital gains realization to short-term and long-term rates. We demonstrate that when the short-term capital gains tax rate is higher relative to the long-term rate, the tax timing option becomes more valuable, causing taxpayers to delay gains realization to long-term. Our finding adds validity to the assumption in empirical literature that discontinuity encourages long-term holding, which can have a positive effect on firms' real activities such as long-term investments and innovation (He, Jacob, Vashishtha and Venkatachalam, 2022) as well as IPO valuation (Li, Lin and Robinson, 2016).

Second and very importantly, we demonstrate that the desire to delay a quick realization of capital gains due to tax rate discontinuity varies consistently with taxpayers' characteristics and incentives. Taxpayers with higher adjusted gross income are more exposed to capital gains taxation and taxpayers more advanced in age can benefit more from delaying a quick realization of gains. Therefore, a higher proportion of these taxpayers is associated with a more pronounced negative association between capital gains realization and tax rate discontinuity. Further, taxpayer sophistication, as reflected in attention paid to capital gains tax and financial literacy, enhances the negative association between gain realization and rate discontinuity while a preference for taking risk mitigates taxpayers' tendency to delay capital gains realization. These granular results provide insights into how taxpayers realize capital gains in response to tax rate intertemporal discontinuity.

Third, we contribute to a finer understanding of the effect of long-term capital gains tax rate on capital gains realization by differentiating their steady-state association in "a consumption-based" effect from the "locked-in" effect along the trajectories of rate changes. While the literature has shown that a reduction in long-term capital gains tax rate can cause a one-off selling of shares with accumulated

long-term gains (Dai, Maydew, Shackelford and Zhang, 2008; Jacob 2018), we demonstrate that the association between the long-term tax rate and capital gains realization in a steady state does not have to be negative.[1] Consumption-motivated investors will need to realize a certain amount of capital gains after tax. This enables a positive association between the long-term rate and capital gains realization (Hines and Schaffa, 2023).

Finally, we contribute to the identification of a causal effect of capital gains tax rate intertemporal discontinuity on direct gains realization. Some prior studies have relied on federal tax regime changes such as TRA1997 (Dai, Maydew, Shackelford and Zhang, 2008; Chyz and Li, 2012). However, federal tax regime changes can potentially prevent researchers from identifying an ideal matched group in a simple and straightforward difference-in-differences analysis, even though a more nuanced partitioning of treated versus matched groups can be achieved by adjacent regime tests (Li, Lin and Robinson, 2016) or unaffected flow-through entities (Yagan, 2015, in a dividend tax setting). We instead take advantage of staggered state capital gains tax rate changes and perform a generalized difference-in-differences analysis using state-level tax rates as well as a stacked difference-in-differences analysis using occasions of changes in state-level tax rate discontinuity. This approach of using state tax rates helps us establish causality from discontinuity to capital gains realization. Further, we enrich the expanding literature that uses state tax rates or international tax settings for causal tax research (Heider and Ljungqvist, 2015; Faccio and Xu, 2015; Ljungqvist, Zhang and Zuo, 2017; Mukherjee, Singh and Zaldokas, 2017; He, Jacob, Vashishtha and Venkatachalam, 2022). Exploiting regional tax rate changes across jurisdictions or sub-jurisdictions can reveal valuable insights on various tax issues and provide comfort in establishing causality.

## 2. Literature and Predictions

In the U.S. asset and capital markets, as in many other jurisdictions, a capital gains tax is levied on realized gains when an asset is disposed of. This tax is also often designed to be a function of the asset holding period. When the short-term tax rate is higher than the long-term tax rate, portfolio rebalancing due to immediate information innovation can be delayed if an asset has been held short-term (e.g., usually not more than a year). That is, with short-term assets or securities held in an investment portfolio, tax-sensitive investors, faced with new information, cannot immediately rebalance their portfolios to a new position without incurring an additional tax cost. A direct consequence of this tax cost is a delay in the realization of short-term gains of certain assets when investors optimize under the

[1] The positive association between the long-term rate and capital gains realization is akin to an equity tax capitalization effect. For example, with a reduction in tax rate on equity income, equilibrium stock returns decrease (Brennan, 1970; Kontoghiorghes, 2024) – a positive association.

constraint of a capital gains tax cost that is based on asset holding period, as formulated in Shackelford and Verrecchia (2002) who term the difference between short-term and long-term rates the capital gains tax rate intertemporal discontinuity.

Based on this theory, there should be a negative association between capital gains tax rate intertemporal discontinuity and (short-term) capital gains realization. Note that this discontinuity effect is related to but distinct from the lock-in effect associated with assets with accumulated long-term gains. For example, Ayers, Lefanowicz and Robinson (2003; 2004) demonstrate that the acquisition premium and the likelihood of a nontaxable acquisition increase in accumulated long-term capital gains to entice investors of target firms into selling shares, a phenomenon largely driven by the target CEOs' capital gains tax burden (Hanlon, Verdi and Yost, 2021). Similarly, Jin (2006) shows that institutions serving tax-sensitive clients are reluctant to sell shares with accumulated long-term gains. Relying on a federal tax regime change, Dai, Maydew, Shackelford and Zhang (2008) provide evidence of price pressure for stocks with accumulated long-term gains around the enactment of TRA1997 which reduced the long-term federal capital gains tax rate, causing investors to sell and rebalance. Jacob (2018) finds a similar result in a Swedish setting. A governance consequence of lock-in is that it can cause tax-sensitive investors to vote against management as they face costly exit (Dimmock, Gerken, Ivkovic, and Weisbenner, 2018) and CEOs to take less risk in their firms (Yost, 2018).

In a world where capital gains taxation does not depend on asset holding period, with perfect initial capital gains tax capitalization when assets are acquired, that is, if buyers of assets perfectly price in all future capital gains tax liabilities, there should not be a lock-in of shares with capital gains in a steady state. In reality, the lock-in effect acts as an *ex post* remedy to initial over- or under-capitalization when unplanned tax rate change, information or consumption events occur, or it can simply be due to a behavioral bias where investors become oblivious that they have priced in the capital gains tax liabilities when purchasing the assets. For example, lock-in can happen when there is a change in the capital gains tax rate (Dai, Maydew, Shackelford and Zhang, 2008; Jacob, 2018), an enticement to sell assets (Ayers, Lefanowicz and Robinson, 2003; 2004), or an arrival of information that alters asset value (Blouin, Raedy and Shackelford, 2003).

The introduction of capital gains taxation contingent on asset holding period changes this dynamic. A reluctance to dispose of short-term gains can exist in an equilibrium when taxpayers balance the additional tax cost of realizing capital gains short-term and the urge to immediately balance their investment portfolios with the new arrival of information. The existing research tends to infer this negative association between rate discontinuity and gains realization. For example, with a reduction in selling due to the prospect of realizing short-term gains, stock float decreases and stock price increases as demonstrated in Blouin, Raedy, and Shackelford (2003) around earnings disclosures and additions to

the S&P 500 index. Using federal capital gains tax regime changes, Li, Lin and Robinson (2016) show that IPO underpricing increases in federal tax rate intertemporal discontinuity as initial IPO investors, faced with a higher short-term capital gains tax rate, hold out and demand a higher price when selling short-term in the secondary market. Both studies infer a delay in selling appreciated shares with short-term gains due to tax rate discontinuity based on price pressure.[2] He, Jacob, Vashishtha and Venkatachalam (2022), in an international setting, provide evidence that discontinuity promotes corporate innovation and long-term investment as it encourages long-term holding. However, the literature lacks a direct analysis of the dampening effect of discontinuity on actual capital gains realization, which forms the theoretical foundation of many existing empirical studies.

We take advantage of the availability of county-level information on capital gains realization from the IRS and state-level capital gains tax rates from NBER to establish a causal effect of capital gains tax rate discontinuity on capital gains realization. As discussed earlier, since tax rate discontinuity causes an incentive to delay the realization of short-term capital gains, there should be a negative association between tax rate discontinuity and short-term capital gains realization.

We have so far argued that tax rate discontinuity will cause short-term capital gains realization to decrease. However, will a reduction in short-term realization induce a corresponding increase in long-term capital gains realization that completely offsets the reduction in short-term realization? If this occurs, then in a steady state, we may not be able to find a negative association between discontinuity and capital gains realization as we empirically rely on aggregate county-level capital gains realization that does not distinguish short-term versus long-term gains. We argue that a complete offset is only likely to happen for an asset when information innovation arrives right before its long-term gain qualification. Only an offset like this would preserve the value of information. Taxpayers need to strike a balance between the value from immediate execution upon information arrivals and a lower tax upon long-term capital gains qualification. When information motivated short-term selling is delayed several months before an asset's long-term qualification, a complete offset is unlikely to occur as the information would have been stale upon long-term qualification and new information would also have arisen. That is, due to a delay in short-term trading, the value of the information is lost and cannot be completely picked up by subsequent trades. Therefore, short-term capital gains realization, when delayed, loses its information value over time and the delay would be at least partially permanent.

Based on the above discussion, we propose our hypothesis below:

Hypothesis: *Capital gains realization decreases in tax rate discontinuity.*

[2] This price pressure in essence is also manifested in a positive abnormal return around ex-dividend days when investors tradeoff high-tax-rate dividends versus low-tax-rate long-term capital gains (Elton and Gruber, 1970; Kalay, 1982; Michaely and Vila, 1995; 1996; Dhaliwal and Li, 2006).

Of course, if we continue to entertain the possibility of an intertemporal offset between short-term and long-term gains, a negative association between tax rate discontinuity and capital gains realization is an empirical question, adding tension to our prediction.

The above prediction is based on the premise that taxpayers who are affected by capital gains taxation need to exercise the capital gains tax timing option created by the tension between the short-term and long-term rates. To the extent that capital gains tax liabilities are correlated with income (Campbell, 2006; Van Rooij, Lusardi and Alessie, 2012), we expect the negative associated between discontinuity and capital gains realization to increase in taxpayers' adjusted gross income. In addition, under the current tax law, death removes capital gains liabilities (Dammon, Spatt and Zhang, 2001). This makes the avoidance of short-term gains even more desirable in increasing the value of bequest as taxpayers approach death. We expect the negative association to increase in taxpayers' age.

Further, our main prediction hinges on taxpayers being sophisticated enough to be aware of and to be able to properly exercise the capital gains tax timing option. Taxpayers who are not aware of or who pay no attention to capital gains tax issues would be less sensitive to tax rate discontinuity (Chetty, Loony and Kroft, 2009). In addition, taxpayers who lack financial literacy or access to financial advice may be less sensitive to the tax cost embedded in their capital gains realization decisions (Lusardi and Mitchell, 2014; Graham, Hanlon, Shevlin and Shroff, 2017). Therefore, the negative association between rate discontinuity and capital gains realization should enhance in taxpayers' financial literacy.

On the other hand, taxpayers who have a preference for risk-taking would like to trade more quickly and frequently to exploit information innovation (Barber and Odean, 2000). That is, these taxpayers are more likely to want to execute their trades at their preferred time regardless of the need to bear an extra tax cost. This would cause the negative association between discontinuity and capital gains realization to attenuate.

## 3. Data and Sample Construction

### *3.1. Net capital gain realization*

We utilize data on net capital gain realization at the county level from the IRS database, covering the years from 2010 to 2021. The Statistics of Income (SOI) program compiles county income data based on addresses reported in individual income tax returns (Form 1040) filed with the IRS. This database contains capital gains realization across eight adjusted gross income (AGI) categories, providing adequate opportunities for researchers to understand the nuance of the association between tax rate discontinuity and capital gains realization conditional on taxpayers' level of income. These county-level data are based on tax filings processed by the IRS for each calendar year and do not represent the full U.S. population.

This dataset includes key variables such as county Federal Information Processing Series (FIPS) codes, eight adjusted gross income (AGI) categories, wages and salaries, and ordinary dividends. For our research, we specifically focus on the net capital gains amount. This variable captures the net of short-term capital gains (short-term capital gains minus short-term capital losses) and long-term capital gains (long-term capital gains minus long-term capital losses). We use this measure to evaluate the extent to which households' capital gains realization behavior is affected by state-level capital gains taxation.

### *3.2. State-level capital gains tax rates*

State-level tax rate data for each year are sourced from the NBER Taxsim model, which is used in many studies examining the effects of state taxes on various issues (Baker and Wurgler, 2004; Armour, Burkhauser and Larrimore, 2013; Heider and Ljungqvist, 2015; Zidar, 2019; Kang, Li and Lin, 2021). To specifically capture the difference in tax treatment between short-term and long-term capital gains, we use the difference between the short-term capital gains tax rate and the long-term capital gains tax rate at the state level as our main independent variable. This approach allows us to analyze how the intertemporal discontinuity in capital gains tax rate influences aggregate household behavior. We also examine the effects of short-term and long-term rates separately.[3]

### *3.3. Other county-level information*

We incorporate a range of county-level control variables, sourced from the U.S. Bureau of Economic Analysis and the Bureau of Labor Statistics. These variables include personal income, GDP, unemployment rates, GDP growth and the median age of the population from the U.S. Bureau of Economic Analysis and the Bureau of Labor Statistics. Appendix A presents data sources in detail. We take the logarithmic form of all variables except for those measured as percentages.

To conduct cross-sectional analyses, we use the number of tax professionals in each county, obtained from the IRS website, to proxy for access to financial advice and thus financial literacy at the county level. We use the Google search volume of "capital gains tax" at the state level to capture households' attention to capital gains tax. Attention to capital gains tax can also be correlated with financial literacy. We use survey data from the National Financial Capability Study (NFCS), which captures the share of state respondents who report a very high willingness to take financial investment risks (scoring 10 on a

[3] State tax regimes for capital gains fall into three distinct categories. First, a majority of states with an income tax do not differentiate between short- and long-term gains, taxing both as ordinary income. Second, a set of states, such as Florida and Texas, levy no individual income tax and therefore impose no tax on capital gains. Finally, a minority of states, including Wisconsin and South Carolina, offer preferential treatment for long-term gains, most commonly by permitting an exclusion of a portion of the gain from the state's income tax base.

scale of 1 to 10). We leverage on the counties' frontier experiences from Bazzi, Fiszbein and Gebresilasse (2020, 2021), which we use as an alternative measure of risk-taking preference.

## 4. Empirics

### *4.1. Potential endogeneity in capital gains taxation*

Capital gains tax rates can potentially be endogenous to state economic conditions. Similar to He, Jacob, Vashishtha and Venkatachalam (2022), before examining how tax rate discontinuity affects capital gains realization, we look at whether and how capital gains tax rates and discontinuity are determined by state economic factors. We estimate the following regression model:

$$Tax\ Rate_{s,t} = \lambda_1 LnGDP_{s,t} + \lambda_2 Unemp_{s,t} + \lambda_3 GDPGrowth_{s,t} + \lambda_4 LnAge_{s,t} + \lambda_5 LnIncome_{s,t} + \alpha_s + \alpha_t + \varepsilon_{s,t}, \quad (1)$$

where $Tax\ Rate_{s,t}$ is short-term ($Short_{s,t}$), long-term ($Long_{s,t}$) or their difference ($Discontinuity_{s,t}$) for State $s$ and Year $t$. $LnGDP_{i,s,t}$ is the logarithm of annual real GDP for State $s$ in Year $t$ (Bureau of Economic Analysis), $LnAge_{i,s,t}$ is the logarithm of median population age for State $s$ in Year $t$ (Census Bureau), $Unemp_{i,s,t}$ is the unemployment rate (%) for State $s$ in Year $t$ (Bureau of Labor Statistics), $GDPGrowth_{i,s,t}$ is the GDP growth rate for State $s$ in Year $t$ (Bureau of Economic Analysis), $LnIncome_{i,s,t}$ is the logarithm of per capita personal income for State $s$ in Year $t$ (Bureau of Economic Analysis). $\alpha_s$ and $\alpha_t$ are state and year fixed effects. $\varepsilon_{s,t}$ is the regression residual.

Results are reported in Table 1. While only $LnAge$ appears to positively affect short-term and long-term rates, none of the state variables affects capital gains tax rate discontinuity. This result is similar to He, Jacob, Vashishtha and Venkatachalam (2022), in an international setting. Therefore, at least for the sample period and setting that we use, state-level capital gains tax rate discontinuity appears to be exogenous to these state economic factors.

### *4.2. Effect of capital gains taxation on capital gains realization*

We first directly establish the link between tax rate discontinuity and capital gains realization in an intensive margin analysis. Examining the effects of state-level tax rates on various issues, a generalized difference-in-differences model is normally the preferred approach to establish causal associations as it incorporates the magnitudes of various tax rates (Fuest, Peichl and Siegloch, 2018; Giroud and Rauh, 2019), especially when, as in our case, tax rate discontinuity is largely exogenous to state-level economic factors. We estimate the following regression with AGI-county-year as the basic unit:

$$Realization_{g,i,s,t} = \beta Tax\ Rate_{s,t} + \gamma Controls_{i,s,t} + \alpha_i + \alpha_t + \alpha_g + \varepsilon_{i,s,t}, \quad (2)$$

where $Realization_{g,i,s,t}$ is the net capital gains realization scaled by the total population for AGI category $g$, County $i$, State $s$ in Year $t$. $Tax\ Rate_{s,t}$ is the capital gains tax rate discontinuity ($Discontinuity$) or its

components, short-term and long-term capital gains tax rates (*Short* and *Long*) for State *s* in Year *t*. $Controls_{i,s,t}$ is a vector of county-level control variables: $LnIncome_{i,s,t}$ is the logarithm of annual personal income per capita for County *i*, State *s* in Year *t* (Bureau of Economic Analysis), $LnGDP_{i,s,t}$ is the logarithm of annual real GDP for County *i*, State *s* in Year *t* (Bureau of Economic Analysis), $LnAge_{i,s,t}$ is the logarithm of median age for County *i*, State *s* in Year *t* (Census Bureau), $Unemp_{i,s,t}$ is the unemployment rate (%) for County *i*, State *s* in Year *t* (Bureau of Labor Statistics), $GDPGrowth_{i,s,t}$ is the GDP growth rate for County *i*, State *s* in Year *t* (Bureau of Economic Analysis). $\alpha_i$, $\alpha_g$ and $\alpha_t$ are county, AGI and year fixed effects. $\varepsilon_{i,s,t}$ is the regression residual.

Our dependent variable is the county-level aggregate capital gains realization. When the short-term capital gains tax rate exceeds the long-term rate, tax-sensitive, sophisticated investors are likely to delay realizing some short-term gains when making liquidity and portfolio rebalancing decisions. It is important to note that the observed decrease in capital gains realization may result from both the delay in realizing gains and the incentive in realizing losses (Constantinides, 1983). Specifically, within the short-term capital gains domain, investors who realize gains may also consider simultaneously realizing losses, to the extent permitted by an optimally balanced portfolio, to offset some tax cost. In other words, gains and losses are not realized in isolation. However, we are unable to separately account for gains and losses based on the data that we use. We thus implicitly assume that taxpayers own some "super-aggregated assets". Nevertheless, the timing of realizing both gains and losses relies on taxpayers being somewhat sophisticated in tax-related matters. Since we use county-level aggregate net capital gains realization, taxpayer sophistication can be represented by its county-wide weighted average across all taxpayers. In our subsequent analysis, we exploit cross-county variation in taxpayer sophistication to demonstrate that the association between tax rate intertemporal discontinuity and capital gains realization is indeed stronger in regions with a high level of taxpayer financial/tax sophistication.

Summary statistics are reported in Table 2. The average capital gains realization per capita (scaled by county population) is USD160. As our basic unit every year is county-AGI category, the average county-level per capita capital gains realization is USD1,280 (USD160 × 8 AGI categories). Table 2 also shows that an average county has a GDP of USD5.61 million, a GDP growth rate of 2%, a population of 103.7 thousand residents, and a per capita income of USD42.35 thousand. The average short-term capital gains rate is 4.82% and the average long-term rate is 4.63%. Figure 1.A shows the time-series averages of capital gains realization across all counties. Figure 1.B (1.C) depicts the time-series averages of short-term (long-term) capital gains tax rate across all states.

Regression results are reported in Table 3. The coefficients on *Discontinuity* are negative and significant (-0.034, $t$ = -3.23 without controls; -0.035, $t$ = -2.77 with controls). Therefore, we find direct

support for a negative association between tax rate discontinuity and capital gains realization. With a one-standard deviation increase in discontinuity, capital gains realization decreases by 21.22% from the mean (-0.035×0.97/0.16), an economically significant change. As for controls, county-level unemployment rate, GDP growth, median age and per capita personal income appear to contribute positively to capital gains realization.

Next, we relax the model by replacing discontinuity with short-term and long-term capital gains tax rates independently. The coefficients on *Short* are both negative and significant (-0.031, $t$ = -2.48 without controls; -0.032, $t$ = -2.31 with controls). Therefore, a high short-term rate delays capital gains realization. The coefficients on *Long* are both positive and significant (0.039, $t$ = 3.29 without controls; 0.038, $t$ = 2.85 with controls). Evaluated at the means of tax rates and capital gains realization (an average county) and using the coefficients with controls, the elasticity of capital gains realization to the short-term rate is -0.96 (-0.032/(0.16/4.82)) and that to the long-term rate is 1.10 (0.038/(0.16/4.63)).

A positive association between long-term rate and capital gains realization is consistent with a consumption-based model. Consumption-motivated investors care for after-tax cashflow, akin to the tax capitalization theory of stock valuation. This way, a higher long-term capital gains tax rate can potentially motivate investors to realize more capital gains to preserve after-tax consumption (Hines and Schaffa, 2023). Therefore, a positive steady-state association between the long-term rate and capital gains realization does not preclude taxpayers with long-term capital gains from taking in an event-time windfall and rebalance when a sudden long-term rate cut occurs (Dai, Maydew, Shackelford and Zhang, 2008; Jacob, 2018).

This pattern related to the two tax rates is consistent with Li, Lin and Robinson (2016) who, in an event study setting, show that IPO underpricing increases in the short-term rate (federal rate discontinuity) but decreases in the long-term rate as initial IPO investors price in the effect of discontinuity when they are enticed to sell shares short-term right after IPOs. We instead show a steady-state equilibrium effect of capital gains taxation on gains realization. Our pattern also pairs well with He, Jacob, Vashishtha and Venkatachalam (2022) who show that while corporate innovation is positively associated with capital gains tax rate discontinuity and the short-term rate, it is negatively associated with the long-term rate. That is, the dynamics of the interaction between the short-term and long-term rates can encourage innovation, due to longer stock holding associated with rate discontinuity. Our results provide support for the underlying assumption of both studies.

It is worth noting that a positive association between long-term rate and capital gains realization does not necessarily contradict patterns found in the literature. Dai, Maydew, Shackelford and Zhang (2008) show that after the enactment of TRA1997 which reduced the long-term capital gains tax rate at the federal level, stocks with accumulated long-term gains have lower returns. They thus infer that investors

were selling these stocks to offload locked-in cumulative long-term gains.[4] On the other hand, our research differs from Agersnap and Zidar (2021) who investigate the overall elasticity of capital gains realization to long capital gains tax rate (federal plus state) and their revenue implications. They find a negative elasticity of the capital gains tax rate that is well below one. We focus on the tension between short-term and long-term rates and find a negative short-term effect and a positive long-term effect on capital gain realization. The two studies' methodological approaches and data differ from each other. While we conduct a county-level analysis to provide granular insights into taxpayer responses to short-term and long-term rates, Agersnap and Zidar (2021) employ a direct-projection approach to estimate the tax rate change effect on capital gains realization at the state level.

### *4.3. Further identification for the effect of tax rate discontinuity on capital gains realization*

#### *4.3.1. Stacked difference-in-differences*

We focus our effort on the effect of tax rate discontinuity on capital gains realization. While we have earlier argued that a generalized difference-in-differences model is the preferred approach (Fuest, Peichl and Siegloch, 2018; Giroud and Rauh, 2019) in a state-tax setting to establish causal associations, here we utilize changes in state-level tax rate discontinuity in a stacked difference-in-differences design to further buttress identification. We begin by identifying events where there is an increase or decrease in tax rate discontinuity, representing either an exacerbation or an alleviation of short-term trading pressure at the state level, from 2010 to 2021. Figure 2.A shows the spatial distribution of discontinuity changes and Figure 2.B shows the time-series distribution of the frequency of discontinuity increases and decreases.

Each discontinuity change event is treated as a distinct cohort. For each cohort, we define an event window that spans from year $t$ - 4 to year $t$ + 3, with $t$ representing the year of the tax rate discontinuity change. Counties in states experiencing discontinuity shocks are designated as treated counties, while counties in states without any tax rate discontinuity changes during the sample period serve as matched counties. We retain the largest tax rate discontinuity change for each county to address the overlap issue. We require at least one pre-event and post-event period for each cohort. The resulting cohorts of tax rate discontinuity increases or decreases are then stacked into two separate datasets. We then estimate a stacked difference-in-differences regression for tax discontinuity increases and decreases separately to evaluate their respective impacts on capital gains realization:

$$Realization_{g,i,s,t} = \beta Treat_s \bullet Post_t + \gamma Controls_{i,s,t} + \alpha_{i,c} + \alpha_{t,c} + \alpha_{g,c} + \varepsilon_{i,t}, \quad (3)$$

[4] An analogy can be drawn with an equity (dividend and capital gains) tax capitalization effect. While equilibrium stock returns increase in the tax on equity to compensate tax-burdened investors (Brennan, 1970; Litzenberger and Ramaswamy, 1979; 1980; 1982; Kontoghiorghes, 2024), an announcement of a reduction in the equity tax rate can cause an immediate increase in stock prices (Lang and Shackelford, 2000).

where $Treat_s$ equals 1 for County $i$ in State $s$ that experienced a discontinuity increase or decrease within our sample period, and 0 otherwise. $Post_{s,t}$ is an indicator that equals 1 for observations during the event year and the three years following the change in tax rate discontinuity. As treatment is based on changes in discontinuity (short-term rate minus long-term rate), the coefficient on $Treat \bullet Post$ in fact captures the response of capital gains realization to discontinuity changes if a high short-term rate motivates taxpayers to delay selling and hold shares longer. Control variables are as defined earlier. $\alpha_{i,c}$ , $\alpha_{g,c}$ and $\alpha_{t,c}$ are county-by-cohort, AGI-by-cohort and year-by-cohort fixed effects respectively. $\varepsilon_{i,s,t}$ is the regression residual.

We estimate the above equation for discontinuity increase and decrease subsamples separately. Results are reported in Table 4. For discontinuity increases, the coefficients on $Treat \bullet Post$ are negative and significant (-0.046, $t$ = -2.32 without controls and -0.047, $t$ = -2.45 with controls). Therefore, with a discontinuity increase, taxpayers realize fewer capital gains, supporting our prediction. On the other hand, taxpayers do not appear to respond to decreases in discontinuity. For the discontinuity decrease subsample, the coefficients on $Treat \bullet Post$ are insignificant.

Many studies have found that the effects of tax rate reductions are often more muted under various scenarios. For example, Heider and Ljungqvist (2015) show that while corporate leverage increases in response to state corporate tax rate increases, it does not change with corporate tax rate reductions. They argue that managers do not have an immediate incentive to decrease leverage which mainly benefits debtholders. Ljungqvist, Zhang and Zuo (2017) provide evidence that firms reduce risk in response to an increase in state corporate tax rate but do not increase in response to a reduction in corporate tax rate. They show that creditor-imposed constraints, as manifested in high leverage, cause this muted response to tax rate decreases. Mukherjee, Singh and Zaldokas (2017) demonstrate that while state corporate tax rate increases reduce innovation, the effect of tax rate decreases is insignificant. They conjecture that innovation takes a long time to increase after a tax rate cut. Kang, Li and Lin (2021) show an asymmetric incidence of bank tax on loan pricing (with a muted response of loan pricing to bank tax rate cuts) that is likely due to a convex loan demand curve. Also in a German setting, Fuest, Peichl and Siegloch (2018) find that while an increase in corporate tax reduces wage, a reduction does not increase wage.

We attempt a dynamic explanation for our asymmetric result here. While we have the aggregate capital gains realization that includes both short-term and long-term gains (losses) realization, the part that is associated with discontinuity should be related to short-term gains realization. When discontinuity increases, taxpayers realize fewer net short-term gains after offsetting gains against losses. As there is a low urge to realize gains, losses are also realized less. Realizing fewer losses is easier for retail investors who have a behavioral penchant for a reluctance to realize losses (Kahneman and

Tversky, 1979; Odean, 1998). This behavioral bias works towards the negative effect of discontinuity on capital gains realization with a discontinuity increase. With a discontinuity decrease, the situation is more complicated. A discontinuity decrease would suggest more realization of net short-term gains. This would require that for tax efficiency, investors offset as many short-term losses as portfolio rebalancing would deem appropriate. However, this time, retail investors' behavioral penchant for avoiding loss realization works against the effect of discontinuity on capital gains realization. The reluctance to realize an adequate amount of losses would in turn reduce the amount of gains to be realized, causing an overall muted response of capital gains realization to discontinuity decreases.

*4.3.2. Dynamic model*

To validate the parallel trends assumption and to explore the dynamics of the treatment effect, we estimate a dynamic stacked difference-in-differences model with indicators for the years before and years after tax rate discontinuity changes. We use the following specification:

$$Realization_{i,s,t} = \sum_{k=-3}^{3} \beta_k \, Treat_{s,t} \bullet D_k + \gamma Controls_{i,s,t} + \alpha_{i,c} + \alpha_{g,c} + \alpha_{t,c} + \varepsilon_{i,s,t}, \quad (4)$$

where $D_k$ indicate years relative to the discontinuity changes with $k \in \{-3, -2, -1, 0, 1, 2, 3\}$. We set Year -4 as the reference year and $k \in \{-3, -2, -1, 0, 1, 2, 3\}$ therefore respectively refers to three years, two years, one year before the tax rate discontinuity change, the year of tax rate discontinuity change, one year, two years and three years after the tax rate discontinuity change. $\alpha_{i,c}$ , $\alpha_{g,c}$ and $\alpha_{t,c}$ are county-by-cohort, AGI-by-cohort and year-by-cohort fixed effects respectively. $\varepsilon_{i,s,t}$ is the regression residual. All other variables are as defined earlier.

As shown in Table 5, for the discontinuity increase subsample, the coefficients for the three years preceding a tax rate discontinuity increase are statistically insignificant, suggesting that treated counties (those experiencing a tax rate discontinuity increase) and matched counties (those without a tax rate discontinuity change) exhibit similar pre-discontinuity-increase trends in capital gains realization. During the year of the increase, the coefficient is negative and significant (-0.038, $t$ = -2.59). In the next three years after the discontinuity increase, the coefficients are all negative and are significant for two years (-0.027, $t$ = -1.59 for year 1; -0.041, $t$ = -1.94 for year 2; -0.072, $t$ = -2.54 for year 3). Therefore, a reduction in capital gains realization due to a capital gains tax rate discontinuity increase appears to be persistent (Figure 3.A). Overall, we have evidence that when discontinuity increases, capital gains realization decreases.

For discontinuity decreases, all year and treatment interactions are insignificant (Table 5), except for $Treat \bullet D_{-2}$, which is negative and significant (-0.019, $t$ = -2.14). Therefore, this represents a small disruption to the parallel pre-trend, while there are no post-reduction differences during the event year and the three years after the event. Figure 3.B gives a visual of a dynamic effect and it appears largely

flat. Overall, the message carried by Table 5 is similar to that by Table 4. We thus reaffirm the pattern that taxpayer reaction to capital gains tax rate discontinuity changes is asymmetric – while they reduce capital gains realization in response to an increase in discontinuity, they do not react to a decrease in discontinuity.

### *4.4. Effect of discontinuity on capital gains realization across income and age groups*

#### *4.4.1. Income groups*

High-income or wealthy taxpayers are more likely to participate in securities investments or own properties (Campbell, 2006; Van Rooij, Lusardi and Alessie, 2012; Jacob, 2018), they are thus more likely to encounter tax issues associated with the timing of capital gains realization. We expect high-AGI taxpayers to be more sensitive to the effect of tax rate discontinuity on capital gains realization. To gauge the differential effect of the tax rate discontinuity on capital gains realization across individuals with different levels of income, we utilize adjusted gross income (AGI) data provided by the IRS and estimate our regression Equation (2) separately for AGI groups. We use four income levels, AGI ≤ USD10,000, USD10,000 < AGI ≤ USD50,000, USD50,000 < AGI ≤ USD100,000, and AGI > USD100,000.

Panel A, Table 6 (Figure 4.A) presents the results. The coefficients on Discontinuity are all negative and significant and their magnitude increases monotonically in AGI (-0.003, t = -4.83 for AGI ⩽ USD10,000; -0.010, t = -2.89 for USD10,000 < AGI ⩽ USD50,000; -0.027, t = -3.17 for USD50,000 < AGI ⩽ USD100,000; and -0.090, t = -2.51 for AGI > USD100,000). It appears that the sensitivity of capital gains realization to discontinuity predictably increases monotonically in taxpayers' level of income. In fact, these coefficients represent an average or a fixed effect of the association between discontinuity and capital gains realization within each AGI category. Further, they suggest that high income taxpayers are more sensitive to the effect of tax rate discontinuity on capital gains realization, validating our intuition that high income taxpayers are more likely to invest in securities and own properties.

#### 4.4.2. *Age groups*

The U.S. tax law forgives capital gains upon the death of taxpayers. Based on Dammon, Spatt and Zhang (2001), older taxpayers have an added reason to avoid short-term gains as this will maximize the value of their bequest in the presence of discontinuity. We divide our sample into four county-leverage average taxpayer age groups and estimate regression Equation (2) separately in these four subsamples.

Panel B, Table 6 (Figure 4.B) presents the results. The coefficients on *Discontinuity* are all negative and are significant in age groups 3 and 4, with their magnitude in ascending order (-0.001, $t$ = -0.06 for age group 1; -0.010, $t$ = -0.90 for age group 2; -0.015, $t$ = -3.49 for age group 3; and -0.047, $t$ = -2.40 for age group 4). These results suggest that age increases taxpayers' sensitivity to short-term gains the avoidance of which increases the value of their bequest as they approach death under the tax law.

### *4.5. Robustness*

#### *4.5.1. Alternative measures for capital gains realization*

We utilize two alternative measures of capital gains realization: 1) county net capital gains realization scaled by county GDP; 2) county net capital gains realization scaled by county labor force; and 3) county net capital gains realization scaled by county number of tax returns. Panel A.1, Table 7 presents the estimation results of Equation (2) using the measure scaled by GDP. The coefficients on *Discontinuity* are both negative and significant (-0.110, $t$ = -3.31 without controls; -0.100, $t$ = -3.74 with controls), the coefficients on *Short* are both negative and significant (-0.108, $t$ = -3.10 without controls; -0.099, $t$ = -3.51 with controls), and the coefficients on *Long* are both positive and significant (0.112, $t$ = 3.30 without controls; 0.102, $t$ = 3.71 with controls). Panels A.2 and A.3 use the measured scaled by labor force or the number of tax returns and we find the same pattern. Overall, the general conclusion of our analysis is unchanged when we use alternative measures of capital gains realization.

#### *4.5.2. Adjacent state difference-in-differences for discontinuity*

We restrict our analysis to bordering states that are likely similar in social and economic conditions. Panel B, Table 7 presents the result of a difference-in-differences analysis of the effect of tax rate discontinuity on capital gains realization using Equation (3). For discontinuity increases, the coefficient on *Treat•Post* is negative and significant (-0.027, $t$ = -1.99) and for discontinuity decreases, the coefficient on *Treat•Post* is insignificant, similar to what we find earlier. Again, we find causality going from tax rate discontinuity to capital gains realization.

### *4.6. Extensive margin analysis*

So far, we have focused on how rate discontinuity affects the intensity of capital gains realization – an intensive margin analysis. Here, we conduct an extensive margin analysis by examining how rate discontinuity affects the number of tax returns with capital gains realization filed with the IRS. Such a test would give us an idea how the overall incentive to realize capital gains is affected by the capital gains tax design.

We replace *Realization* in Equation (2) with *Number of Tax Returns with Capital Gains Realization*, which is the number of tax returns with net capital gains filed with the IRS for a county-year. Results are reported in Table 8. The effect of *Discontinuity* on tax returns with capital gains is negative and significant (-49.981, $t$ = -2.57), suggesting that when discontinuity increases, the number of returns with capital gains goes down. The coefficient on *Short* is negative and significant (-48.986, $t$ = -2.40) and the coefficient on *Long* is positive and significant (51.374, $t$ = 2.53), consistent with earlier intensive margin results.

As an individual or a household needs to file a return whether or not it has capital gains realization, the decision to file should be orthogonal to capital gains taxation. Thus, the total number of returns needs not be associated with discontinuity, providing us with the opportunity of a falsification test. When we replace *Realization* with *Number of Tax Returns*, which is total number of returns filed with the IRS for a county-year irrespective of whether there is a capital gains component, the coefficients on *Discontinuity*, *Short* and *Long* are all insignificant, suggesting that overall filing decisions are not related to capital gains taxation.

To sum, when discontinuity or the short-term rate is high, taxpayers are less likely to file a return with capital gains, meaning that they are less likely to realize gains with high discontinuity or a high short-term rate. On the other hand, taxpayers are more likely to realize capital gains when the long-term rate is high.

## 5. Cross-sectional Variation

### *5.1. Taxpayer sophistication and the capital gains tax rate discontinuity effect*

#### *5.1.1. Attention paid to capital gains tax*

From an individual investor's perspective, people tend to respond primarily to salient tax changes (Chetty, Loony and Kroft, 2009). When taxpayers pay attention to a specific issue, they are likely aware of its consequences and implications. In our context, if taxpayers are aware of the timing implications of tax rate discontinuity, they are more likely to avoid short-term gains realization, contributing to a negative association between discontinuity and capital gains realization.

To capture individuals' attention paid to capital gains tax related issues, we use Google search volume intensity across states as a proxy. This measure of attention is simple and intuitive and has been used in prior studies under various contexts, such as awareness of ozone pollution (Chow, Fan, Huang, Li and Li, 2023) and climate changes (Choi, Gao and Jiang, 2020). We use a generic search term "capital gains tax". A search term involving "capital gains tax rate intertemporal discontinuity" would perhaps be too academic for regular Internet users. A high level of search intensity for "capital gains tax" indicates greater awareness of potential tax implications related to capital gains realization,

including tax rate discontinuity, enabling taxpayers to adjust their investments and trading behaviors accordingly. We estimate Equation (2) separately for counties with high and low levels of Google search volume intensity for "capital gains tax". The results in Panel A, Table 9 show that the coefficient on the state tax rate discontinuity is negative and significant (-0.032, $t$ = -3.08) in counties with high Google search intensity but is insignificant (-0.019, $t$ = -1.93) in counties with low Google search intensity, though the difference between these two coefficients is not statistically significant ($p$ = 0.14). This suggests that individuals are more likely to consider the timing of their capital gains realization and adjust their trading activities in regions where there is greater attention paid to capital gains tax issues. As paying attention can indicate investor sophistication, this pattern shows that delaying short-term gains when the short-term rate is higher than the long-term rate is a matter of investor sophistication.

*5.1.2. Financial literacy*

Successful participation in the capital markets requires a certain level of financial literacy (Lusardi and Mitchell, 2014) and the timing of capital gains realization between short- and long-term investments particularly demands a high level of financial sophistication (Graham, Hanlon, Shevlin and Shroff, 2017). Previous studies typically distinguish between sophisticated and unsophisticated investors by comparing institutional to non-institutional investors of firms (Bartov, Radhakrishnan and Kirinski, 2000; Ayers, Li and Yeung, 2011). In our research, we explore how aggregate county-level taxpayer financial literacy influences the timing behavior of capital gains realization.

To proxy financial literacy, we use the number of tax professionals at the county level. In counties with a high number of tax professionals, we expect individuals to have greater access to tax knowledge and professional assistance, which would enable them to better time capital gains realization. Therefore, the sensitivity of capital gains realization to a discontinuity increase should be more pronounced when there are more tax professionals locally. We conduct a subsample analysis by estimating Equation (2) separately for counties with high and low numbers of tax professionals. Panel B, Table 9 presents the results. The coefficient on *Discontinuity* is negative and significant (-0.034, $t$ = -2.20) and is of greater magnitude ($p$-value = 0.02) in the high tax professional subsample than that (-0.016, $t$ = -3.60) in the low tax professional subsample, supporting our prediction. Therefore, taxpayer financial sophistication matters in the effect of rate discontinuity on capital gains realization. This pattern can also be consistent with that related to the AGI analysis. High-income taxpayers, due to their higher likelihood of participating in the capital market (Campbell, 2006; Van Rooij, Lusardi and Alessie, 2012), tend to have a higher level of financial literacy or have better access to financial professionals, leading to a more pronounced association between discontinuity and capital gains realization.

*5.2. Risk-taking preference and the capital gains tax rate discontinuity effect*

The magnitude of the tax lock-in effect is not uniform across all taxpayers but is instead systematically moderated by their personal risk preference. The theoretical framework of Shackelford and Verrecchia (2002) centers on a fundamental trade-off: an investor holding an appreciated asset must choose between optimal tax planning and optimal portfolio management. Investors with a preference for risk-taking are more likely to ignore the timing benefit of capital gains realization as they tend to trade more frequently and impulsively (Barber and Odean, 2000), reducing the tax timing sensitivity of capital gains realization.

To proxy for risk-taking preference, we use the proportion of respondents who claim that they have very high willingness to take risks in terms of financial investments (10 on a scale of 1 to 10) in a state, based on the National Financial Capability Study (NFCS). We divide our full sample into a high risk-taking subsample and a low risk-taking subsample and estimate Equation (2) in each subsample. Panel A, Table 10 shows that, in the high risk-taking subsample, the coefficient on *Discontinuity* is significantly positive (0.139, $t = 2.17$), indicating that high risk-taking individuals exhibit increased trading frequency despite the higher tax costs associated with frequent trading. In the low risk-taking subsample, the coefficient on *Discontinuity* is negative and significant (-0.038, $t = -3.97$). The difference between these two coefficients is statistically significant ($p = 0.00$). Therefore, the negative association between tax rate discontinuity and capital gains realization is driven by low risk-taking individuals who are impulsive in immediate trading. In fact, ignoring tax-timing issues can be a further reason why retail investors lose by frequent trading (Barber and Odean, 2000; Barber, Lee, Liu and Odean, 2009).

Our second proxy for risk-taking preference is frontier individualism. The historical westward expansion in the earlier history of the United States cultivated individualism in regions with longer frontier experience (Bazzi, Fiszbein and Gebresilasse, 2020; 2022). Land abundance in the west created expectations of upward mobility through self-reliant effort and self-will, cultivating individualism and a risk-taking preference. We use a county's total frontier experience (Bazzi, Fiszbein and Gebresilasse, 2020) which is the amount of time, scaled in decades, that a given county remained on the U.S. frontier. We estimate Equation (2) separately in high-individualism and low-individualism subsamples. Panel B, Table 10 shows that while the coefficients on *Discontinuity* are negative and significant for both subsamples, it is significantly greater in magnitude ($p = 0.00$) for the low individualism subsample (-0.063, $t = -2.55$) than that for the high individualism subsample (-0.017, $t = -2.59$). Therefore, individualism attenuates the association between discontinuity and capital gains realization.

## 6. Summary and Conclusion

We examine how capital gains tax rate intertemporal discontinuity, the difference between short-term and long-term capital gains tax rates, affects capital gains realization. Prior studies have largely relied on price pressure, stock trading patterns, and have used federal tax regime changes that largely applies to most taxpayers. We utilize county-level data on capital gains realization and take advantage of state-level capital gains tax rates that can potentially enable us to sharpen identification of a causal effect between the two. We show that the suppression of capital gains realization is due to taxpayers timing their activities to avoid short-term gains realization when the short-term rate is higher than the long-term rate.

We further demonstrate how taxpayers realize capital gains in response to tax rate discontinuity. The negative effect of tax rate discontinuity on capital gains realization increases in adjusted gross income as high-income taxpayers are more likely to have securities investments or own properties and thus are more sensitive to capital gains tax-related issues. This negative effect also increases in taxpayers age as the avoidance of short-term realization increases the value of bequest under the tax law when they approach death. Finally, this negative association enhances in local financial literacy and Google-based attention for capital gains tax and attenuates in local risk-taking preference and individualism.

Overall, we offer direct causal evidence that tax rate discontinuity suppresses capital gains realization. Adding further to the capital gains tax literature, our granular results provide insights into how taxpayers, depending on their characteristics and incentives, realize capital gains in response to tax rate intertemporal discontinuity in a varied fashion.

One limitation of our study is the nature of the available data. The county-level IRS statistics provide aggregate net capital gains realization, which does not permit direct decomposition into short-term and long-term components. Consequently, we cannot separately estimate the elasticity of short-term and long-term gains to the tax discontinuity. Nevertheless, our analysis provides the first direct evidence of the net equilibrium effect of this tax policy at a granular, sub-national level. Our findings represent a crucial first step in empirically validating this theory using observed realization data rather than relying on indirect inferences from price pressure or trading patterns. Future research using taxpayer-level microdata, should it become available, could build upon our findings by disentangling these components and providing a more granular understanding of the underlying taxpayer decisions.

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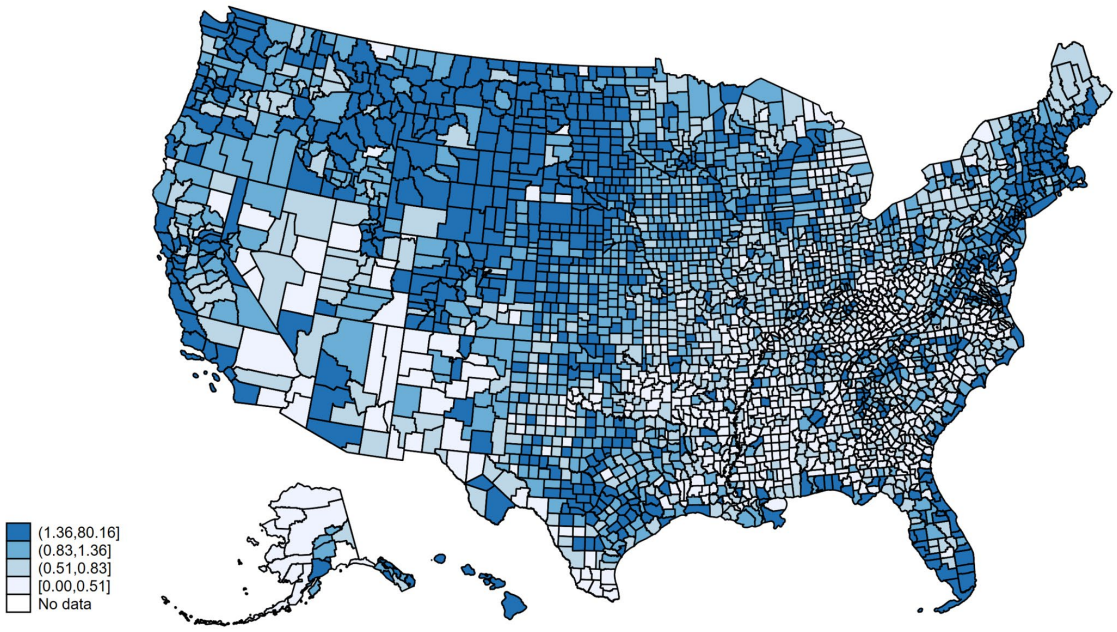
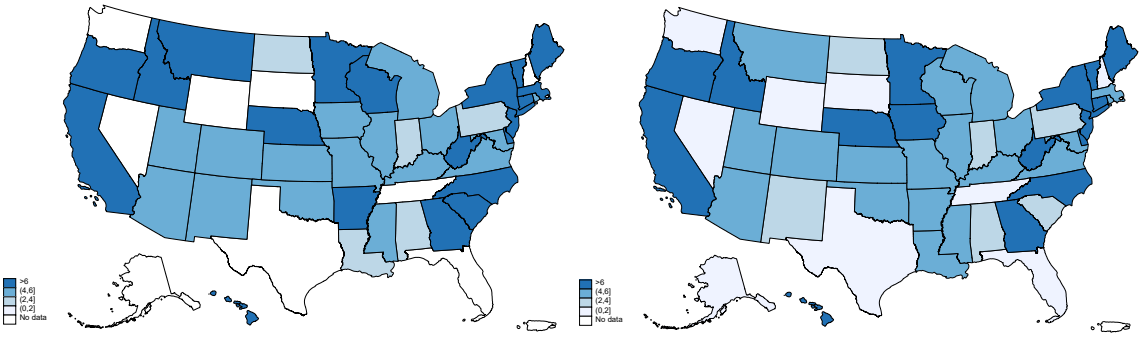
## Appendix A. Variable Definitions

| Variables | Definition | Sources |
|---|---|---|
| ***Dependent*** | | |
| *Net Capital Gain* | Net capital gain (less loss) amount (in thousands) scaled by the total population in county i in year t | IRS Tax file. [Net capital gain-A01000] U.S. Census Bureau, Population Division |
| *Net Capital Gain_Labor* | Net capital gain (less loss) amount (in thousands) scaled by the total number of labor force in county i in year t | |
| *Net Capital Gain_GDP* | Net capital gain (less loss) amount (in thousands) scaled by the total real GDP in chained (2012) dollars in county i in year t | |
| ***Independent*** | | |
| *Discontinuity* | State-level short-term capital gains tax rate minus state-level long-term capital gains tax rate | NBER https://www.nber.org/research/data/taxsim |
| *Treat* | Equals 1 for counties affected by a tax rate discontinuity increase and zero otherwise | NBER https://www.nber.org/research/data/taxsim |
| *Post* | Equals 1 for the year of tax rate discontinuity increase and years after, and zero otherwise. | |
| ***Financial literacy*** | | |
| *Tax pro* | Number of tax professionals at the county level | IRS website |
| ***Risk taking*** | | |
| *Frontier* | Total frontier experience (TFE), which is the amount of time, scaled in decades, that a given county remained on the frontier. | Bazzi et al. (2020) |
| *Risk* | Proportion of respondents who claim that say they have very high willingness to take risks in terms of financial investments (10 on a scale of 1 to 10) in a state. | National Financial Capability Study (NFCS) |
| ***Attention*** | | |
| *Cap_GSV* | Google search volume of "capital gains tax" at the state level from 2010 to 2021 | Google |
| ***Controls*** | | |
| *LnIncome* | Log of per capita personal income at the county level of year t. Per capita personal income is calculated by the personal income of a given area divided by the resident population of the area. The resident population is from Census Bureau midyear population estimates. | Bureau of Economic Analysis |
| *LnGDP* | Log of annual real GDP at the county level of year t. Real GDP by county and metropolitan area is an inflation-adjusted measure of each area's gross product that is based on national prices for the goods and services produced within the area. The real estimates of gross domestic product (GDP) by county and metropolitan area are measured in chained (2012) dollars. | Bureau of Economic Analysis |
| *LnAge* | Log of median age at the county level of year t. Median Age by county reports the median age of a population for a given county. | Census Bureau |
| *Unemp* | Unemployment rate (%) at the county level of year t | Bureau of Labor Statistics |
| *Gdpgrowth* | GDP growth rate (%) of year t | Bureau of Economic Analysis |



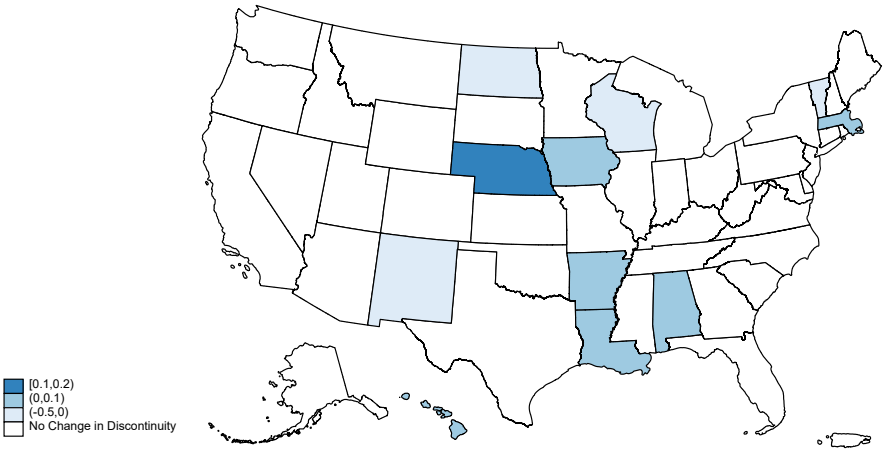

A. County Capital Gains Realization



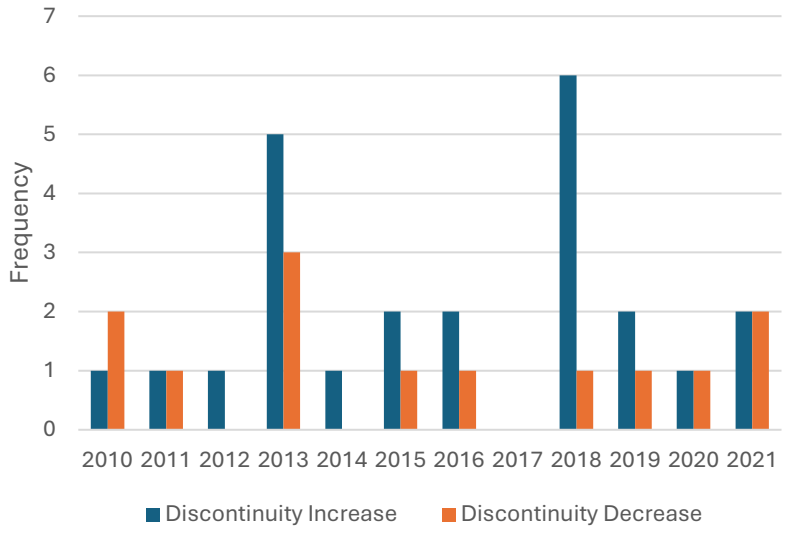

B. State short-term Rate

C. State long-term Rates

Figure 1. Time-series Averages of County-level Capital Gains Realization and State-Level Capital Gains Tax Rates

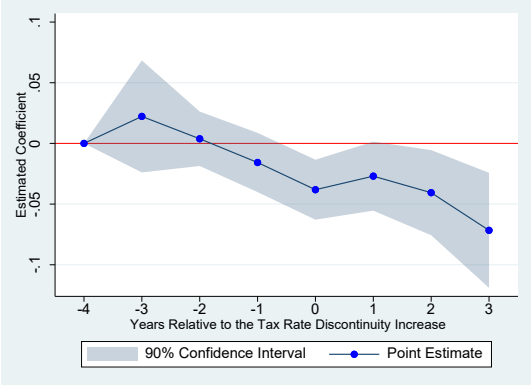



A. Spatial Change

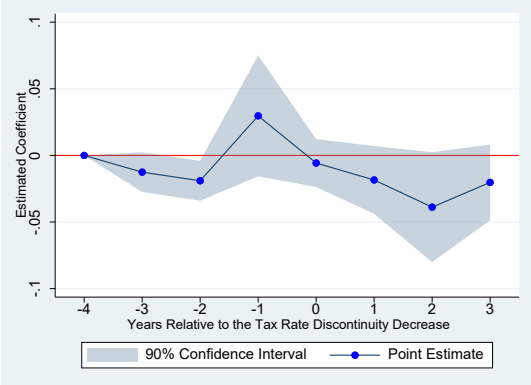



B. Time-series Change

**Figure 2. Changes in Capital Gains Tax Rate Intertemporal Discontinuity**

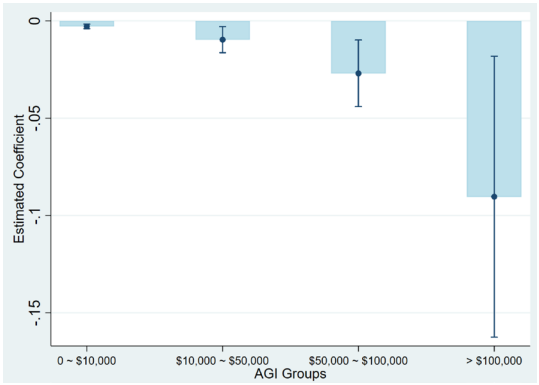



A. Discontinuity Increases

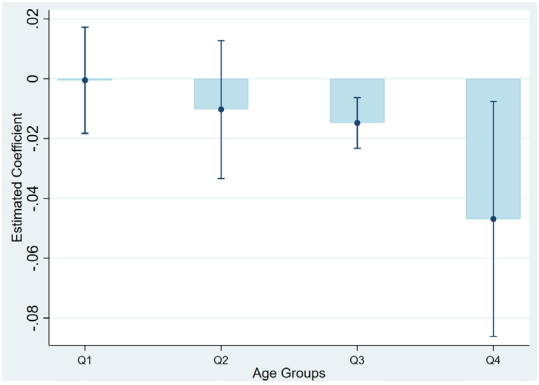



B. Discontinuity Decreases

**Figure 3. Dynamic Effect of State Tax Rate Discontinuity Changes on Capital Gains Realization**




A. AGI Quartiles




B. Age Quartiles

**Figure 4. Effects of State Tax Rate Discontinuity on Capital Gains Realization across AGI and Age Quartiles**

**Table 1**
**Potential Endogeneity in Capital Gains Taxation**

| VARIABLES | *Short* | *Long* | *Discontinuity* |
|---|---|---|---|
| *LnGDP* | -0.860 | -0.862 | 0.003 |
| | (-1.07) | (-1.25) | (0.00) |
| *Unemp* | 0.061 | 0.035 | 0.026 |
| | (1.44) | (0.89) | (1.09) |
| *GDPgrowth* | 0.032 | 0.142 | -0.110 |
| | (0.03) | (0.19) | (-0.18) |
| *LnAge* | 7.249* | 7.376* | -0.127 |
| | (1.78) | (1.91) | (-0.06) |
| *LnIncome* | 1.326 | 1.603 | -0.277 |
| | (1.17) | (1.61) | (-0.29) |
| State FE | YES | YES | YES |
| Year FE | YES | YES | YES |
| Observations | 611 | 611 | 611 |
| Adjusted R-squared | 0.981 | 0.981 | 0.969 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. *Short*, short-term capital gains tax rate at the state level; *Long,* long-term capital gains tax rate at the state level; *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state-year level. *LnGDP*, the logarithm of annual real GDP at state-year level. *Unemp*, the unemployment rate (%) at the state-year level. *GDPgrowth*, GDP growth rate at state-year level. *LnAge,* the logarithm of median age at the state-year level. *LnIncome,* the logarithm of per capita personal income at state-year level. The sample is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 2**
**Summary Statistics**

| | Count | Mean | p25 | p50 | p75 | Std |
|---|---|---|---|---|---|---|
| *Capital Gains Realization (in thousands)/Population* | 287535 | 0.16 | 0.01 | 0.03 | 0.10 | 1.01 |
| *Short* | 287535 | 4.82 | 3.23 | 5.20 | 6.47 | 3.01 |
| *Long* | 287535 | 4.63 | 3.23 | 5.00 | 6.18 | 2.93 |
| *Discontinuity* | 287535 | 0.19 | 0 | 0 | 0 | 0.97 |
| *GDP (in thousands)* | 287535 | 5610.52 | 363.06 | 934.76 | 2697.32 | 24100.00 |
| *LnGDP* | 287535 | 13.92 | 12.80 | 13.75 | 14.81 | 1.58 |
| *GDPgrowth* | 287535 | 0.02 | -0.02 | 0.01 | 0.05 | 0.09 |
| *Pop* | 287535 | 103720 | 11112 | 26107 | 68604 | 330225.30 |
| *lnPop* | 287535 | 10.29 | 9.32 | 10.17 | 11.14 | 1.48 |
| *Unemp* | 287535 | 6.10 | 4.00 | 5.50 | 7.70 | 2.80 |
| *Income (in thousands)* | 287535 | 42.35 | 34.18 | 39.96 | 47.47 | 12.93 |
| *lnIncome* | 287535 | 10.62 | 10.44 | 10.60 | 10.77 | 0.26 |
| *Age* | 287535 | 41.23 | 38.10 | 41.20 | 44.20 | 5.28 |
| *LnAge* | 287535 | 3.71 | 3.64 | 3.72 | 3.79 | 0.13 |

*Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level; *Short*, short-term capital gains tax rate at the state level; *Long,* long-term capital gains tax rate at the state level. *LnGDP*, the logarithm of annual real GDP at county-year level. *Unemp*, the unemployment rate (%) at the county-year level. *GDPgrowth*, GDP growth rate at county-year level. *LnAge,* the logarithm of median age at the county-year level. *LnIncome,* the logarithm of per capita personal income at county-year level.

**Table 3**
**Effect of State-level Capital Gains Taxation on Capital Gains Realization**

| VARIABLES | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| *Discontinuity* | -0.034*** | -0.035*** | | |
| | (-3.23) | (-2.77) | | |
| *Short* | | | -0.031** | -0.032** |
| | | | (-2.48) | (-2.31) |
| *Long* | | | 0.039*** | 0.038*** |
| | | | (3.29) | (2.85) |
| *LnGDP* | | 0.060* | | 0.060* |
| | | (1.71) | | (1.71) |
| *Unemp* | | 0.011** | | 0.011** |
| | | (2.38) | | (2.33) |
| *Gdpgrowth* | | 0.053** | | 0.053** |
| | | (2.12) | | (2.15) |
| *LnAge* | | 1.084*** | | 1.083*** |
| | | (4.30) | | (4.33) |
| *LnIncome* | | 0.313*** | | 0.311*** |
| | | (2.74) | | (2.73) |
| Controls | NO | YES | NO | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 292,509 | 287,535 | 292,509 | 287,535 |
| Adjusted R-squared | 0.148 | 0.148 | 0.148 | 0.148 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. All regressions are based on a generalized DiD estimation. *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level; *Short*, short-term capital gains tax rate at the state level; *Long,* long-term capital gains tax rate at the state level. *LnGDP*, the logarithm of annual real GDP at county-year level. *Unemp*, the unemployment rate (%) at the county-year level. *GDPgrowth*, GDP growth rate at county-year level. *LnAge,* the logarithm of median age at the county-year level. *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 4**
**Effect of Capital Gains Tax Rate Discontinuity on Capital Gains Realization**

| | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| VARIABLES | Discontinuity Increases | | Discontinuity Decreases | |
| *Treat•Post* | -0.046** | -0.047** | -0.023 | -0.024 |
| | (-2.32) | (-2.45) | (-1.04) | (-1.11) |
| *LnGDP* | | 0.045 | | 0.013 |
| | | (1.39) | | (0.52) |
| *Unemp* | | 0.008* | | 0.002 |
| | | (1.95) | | (0.88) |
| *GDPgrowth* | | 0.033 | | 0.031 |
| | | (1.47) | | (1.63) |
| *LnAge* | | 0.887*** | | 0.612*** |
| | | (3.76) | | (3.98) |
| *LnIncome* | | 0.178*** | | 0.112** |
| | | (2.83) | | (2.47) |
| Controls | NO | YES | NO | YES |
| County-Cohort FE | YES | YES | YES | YES |
| AGI-Cohort FE | YES | YES | YES | YES |
| Year-Cohort FE | YES | YES | YES | YES |
| Observations | 1,221,934 | 1,197,083 | 808,917 | 792,533 |
| Adjusted R-squared | 0.161 | 0.160 | 0.170 | 0.169 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. The regression is based on a stacked DiD estimation. *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Treat* equals 1 for counties experiencing an increase (decrease) in tax rate discontinuity and 0 for counties without any changes in tax rate discontinuity across the sample period. *Post* equals 1 for years of and after the increase (decrease) in tax rate discontinuity. *LnGDP*, the logarithm of annual real GDP at county-year level. *Unemp*, the unemployment rate (%) at the county-year level. *GDPgrowth*, GDP growth rate at county-year level. *LnAge,* the logarithm of median age at the county-year level. *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 5**
**Dynamic Effect of Changes in State Tax Rate Discontinuity on Capital Gains Realization**

| | Net Capital Gains Realization | |
|---|---|---|
| VARIABLES | Discontinuity Increases | Discontinuity Decreases |
| $Treat \bullet D_{-3}$ | 0.022 | -0.013 |
| | (0.81) | (-1.42) |
| $Treat \bullet D_{-2}$ | 0.004 | -0.019** |
| | (0.29) | (-2.14) |
| $Treat \bullet D_{-1}$ | -0.016 | 0.030 |
| | (-1.08) | (1.10) |
| $Treat \bullet D_{0}$ | -0.038** | -0.006 |
| | (-2.59) | (-0.54) |
| $Treat \bullet D_{+1}$ | -0.027 | -0.018 |
| | (-1.59) | (-1.22) |
| $Treat \bullet D_{+2}$ | -0.041* | -0.039 |
| | (-1.94) | (-1.58) |
| $Treat \bullet D_{+3}$ | -0.072** | -0.020 |
| | (-2.54) | (-1.20) |
| Controls | YES | YES |
| County-cohort FE | YES | YES |
| AGI-cohort FE | YES | YES |
| Year-cohort FE | YES | YES |
| Observations | 1,197,083 | 792,533 |
| Adjusted R-squared | 0.160 | 0.169 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. The regression is based on a stacked DiD estimation. *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. $Treat \bullet D_{-3}$, $Treat \bullet D_{-2}$, $Treat \bullet D_{-1}$, $Treat \bullet D_{0}$, $Treat \bullet D_{+1}$, $Treat \bullet D_{+2}$, $Treat \bullet D_{+3}$ equal 1 for 3 years, 2 years and 1 year before changes in tax rate discontinuity, and equals 1 for the year of, 1 year, 2 years and 3 years after changes in tax rate discontinuity for counties experiencing the change of tax rate discontinuity, respectively, and equals 0 otherwise. Controls include *LnGDP*, the logarithm of annual real GDP at county-year level; *Unemp*, the unemployment rate (%) at the county-year level; *GDPgrowth*, GDP growth rate at county-year level; *LnAge*, the logarithm of median age at the county-year level; *LnIncome*, the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 6**
**Effect of State Tax Rate Discontinuity on Capital Gains Realization in AGI and Age Subsamples**

Panel A: AGI Subsamples

| | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| VARIABLES | <$10,000 | $10,000~$50,000 | $50,000~$100,000 | >$100,000 |
| *Discontinuity* | -0.003*** | -0.010*** | -0.027*** | -0.090** |
| | (-4.83) | (-2.89) | (-3.17) | (-2.51) |
| Controls | YES | YES | YES | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 73,076 | 67,810 | 73,766 | 72,883 |
| Adjusted R-squared | 0.349 | 0.499 | 0.496 | 0.329 |

Panel B: Age Subsamples

| | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| VARIABLES | AgeQ1 | AgeQ2 | AgeQ3 | AgeQ4 |
| *Discontinuity* | -0.001 | -0.010 | -0.015*** | -0.047** |
| | (-0.06) | (-0.90) | (-3.49) | (-2.40) |
| Controls | YES | YES | YES | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 73,219 | 72,802 | 70,008 | 71,506 |
| Adjusted R-squared | 0.231 | 0.124 | 0.225 | 0.131 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. The regression is based on a generalized DiD estimation. Panel A presents the differential effect of tax rate discontinuity across AGI groups, while Panel B reports the differential effect of short-term and long-term capital gains tax rates across age groups. The sample in Panel A is divided into four groups based on the taxpayers' adjusted gross income (AGI): <$10,000; $10,000 to under $50,000; $50,000 to $100,000; $100,000 or more. The sample in Panel B is divided into four groups based on the median age of the total population at the county level. *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level. *LnGDP*, the logarithm of annual real GDP at county-year level. Controls include *LnGDP*, the logarithm of annual real GDP at county-year level; *Unemp*, the unemployment rate (%) at the county-year level; *GDPgrowth*, GDP growth rate at county-year level; *LnAge,* the logarithm of median age at the county-year level; *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 7**
**Robustness of the Association between Tax Rate Discontinuity and Capital Gains Realization**

Panel A: Alternative Measures of Capital Gains Realization

*A.1. Net Capital Gains Realization Scaled by GDP*

| VARIABLES | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| *Discontinuity* | -0.110*** | -0.100*** | | |
| | (-3.31) | (-3.74) | | |
| *Short* | | | -0.108*** | -0.099*** |
| | | | (-3.10) | (-3.51) |
| *Long* | | | 0.112*** | 0.102*** |
| | | | (3.30) | (3.71) |
| Controls | NO | YES | NO | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 287,605 | 287,535 | 287,605 | 287,535 |
| Adjusted R-squared | 0.240 | 0.241 | 0.240 | 0.241 |

*A.2. Net Capital Gains Realization Scaled by Labor Force*

| VARIABLES | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| *Discontinuity* | -0.069*** | -0.068*** | | |
| | (-3.41) | (-3.02) | | |
| *Short* | | | -0.063** | -0.063** |
| | | | (-2.67) | (-2.54) |
| *Long* | | | 0.077*** | 0.074*** |
| | | | (3.29) | (2.95) |
| Controls | NO | YES | NO | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 292,491 | 287,535 | 292,491 | 287,535 |
| Adjusted R-squared | 0.172 | 0.171 | 0.172 | 0.171 |

*A.3. Net Capital Gains Realization Scaled by Number of Tax Returns*

| VARIABLES | Net Capital Gains Realization | | | |
|---|---|---|---|---|
| *Discontinuity* | -1.600*** | -1.351*** | | |
| | (-3.24) | (-3.36) | | |
| *Short* | | | -1.647*** | -1.390*** |
| | | | (-3.18) | (-3.18) |
| *Long* | | | 1.531*** | 1.296*** |
| | | | (3.13) | (3.36) |
| Controls | NO | YES | NO | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 278,487 | 273,694 | 278,487 | 273,694 |
| Adjusted R-squared | 0.511 | 0.511 | 0.511 | 0.511 |

Panel B. Adjacent States Difference-in-differences

| | Net Capital Gains Realization | |
|---|---|---|
| VARIABLES | Discontinuity Increases | Discontinuity Decreases |
| *Treat•Post* | -0.027* | -0.024 |
| | (-1.99) | (-1.16) |
| Controls | YES | YES |
| County-Cohort FE | YES | YES |
| AGI-Cohort FE | YES | YES |
| Year-Cohort FE | YES | YES |
| Observations | 115,689 | 45,897 |
| Adjusted R-squared | 0.209 | 0.203 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. Panel A presents the effect of tax rate discontinuity on

alternative measures of net capital gains realization based on a generalized DiD estimation and Panel B presents the effect of changes in tax rate discontinuity on net capital gains based on a stacked DiD estimation. In Panel A.1, *Net Capital Gains Realization* is the amount of net capital gains (less loss) scaled by the county-level total GDP for the respective year. In Panel A.2, *Net Capital Gains Realization* is the amount of net capital gains (less loss) scaled by the county-level total labor force for the respective year. In Panel A.3, *Net Capital Gains Realization* is the amount of net capital gains (less loss) scaled by the number of tax returns for the respective year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level; *Short*, short-term capital gains tax rate at the state level; *Long,* long-term capital gains tax rate at the state level. In Panel B, *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Treat* equals 1 for counties experiencing an increase (decrease) in tax rate discontinuity and 0 for counties located in adjacent states without any changes in tax rate discontinuity across the sample period. *Post* equals 1 for years of and after the increase (decrease) in tax rate discontinuity. Controls include *LnGDP*, the logarithm of annual real GDP at county-year level; *Unemp*, the unemployment rate (%) at the county-year level; *GDPgrowth*, GDP growth rate at county-year level; *LnAge,* the logarithm of median age at the county-year level; *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 8**
**Effect of Capital Gains Tax Rate Discontinuity on the Number of Tax Returns with Capital Gains Realization**

| VARIABLES | Number of Tax Returns with Capital Gains Realization | | Number of Tax Returns | |
|---|---|---|---|---|
| *Discontinuity* | -49.981** | | 0.817 | |
| | (-2.57) | | (0.02) | |
| *Short* | | -48.986** | | -30.448 |
| | | (-2.40) | | (-0.42) |
| *Long* | | 51.374** | | -45.143 |
| | | (2.53) | | (-0.56) |
| Controls | YES | YES | YES | YES |
| County FE | YES | YES | YES | YES |
| AGI FE | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES |
| Observations | 287,535 | 287,535 | 289,358 | 289,358 |
| Adjusted R-squared | 0.681 | 0.681 | 0.697 | 0.697 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. All regressions are based on a generalized DiD estimation. The dependent variable in Columns (1) and (2) is *Number of Tax Returns with Capital Gains Realization,* the number of tax returns with net capital gains filed with the IRS for a county-year, and the dependent variable in Columns (3) and (4) is *Number of Tax Returns*, the number of tax returns filed with the IRS for a county-year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level. *Short*, short-term capital gains tax rate at the state level. *Long,* long-term capital gains tax rate at the state level. *LnGDP*, the logarithm of annual real GDP at county-year level. *Unemp*, the unemployment rate (%) at the county-year level. *GDPgrowth*, GDP growth rate at county-year level. *LnAge,* the logarithm of median age at the county-year level. *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 9**
**Taxpayer Sophistication and the Effect of Tax Rate Discontinuity on Capital Gains Realization**

Panel A: Attention Paid to Capital Gains Tax

| | Net Capital Gains Realization | |
|---|---|---|
| VARIABLES | High attention | Low attention |
| *Discontinuity* | -0.032*** | -0.019* |
| | (-3.08) | (-1.93) |
| | *p-value* = 0.14 | |
| Controls | YES | YES |
| County FE | YES | YES |
| AGI FE | YES | YES |
| Year FE | YES | YES |
| Observations | 148,607 | 138,928 |
| Adjusted R-squared | 0.135 | 0.166 |

Panel B: Financial Literacy

| | Net Capital Gains Realization | |
|---|---|---|
| VARIABLES | High Tax Professionals | Low Tax Professional |
| *Discontinuity* | -0.034** | -0.016*** |
| | (-2.20) | (-3.60) |
| | *p-value* = 0.02 | |
| Controls | YES | YES |
| County FE | YES | YES |
| AGI FE | YES | YES |
| Year FE | YES | YES |
| Observations | 133,177 | 133,326 |
| Adj. R-squared | 0.148 | 0.285 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. The regression is based on a generalized DiD estimation. In Panel A, the sample is divided into two groups in Columns (1) and (2) based on the Google search intensity of the keyword "capital gains tax" at the state level from 2010 to 2021. Counties in states with search intensity above the sample median are categorized as the high group, while those with search intensity below the median are categorized as the low group. In Panel B, the sample is divided into two groups in Columns (1) and (2) based on the number of enrolled tax professionals at the county level. Counties with a value higher than the sample median are categorized as the high group, while those with a value below the median are categorized as the low group. *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level. Controls include *LnGDP*, the logarithm of annual real GDP at county-year level; *Unemp*, the unemployment rate (%) at the county-year level; *GDPgrowth*, GDP growth rate at county-year level; *LnAge,* the logarithm of median age at the county-year level; *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.

**Table 10**
**Taxpayer Risk-taking Preference and the Effect of Tax Rate Discontinuity on Capital Gains Realization**

Panel A: Based on the National Financial Capability Study (NFCS)

| | Net Capital Gains Realization | |
|---|---|---|
| VARIABLES | High Risk-taking | Low Risk-taking |
| *Discontinuity* | 0.139** | -0.038*** |
| | (2.17) | (-3.97) |
| | *p-value* = 0.00 | |
| Controls | YES | YES |
| County FE | YES | YES |
| AGI FE | YES | YES |
| Year FE | YES | YES |
| Observations | 146,639 | 140,896 |
| Adjusted R-squared | 0.169 | 0.125 |

Panel B: Based on Frontier Individualism

| | Net Capital Gains Realization | |
|---|---|---|
| VARIABLES | High Individualism | Low Individualism |
| *Discontinuity* | -0.017** | -0.063** |
| | (-2.59) | (-2.55) |
| | *p-value* = 0.00 | |
| Controls | YES | YES |
| County FE | YES | YES |
| AGI FE | YES | YES |
| Year FE | YES | YES |
| Observations | 144,772 | 139,938 |
| Adj. R-squared | 0.124 | 0.165 |

This table reports OLS coefficient estimates, and, in parentheses, robust t-statistics clustered at the state level. The regression is based on a generalized DiD estimation. In Panel A, the sample is divided into two groups in Columns (1) and (2) based on the proportion of respondents who claim that say they have very high willingness to take risks in terms of financial investments (10 on a scale of 1 to 10) in a state every three years from 2009 to 2021. Counties in states with the proportion above the sample median are categorized as the high group, while those with the proportion below the median are categorized as the low group. In Panel B, the sample is divided into two groups in Columns (1) and (2) based on the level of individualism, which is measured by the amount of time scaled in decades that a county remained on the frontier of the United States. Counties with a value higher than the sample median are categorized as the high group, while those with a value below the median are categorized as the low group. *Net Capital Gains Realization*, the amount of net capital gains (less loss) scaled by the county-level total population for the respective year. *Discontinuity,* differences between short-term capital gains tax rate and long-term capital gains tax rate (*Short-Long*) at the state level. Controls include *LnGDP*, the logarithm of annual real GDP at county-year level; *Unemp*, the unemployment rate (%) at the county-year level; *GDPgrowth*, GDP growth rate at county-year level; *LnAge,* the logarithm of median age at the county-year level; *LnIncome,* the logarithm of per capita personal income at county-year level. The sample period is from 2010 to 2021. *, **, and *** indicate significance levels at 0.10, 0.05 and 0.01, respectively.