

Tax Regimes and Capital Gains Realizations*

Martin Jacob[†]

WHU – Otto Beisheim School of Management

Forthcoming in European Accounting Review

June 15, 2016

Abstract

This paper contrasts the individual capital gains realization behavior between progressive and proportional tax regimes. Using a longitudinal panel of over 288,000 individuals in Sweden, I exploit the 1991 tax reform in Sweden that changed progressive capital gains tax rates ranging from 12% to 80% to a proportional tax rate of 30%. Using the proportional tax system to control for non-tax reasons to realize capital gains, I show that individuals are highly responsive to capital gains tax incentives created by temporary income changes under a progressive capital gains tax. More specifically, I find that individuals with temporary negative (positive) income changes sell (hold) shares that they would hold (sell) in the absence of temporary tax incentives. Further, I show that high-income individuals are more tax sensitive than low-income individuals. This result indicates that low-income individuals facing temporary negative income changes could trade predominantly for non-tax reasons.

Keywords: Capital Gains Realizations, Proportional Tax, Progressive Tax, Top Incomes

JEL Classification: H20, H24, D14, D31

* I am grateful to an anonymous referee, Annette Alstadsæter, Alan Auerbach, Sören Blomquist, Sebastian Eichfelder, Oguzhan Karakas, Wojciech Kopczuk, Laurence van Lent (the editor), Garen Markarian, Ed Maydew, Maximilian Müller, Dmitriy Muravyev, Jim Poterba, Kai Sandner, Håkan Selin, Douglas Shackelford, Jerome Taillard, Daniel Waldenström, and seminar participants at Boston College, the University of North Carolina, ZEW in Mannheim, the University of Passau, WHU – Otto Beisheim School of Management, the Uppsala Center for Fiscal Studies, the Swedish Ministry of Finance, the 26th Congress of the European Economic Association in Oslo, the 2012 American Accounting Association Annual Meeting in Washington, DC, and the 34th European Accounting Association Annual Congress in Rome for their helpful comments and recommendations on earlier versions of the paper. I thank Tobias Lindhe for providing data on marginal income tax rates. Special thanks go to Jan Södersten for his valuable support and comments at all stages of this project. Major parts of this research were carried out while I was visiting the Uppsala Center for Fiscal Studies.

[†] Corresponding author: WHU – Otto Beisheim School of Management, Burgplatz 2, 56179 Vallendar, Germany. Tel. +49 261 6509 350; fax +49 261 6509 359; e-mail martin.jacob@whu.edu.

1 Introduction

This paper examines the effect of capital gains taxation under progressive versus proportional tax regimes on individual capital gains realization behavior. These two regimes are widely used around the world and tax authorities tax capital gains either at the progressive marginal income tax rate (e.g., Canada, Australia, and the United States) or at a fixed proportional tax rate (e.g., Finland, Japan, and Sweden). However, despite extensive research on capital gains taxation and trading activity (e.g., Hanlon and Heitzman, 2010), very little is known about the effect of progressive versus proportional taxation on individuals' capital gains realizations. Prior literature is often based on firm-level data without information on which individuals actually change trading behavior in response to a tax reform (e.g., Seida and Wempe, 2000; Blouin, Ready, and Shackelford, 2003; Dai, Maydew, Shackelford, and Zhang, 2008).¹

This paper overcomes this data limitation and uses comprehensive administrative panel data from personal income tax returns to examine capital gains taxation effects. The novel aspect of the paper is that it is able to examine how the tax responsiveness of individuals' capital gains realization activity varies with the tax regime—progressive versus proportional, level of income, and temporary changes in income. Understanding the role of temporary tax incentives and the capital gains tax is generally important (e.g., Stiglitz, 1983; Ball, 1984). If individuals sell (hold) shares that they would hold (sell) in the absence of tax incentives resulting, for example, from temporary income changes, Stiglitz (1983) argues that a capital gains tax interferes with the productive efficiency of the economy and that the economy no longer has the property of exchange efficiency if there is a capital gains tax.² Conceptually, under progressive taxation, a temporarily lower income reduces the marginal capital gains tax rate of an individual investor. In contrast, individuals with temporary excess income could move into a higher tax bracket; they are thus expected to realize lower capital gains. Under a proportional system, temporary income changes have no consequences on the tax rate. Hence, the comparison of the two regimes allows me to

¹ Some studies are based on micro data. For example, Ivković, Poterba, and Weisbenner (2005) use data on individual investments provided by a large discount brokerage house to analyze tax-motivated trading decisions; their data do not include information on individual income or demographic factors and there is no exogenous variation in tax rates. Daunfeldt, Praski-Ståhlgren, and Rudholm (2010) use a comprehensive micro data set but fail to identify variation in capital gains tax rates across individuals during their sample period. Hence, they cannot estimate how tax incentives created by income shocks affect capital gains realizations.

² Another argument of Stiglitz (1983) is that, when firm ownership affects the uses of assets, any tax-induced impediment to sell shares to those who can best manage them could result in less efficient resource allocation.

examine the effect of temporary capital gains tax incentives on realization activity and to test how the effect of temporary tax incentives varies across individuals.

I use the 1991 tax reform in Sweden as a quasi-natural experiment. The choice of Sweden and the 1991 tax reform offers a unique setting for two reasons: First, this tax reform introduced a separate tax schedule for capital income with a proportional tax rate that is similar for all individual investors. Before the reform, capital gains were taxed at a marginal progressive income tax rate, ranging from 30% to 80% (12% to 32%) for short-term (long-term) gains in the 1980s. Since the reform, interest, dividends, and capital gains have been taxed at a flat rate of 30%, irrespective of overall income and holding period. Second, this study uses a comprehensive micro panel data set of over 288,000 individuals over the 1977–2000 period. The Longitudinal Individual Data (LINDA) database is a representative panel of 3.35% of the Swedish population, with individual information on taxable income, wealth, and demographic characteristics.

I first examine how the change in tax rates affects individual capital gains realization activity. Around the reform, high-income individuals experience a large decrease in the marginal tax rate on short-term gains and are thus expected to increase capital gains realization activity. In contrast, low-income individuals face an increase in marginal capital gains tax rates on long-term capital gains. Thus, I expect them to decrease capital gains realizations. To disentangle tax effects from the general macroeconomic trend, I compare how the difference between high- and low-income individuals changed around the reform in a difference-in-differences setting. In all regressions, I control for demographic characteristics, income, wealth, and the general macroeconomic trend. As expected, I find that the effect of the reform is increasing in income. This estimated effect is also economically significant. An increase in average income of one standard deviation—an increase in income by 66%—leads to a 50% increase in the likelihood of realizing capital gains after the tax reform.³

The second part of the empirical analysis examines temporary tax incentives provided by progressive versus proportional capital gains taxation. Under progressive taxation, temporarily positive (negative) changes in income increase (decrease) the marginal income tax rate on capital gains. Such a deviation from the individual's average tax rate can create tax incentives to realize

³ Translating this effect into an elasticity estimate is not possible with my data because I cannot distinguish between short- and long-term capital gains. Hence, I do not know the exact tax rate for the respective capital gains.

capital gains in case of negative income changes or to delay the realization of capital gains in case of positive income changes. In contrast, under proportional taxation, the tax rate is the same for any deviation of the current from the average income. Importantly, non-tax reasons to trade are independent of the tax regime. This includes, for example, the need for cash in case of negative income changes (e.g., Barber and Odean, 2000). Hence, I can use the proportional tax regime as a counterfactual to tease out non-tax reasons to trade. The difference in capital gains realization behavior between the progressive and the proportional tax system reflects the tax incentives (additionally) created by a progressive capital gains tax. I thus expect individuals with positive income changes to increase capital gains realization activity relative to individuals with negative income changes following the transition from progressive to proportional taxation.

I exploit the unique panel data with detailed income information for each individual to test this prediction in a setting akin to a difference-in-differences approach around the 1991 tax reform. This setting compares capital gains realization activity before and after the reform (first difference). The second difference compares individuals with positive to negative income changes. I use the absolute difference between current total income before capital gains and the individual's three-year average income before capital gains as my proxy for temporary income changes. I show that, following the tax regime change, individuals with positive income changes increase their capital gains realization activity relative to individuals with negative changes in income. This result indicates that a progressive tax regime provides large temporary tax incentives that affect capital gains realizations.

Another way of describing this finding is that the tax incentive of temporarily lower tax rates under progressive taxation appears to be more relevant than compensating for negative income changes. However, this is not necessarily the case for all individuals. Andersen and Nielsen (2016) show that, in the case of a forced sale, lower prices are realized when the seller has little financial wealth. Put differently, wealthy individuals face lower costs of liquidity and can demand higher prices (e.g., Barber, Lee, Liu, and Odean, 2009). Related to my case, this implies that low-income individuals with negative income shocks may trade irrespective of the tax incentives because they need cash. In contrast, high-income individuals with negative income changes may be less likely to respond to income shocks by selling capital gains assets. Therefore, taxes may be less relevant for low-income individuals and more important for high-income individuals.

To test whether the reform response with respect to temporary income changes is a function of the level of income, I allow the response of individuals with high positive income changes relative to individuals with high negative changes in income to vary across income levels.⁴ The resulting setting is equivalent to a triple difference setting. I compare the capital gains realization activity before and after the reform (first difference) of individuals with positive to negative income changes (second difference). The third difference compares high-income versus low-income individuals. I find that the response of individuals with high positive income changes relative to those with income shortfalls becomes stronger as income increases. The economic magnitudes are large: Relative to individuals with an income shortfall, individuals with excess income in the top quartile of the income distribution increase the likelihood of realizing capital gains by 24.2 percentage points. This response is more than three times higher than for individuals outside the top quartile of the income distribution. In other words, high-income individuals are significantly more sensitive to tax rate shocks stemming from temporary income changes than low-income individuals are. For low-income individuals, non-tax reasons such as the need for liquidity to compensate for negative income changes appear to be more important than for higher-income individuals; low-income individuals thus appear to have lower capital gains tax responsiveness.

To summarize, this paper contributes to the literature by showing that the tax regime matters for the capital gains realization activity of individuals. Capital gains realization decisions are affected by progressive versus proportional taxation and this effect depends on the deviation of current from average income as well as on the level of average income. My results could also help policymakers to better understand the implications and consequences of capital gains taxation because countries frequently change capital gains tax rates as well as the underlying tax regime. My results indicate that a progressive tax system could cause more distortions because it creates temporary tax incentives that are not present under a proportional tax system. Under a progressive tax system, individuals hold (sell) shares that they would have sold (held) in the absence of a temporary income change. Such temporary tax incentives interfere with the exchange and productive efficiency of the economy, as described by Stiglitz (1983) or Ball (1984).

⁴ Again, I use absolute income changes to avoid small absolute changes in income for low levels of income creating large relative income changes.

The remainder of this paper is organized as follows. Section 2 discusses the institutional background and develops testable hypotheses. Section 3 presents the data, summary statistics, and empirical research design. Section 4 provides the empirical results. Finally, Section 6 sets forth my conclusions.

2 Institutional Background and Hypothesis Development

2.1 Capital Gains Taxation in Sweden and the 1991 Tax Reform

In 1991, Sweden revised its income tax system and moved away from a global income system to a dual income tax (see Agell, Englund, and Södersten, 1996, for a comprehensive overview). This dual income tax system taxes earned income such as labor income separately from capital income (Sørensen, 1994). The tax reform was passed by parliament on April 17, 1990 and signed into law in June 1990. While the tax reform implied major changes to the income tax system, the wealth tax and the inheritance tax were not affected by the 1991 reform. The reform reduced (global) marginal income tax rates from over 80% to a progressive tax rate of 31-51% on earned income. The tax rate on capital income was lowered to a proportional tax rate of 30%. This system is still in effect.

This paper centers on capital gains realizations. Prior to the reform, the individual marginal income tax rate and the holding period determined the capital gains tax burden. Since 1977, individuals were allowed to exclude 60% (50% in 1990) of long-term capital gains from their taxable income. Shareholdings qualified for long-term gains after a holding period of two years. Taxable capital gains were added to taxable income subject to progressive income taxation.⁵

The introduction of the proportional tax rate of 30% had a substantial impact on the taxation of capital gains. As of 1991, nominal capital gains were taxed at 30% regardless of individual income and holding period.⁶ The proportional capital gains tax rate for all taxpayers was further lowered to 25% in 1992/1993 and to 12.5% in 1994. The 1992/1994 tax rate cuts were not part

⁵ Taxpayers might utilize lottery bonds to offset capital losses against capital gains from selling stocks (Green and Rydqvist, 1999). However, this tax saving opportunity is only possible if the lottery bond was issued before 1981. As the volume of eligible outstanding lottery bonds declined from SEK 21 billion in 1981 to SEK 4.3 billion in 1990 and as market capitalization of stocks rose from about SEK 96 billion in 1981 to SEK 525 billion in 1990 (see Figure A.1 of the Online Appendix), lottery bonds should not explain the main findings.

⁶ When selling permanent residences, taxpayers may opt for an alternative tax of 9% of the sales price or, as of 1993, for postponing the capital gains tax on owner-occupied housing (see, e.g., Lundborg and Skedinger, 1988).

of the actual 1991 tax reform process. These changes were implemented by the newly elected government in 1992. In 1995, the newly elected government increased the capital gains tax rate to the 1991 level of 30% (Daunfeldt, Praski-Ståhlgren, and Rudholm, 2010).⁷

The resulting range of short-term and long-term capital gains tax rates on selling stocks over the sample period 1977–2000 is presented in Figure 1. Until 1989, the top marginal income tax rate on short-term capital gains is over 70% (solid gray line) while the bottom marginal income tax on short-term capital gains is around 30% (solid black line).⁸ Since 1991, both groups' capital gains are taxed at 30% (with the exception of 1992–1994). The dashed lines represent the marginal income tax rates on long-term capital gains for the top and the bottom tax bracket, respectively. The long-term capital gains tax rate also changes to the proportional rate of 30% (except for 1992–1994).

[Insert Figure 1 about here]

To summarize, from 1989 to 1991, the marginal tax rate on short-term gains decreased by 42 percentage points to 30% for individuals in the top tax bracket. In contrast, individuals in lower tax brackets faced a higher marginal income tax rate on long-term gains after the reform. However, for many individuals, capital gains tax rates remained almost constant as changes in nominal tax rates apply only to short-term (long-term) shareholdings for higher (lower) income taxpayers. In addition to the changes in the tax rates, another central element of the 1991 reform is the separation between progressively taxed labor income and proportionally taxed capital income. After the reform, capital gains are taxed at 30%, whereas labor income and income from self-employment are taxed at rates ranging from 31% to 56%.

2.2 Hypothesis Development

I exploit the 1991 tax reform to test three main hypotheses. The first hypothesis is related to the change in tax rates and the lock-in effect of capital gains taxation. The lock-in effect and the effect on trading decisions and asset prices have been addressed in theoretical studies (e.g., Ball, 1984;

⁷ Prior to the reform, capital losses could be offset against capital gains. After the 1991 reform, capital losses could only be offset against other capital income and the deductibility of capital losses is restricted to 70% of the nominal loss. However, capital losses from the disposal of listed shares may be fully offset against gains from the sale of listed shares. Remaining losses may be carried forward indefinitely.

⁸ Marginal income tax rates before 1981 are obtained from Du Rietz, Johansson, and Stenkula (2013).

Shackelford and Verrecchia, 2002) as well as empirical studies (e.g., Lang and Shackelford, 2000; Seida and Wempe, 2000; Blouin, Ready, and Shackelford, 2003; Dai, Maydew, Shackelford, and Zhang, 2008). The lock-in effect describes the effect of a high tax rate on capital gains preventing individuals from realizing their capital gains. Instead, they postpone the realization of capital gains. As shown in Figure 1, high-income individuals experience the largest capital gains tax rate cut around the 1991 reform. Therefore, I expect them to trade more after the 1991 reform. In contrast, low-income individuals experience almost no change in the tax rate on short-term capital gains but face an increase in long-term capital gains tax rates; these individuals should trade less after the reform. Hence, some individuals are expected to increase capital gains realizations (high-income individuals), while others might decrease capital gains realizations (low-income individuals). Since I cannot test these two opposing predictions in separate regressions due to lack of a control group, I formulate the hypothesis on the difference between these two groups. This can be tested in a difference-in-differences approach. Thus, I expect that, after the 1991 tax reform, high-income individuals increase capital gains realization activity more than low-income individuals and I formulate the first hypothesis as follows.

Hypothesis 1: *Following the 1991 reform, high-income individuals increase capital gains realization activity relative to low-income individuals.*

While the first hypothesis is based on the change in marginal tax rates, I next examine temporary tax incentives. The key question is whether progressive versus proportional capital gains taxation provides different tax incentives to trade, depending on temporary income changes. Of course, there are many reasons why individuals realize capital gains but, for simplicity, I summarize them as non-tax reasons, related to liquidity, and as tax reasons (see Table 1 for an overview). For a given level of average income, individuals with negative income changes might realize capital gains for liquidity reasons (e.g., Barber and Odean, 2000). In contrast, individuals with positive temporary income changes do not need additional cash and are thus expected to trade normally or less than others. Importantly, the non-tax reasons are unrelated to the underlying capital gains tax regime and should not be affected by the tax reform.

[Insert Table 1 about here]

On the other hand, tax incentives to trade differ across tax regimes, depending on the temporary change in income. Under progressive taxation, temporary negative income changes decrease the marginal income tax rate on capital gains. Individuals are thus expected to trade more because they temporarily have a lower capital gains rate. In the case of a proportional regime, individuals with a negative change in income have no tax reason to trade. They only have the same non-tax reasons as under a progressive tax regime. All else being equal, one would thus expect that, following the change from a progressive to a proportional tax regime, individuals with a negative change in income realize lower capital gains.

Individuals with a positive temporary change in income are reluctant to trade in the case of a progressive tax because positive income changes increase the capital gains tax rate. In other words, individuals face a temporary lock-in effect. Under a proportional system, individuals with a positive change in income do not face a higher current tax rate than their average marginal tax rate. Put differently, there is no additional tax incentive or disincentive to trade. All else being equal, following the change from a progressive to a proportional system, individuals with temporary positive changes in income are expected to realize more capital gains. Again, to be able to test the predictions related to temporary income changes empirically, I focus on the comparison of the two aforementioned groups—individuals with negative versus positive income changes—and formulate the second hypothesis as follows.

Hypothesis 2: *All else being equal, following a change in the tax regime from progressive to proportional, individuals with positive changes in income increase capital gains realization activity relative to individuals with negative changes in income.*

However, not all individuals are equally sensitive to the need for cash when facing negative income changes. Hypothesis 2 relates to the average response across all individuals. The third hypothesis is more refined and takes into account differences in liquidity needs across individuals. As argued above, in the case of forced sales, the liquidity provider realizes a premium. This premium increases as the seller is less wealthy (Andersen and Nielsen, 2016). Related to my case, this implies that low-income individuals could trade irrespective of the tax incentives because they need the cash. In contrast, high-income individuals could put less emphasis on the need for cash. Instead, they might put more emphasis on tax consequences because they do not need cash in case

of negative income changes. Put differently, tax consequences are more important for high-income individuals. For these reasons, I formulate my third hypothesis as follows.

Hypothesis 3: *All else being equal, following a change in the tax regime from progressive to proportional, the increase (decrease) in the capital gains realizations of individuals with positive (negative) income changes is largest for high-income individuals.*

2.3 Data

This study is based on a comprehensive panel data set (LINDA) that covers the period 1977–2000. This unique data set is provided by Statistics Sweden and is a representative panel of 3.35% of the Swedish population. It contains information on income, aggregated household wealth, employment status, education, and demographic characteristics, such as age, gender, marital status, and household size.⁹ The principle data sources are tax returns as well as the population and housing census. Edin and Fredriksson (2000) provide a detailed description of LINDA, its sources and variables. Importantly, they discuss in detail how Statistics Sweden maintains the representativeness of the sample over time.

From the original data set, I restrict my analysis to individuals with information on income and demographic characteristics for at least five consecutive years. I include only years 1977 or later to ensure a constant capital gains tax regime prior to 1991. Moreover, I restrict my sample to years before the 2001 crash. This sample restriction does not change any of my findings. Further, I exclude all observations where the individual's age is below 18. To prevent extreme incomes and outliers distorting the results (Roine and Waldenström, 2008), I eliminate income observations that are not within the 0.01st and the 99.99th percentiles of the total income distribution. This returns the final sample of 288,139 individuals and 4,377,477 observations.

Using large administrative panel data has several advantages. First, since the panel stretches across a significant change in the structure of the tax system, I am able to study the effect of capital gains tax regimes on realization activity. Second, net capital gains realized in one year can be observed directly at the individual level. The data allow for more detailed control of individual

⁹ Information on wealth is available only if total individual wealth exceeds a certain threshold, which, for example, amounted to 900,000 Swedish krona (SEK) in 2000. This is equivalent to 98,127 USD using the 2000 average exchange rate of 9.1718 SEK/USD. I use information on aggregated wealth at the household level. The wealth variable does not contain information on portfolio composition.

demographic and economic characteristics. This data also allow for a more detailed examination of differences the effect of investor level taxation on capital gains realizations across individuals.

This data have, of course, also some limitations. Data on number of transactions, gross capital gains and losses, as well as short-term and long-term capital gains are not available in LINDA. There is no information on whether the gain arises from listed shares, unlisted shares, or real estate.¹⁰ My capital gains measure captures all sources of capital gains. Hence, actual short- and long-term capital gains tax rates are not observable. The amount of capital gains is defined as net realized capital gains over all transactions (gains and losses) in one fiscal year. With respect to the holding period, net capital gains comprise the taxable part of all capital gains in one year, that is, 40% of all long-term gains and 100% of all short-term gains before 1991 and all capital gains as of 1991. This information is available only in another data set—the Household Income Distribution Survey (HINK) data—for 24,080 individuals, but it is restricted to one cross-section of 1989. About 2.8% (1.4%) of all individuals realize long-term (short-term) capital gains (see Figure A.2 in the Appendix) in 1989. For the top decile of the income distribution, the percentage of individuals with long-term gains is 11.1%. Despite the high marginal tax rates on short-term gains, about 6% of individuals in the top decile realize short-term gains in 1989. This suggests that short-term as well as long-term capital gains were realized under progressive taxation.

2.4 Empirical Research Design: Testing Hypothesis 1

The empirical research design exploits the 1991 tax regime change from progressive to proportional and the associated tax rate changes using a difference-in-differences approach. First, I test whether, relative to low-income individuals, high-income individuals increase capital gains realization activity from before to after the reform. The first difference in my approach compares capital gains realization behavior before and after the reform. I then allow the relation between income and capital gains to vary across the two tax regimes.¹¹ Because the data do not allow me

¹⁰ With respect to the source of capital gains, there could be concerns that capital gains from housing dominate realizations. However, the time-series correlation of changes in aggregate capital gains is positively correlated with stock market returns (0.51) while changes in aggregate capital gains are not correlated with changes in the house price index. It thus appears as if capital gains are rather dominated by capital gains from the stock market. Data on aggregated stock returns are from Waldenström (2014). House price index statistics are from Statistics Sweden. Changes in aggregated capital gains are based on my own calculations.

¹¹ The results are qualitatively similar when I use a difference-in-differences setting with dummy variables instead of a continuous variable for the first difference. Specifically, I estimate the response to the reform for each percentile of the income distribution. This result is presented in Figure A.4 of the Online Appendix.

to identify the proportion of long- and short-term gains, I do not know the exact marginal capital gains tax rate for each individual. For these reasons, I use total income excluding capital gains as a proxy for the change in the tax rates. To test Hypothesis 1, I therefore use the following estimation equation:

$$CG_Realized_{i,t} = \alpha_0 + \beta_1 AvIncome_{t-3,t-1} + \beta_2 \cdot Post_t \times AvIncome_{t-3,t-1} \quad (1)$$

$$+ \sum_{a=1}^3 \gamma_a \cdot W_{i,t-a} + \chi \cdot X_{i,t-1} + \alpha_c + \alpha_t + \alpha_i + \epsilon_{i,t}$$

where $CG_Realized_{i,t}$ is the main dependent variable. This is an indicator variable equal to one for individuals realizing capital gains in year t and zero otherwise. For the second dependent variable, I use the natural logarithm of $CG_{i,t}$. The variable CG is the amount in thousands of Swedish kronor of net realized capital gains in year t . By analyzing the decision to realize capital gains ($CG_Realized_{i,t}$) and the amount of realized capital gains ($CG_{i,t}$), my analysis focuses on the extensive margin ($CG_Realized_{i,t}$) and the intensive margin ($CG_{i,t}$). I translate all monetary values into real terms (base year 2000) using the Swedish GNP deflator provided by Statistics Sweden. This ensures that the high levels of inflation in the early 1990s do not bias any findings, since the pre- and post-reform periods are treated similarly. When using the natural logarithm of capital gains as the dependent variable, I include the inverse Mills ratio from a first-stage probit model to control for sample selection. The first-stage probit follows Equation (1) and includes one lag of $CG_Realized$ as the exogenous variable, following prior literature (Daunfeldt, Praski-Ståhlgren, and Rudholm, 2010).

The key independent variable to test Hypothesis 1 is $Post_t \times AvIncome_{t-3,t-1}$. The variable $Post_t$ is a dummy variable for the post-reform period that takes the value one after enactment of the reform and zero for the years prior to 1991. The variable $AvIncome_{t-3,t-1}$ denotes the average income from $t - 3$ to $t - 1$. The coefficient β_2 is expected to be positive; that is, higher-income individuals respond more strongly to the reform than lower-income individuals do. I use the natural logarithm of lagged average total income excluding capital gains as a measure of income. Income is defined as the sum of labor income, income from self-employment, interest income,

pensions, and dividends. Capital gains are excluded from total income, ensuring no mechanical relation between income and capital gains realizations.

I include several control variables. The first set of control variables includes three lags of taxable wealth (vector W). The variable $Wealth_t$ is reported wealth for tax purposes. Controlling for wealth mitigates concerns that the results are driven by the penetration of financial assets. Data on the asset mix of the household portfolio are unfortunately not available from LINDA.¹² The second set of control variables (vector X) consists of marital status, household size, and indicator variables for pension, social assistance, business income, and increases as well as decreases in household size (Calvet, Campbell, and Sodini 2009; Daunfeldt, Praski-Ståhlgren, and Rudholm 2010). I further include three dummy variables that take the value one if the individual resides in a small town, a large city, and the county capital, respectively. Third, I control for regional disparities between 21 counties in Sweden and include county fixed effects (α_c). I further include year fixed effects (α_t) to account for general macroeconomic trends, such as differences in stock returns or GDP growth over time. The main effect of $Post$ is captured by year fixed effects. Finally, I include individual fixed effects (α_i). Standard errors allow for heteroskedasticity and are clustered at the individual level, since realization decisions may be correlated over time for a given taxpayer. I use two different samples to estimate Equation (1). First, I use the entire sample from 1977 to 2000. Second, I exclude 1992–1994 from the analysis to demonstrate that the three years with lower proportional capital gains tax rates do not explain my findings.

2.5 Empirical Research Design: Testing Hypothesis 2

To examine how temporary income changes affect capital gains realizations across tax regimes (Hypothesis 2), I again exploit the 1991 reform and use the deviation of current income from average income, denoted Δ_Income , as the main independent variable of interest. Current and average incomes are defined before capital gains to avoid a mechanical relation between income

¹² There is some aggregated information on portfolio composition based on 19,708 individuals in 1989 and 1990 from the HINK data. I sort these individuals into deciles in accordance with the income deciles from LINDA. For these deciles, I then compute the average portfolio shares of stocks and mutual funds, cash holdings, and real estate. The results (see Figure A.3 in the Appendix) indicate that the relevance of stocks and funds increases in income. Some 10.8% of the average portfolio of individuals in the bottom decile consists of shares and funds. This fraction increases to 20.4% for the top decile. About 44% (70%) of low-income (high-income) individuals own shares, funds, or other securities. The importance of real estate (cash holdings) increases (decreases) from 21% (68%) in the bottom decile to 57% (23%) in the top decile.

changes and capital gains realizations. I use the difference between current and average income instead of the temporary tax rate difference, which would be the natural choice, to compare pre- and post-reform outcomes. After the reform, temporary tax rate differences are zero due to the proportional tax. Since the correlation coefficient between Δ_Income and temporary tax rate differences amounts to 0.66 prior to the reform, the difference between current and average income (Δ_Income) is a good proxy for temporary tax rate differences.

This setting is again akin to a difference-in-differences design. The first difference compares capital gains realization behavior before and after the reform. The second difference compares the capital gains realization behavior of individuals with positive income changes to that of individuals with negative income changes. However, I use a continuous variable to model the second difference and estimate the following regression:

$$CG_Realized_{i,t} = \alpha_0 + \beta_1 \Delta_Income_{t-1} + \beta_2 \cdot Post_t \times \Delta_Income_{t-1} \quad (2)$$

$$+ \sum_{a=1}^3 \gamma_a \cdot W_{i,t-a} + \chi \cdot X_{i,t-1} + \alpha_c + \alpha_t + \alpha_i + \epsilon_{i,t}$$

where $CG_Realized_{i,t}$ is the dependent variable. Again, I also use the natural logarithm of realized capital gains as dependent variable. The main prediction is that, under progressive taxation, an increase in Δ_Income is associated with a lower likelihood of capital gains realizations due to the lock-in effect of temporary high tax rates and to non-tax reasons ($\beta_1 < 0$). Under proportional taxation, there is no temporary tax effect and, consequently, individuals can decide on capital gains realizations without temporary tax considerations. Consistent with Hypothesis 2, that individuals with positive income changes should increase capital gains realization activity relative to individuals with negative income changes from before to after the reform, I expect $\beta_2 > 0$.¹³ Further, I include control variables, individual fixed effects, county fixed effects, and year fixed effects. Importantly, control variables comprise three lags of total income to control for an individual's level of income.

¹³ Since Δ_Income , that is, the difference between current income and the three-year average income, is defined before capital gains, there is no mechanical relation between capital gains realizations and income change.

2.6 Empirical Research Design: Testing Hypothesis 3

To test Hypothesis 3, I extend Equation (2) and allow the coefficient of $Post \times \Delta_Income$ to vary across income levels. This effectively results in a setting akin to a triple difference approach. The first difference compares capital gains realization behavior before and after the reform. The second difference compares the capital gains realization behavior of individuals with positive income changes to that of individuals with negative income changes. The third difference compares the capital gains realization behavior of high-income individuals to that of low-income individuals. Again, I operationalize the second and third differences as continuous variables in the baseline model. I thus estimate

$$\begin{aligned}
 CG_Realized_{i,t} = & \alpha_0 + \beta_1 \Delta_Income_{t-1} + \beta_2 \cdot Post_t \times \Delta_Income_{t-1} & (3) \\
 & + \beta_3 AvIncome_{t-3,t-1} + \beta_4 \cdot Post_t \times AvIncome_{t-3,t-1} \\
 & + \beta_5 \cdot AvIncome_{t-3,t-1} \times \Delta_Income_{t-1} \\
 & + \beta_6 \cdot Post_t \times \Delta_Income_{t-1} \times AvIncome_{t-3,t-1} \\
 & + \sum_{a=1}^3 \gamma_a \cdot W_{i,t-a} + \chi \cdot X_{i,t-1} + \alpha_c + \alpha_t + \alpha_i + \epsilon_{i,t}
 \end{aligned}$$

where $CG_Realized_{i,t}$ is the dependent variable. As before, I also use the natural logarithm of realized capital gains as dependent variable. Consistent with Hypothesis 2, I expect that, relative to individuals with negative income changes, individuals with positive income changes increase capital gains realization activity from before to after the tax reform ($\beta_2 > 0$). The main purpose of Equation (3) is to test Hypothesis 3. I expect that the increase in capital gains realization activity among individuals with positive income changes relative to those with negative income changes becomes larger as income increases. Hence, β_6 should be positive. I include control variables, individual fixed effects, county fixed effects, and year fixed effects from Equation (1).

As an additional test, I test a modified version of Equation (3) where I replace the continuous variables of interest with dummy variables to obtain a triple difference model around the 1991 reform. The first difference again contrasts individual capital gains realization decisions before and after the tax reform; it is captured by the dummy variable $Post$. To model the second difference, I replace Δ_Income with the dummy variable $High\ Positive\ \Delta$. I sort individuals into deciles

of the Δ_Income distribution in each year. I use only individuals in the bottom and top deciles of the Δ_Income distribution in the regression and denote individuals in the top decile as individuals with high positive income changes (*High Positive* $\Delta = 1$).¹⁴ The third difference contrasts high-income individuals with lower-income individuals. Here, I replace the continuous income measure *AvIncome* with the dummy variable *High Income*. I use two cutoffs. First, I use the top 25% of the average income distribution to define the group of *High Income* individuals. Second, I include only the top 10% of the average income distribution when defining the *High Income* group. All the control variables from Equation (3) are included in this test.

2.7 Summary Statistics

Table 2 presents summary statistics for the capital gains variables for the 1977–2000 period. In the sample, 10% of all individual-year observations contain capital gains. The average realized taxable capital gain amounts to SEK 35,940 (in 1990, USD 1 = SEK 5.92). Panel B of Table 2 presents summary statistics for income, wealth, and demographic control variables. On average, income amounts to SEK 153,855 per year over the 1977–2000 period. The range of values of income and wealth measures is considerable—from SEK 52,331 (10th percentile) to 253,557 (90th percentile) ($Income_t$), SEK 52,833 to 241,929 ($AvIncome_{t-2,t}$), and SEK 0 to SEK 638,299 ($Wealth_t$). About 46% of all observations contain non-zero values for taxable wealth. The average age is 50 years, about 51% of individuals are female, and the average household size is 2.1. About 5% of individuals realize business income and about 35% receive pensions.

[Insert Table 2 about here]

¹⁴ In this sample, individuals with high negative income changes have an average income deviation of negative SEK 71,848. To put this figure into perspective, their current income before capital gains is about 60% (median) lower than the average income over the preceding three years. Prior to the reform, these individuals' marginal capital gains tax rate is about 7.6 percentage points below their average capital gains tax rate. Individuals with high positive income changes have an average income deviation of SEK 96,426. Relative to their average income, their current income is about 103% (median) higher. Their current marginal capital gains tax rate is about 9.9 percentage points above the tax rate based on the average income of the three preceding years (prior to 1991).

3 Empirical Results

3.1 The Evolution of Capital Gains in Sweden 1977–2000

Figure 2 plots total realized capital gains over the sample period and shows that total realized capital gains increased from SEK 1.3 billion in 1977 to SEK 25 billion in 2000. The performance of the Swedish stock market is highly correlated to the development of aggregated capital gains, except for 1991 and 1994. The 1991 reform led to a 60.5% surge in aggregated capital gains from SEK 7.4 billion to SEK 11.9 billion, despite an 18% decline in the Swedish stock market index. The effect of the 1991 reform is much stronger for the top percentile of the income distribution. For this group aggregated capital gains more than tripled from SEK 0.82 billion in 1990 to SEK 3.56 billion in 1991. The top 1% of the income distribution thus accounts for over 60% of the total increase in capital gains from 1990 to 1991.

[Insert Figure 2 about here]

The trend in aggregated realized capital gains results from an increasing number of people accessing stock and housing markets. The percentage of individuals realizing capital gains steadily increases over the sample period; in the late 1970s, this figure was less than 1.5% for the entire sample. From 1990 to 1991, the share of individuals realizing capital gains increased by 2.7 percentage points. The increase is greater for the top percentile. The share of top-income individuals with capital gains almost doubled from 20.7% in 1990 to 40.3% in 1991. From 1977 to 1991, average income from capital gains rose from SEK 46,624 to a peak of SEK 105,185 in 1991. After 1991, average capital gains fell (per taxpayer) well below the level of the late 1980s. The top percentile nearly tripled average capital gains from SEK 176,529 in 1990 to SEK 515,574 in 1991. Further, and in contrast to all individuals, taxpayers in the top percentile realized higher average capital gains in the post-reform period than in any year of the pre-reform period. In sum, the increase in aggregated capital gains largely stems from more individuals realizing lower capital gains after the 1991 reform.

3.2 Level of Income and Capital Gains Responses to the 1991 Tax Reform

3.2.1 Graphical Evidence

I now turn to the question of who responded to the 1991 reform and exploit cross-sectional differences in capital gains tax incentives. Figure 3 plots the percentage of total realized capital gains in each year over the 1977–2000 period realized by the top percentile, the 91st to the 99th percentile (P91–P99), and the remaining 90% of the income distribution. Individuals are sorted into percentiles of the three-year average income distribution before capital gains. This ensures that capital gains do not affect the definition of income percentiles. Figure 3 shows that the role of the top percentile and the 91st to the 99th percentile in capital gains realization changes considerably after the tax reform. Under the progressive tax regime, the top percentile and the P91–P99 group realize around 16% and 18%, respectively, of total capital gains, with no significant trend over 1977–1990. High capital gains taxes lock in the gains of high-income investors. In total, the top 10% of the income distribution realizes about one-third of all realized gains under progressive taxation.

[Insert Figure 3 about here]

The share of total capital gains realized by the top 10% increases significantly following the introduction of the proportional tax. This surge amounts to 15 percentage points for the P91–P99 group and to 23 percentage points for the top percentile and reaches a constant level after the reform. It is the result of a real increase in capital gains: Relative to the 1986–1990 period, the top percentile and the P91–P99 group increase capital gains realizations over 1991–1995. This observation can be explained by the large decrease in the marginal tax rate on short-term capital gains for higher-income individuals. At the same time, the remaining 90% of the income distribution decreases capital gains realizations post-reform relative to 1986–1990 (see also Figure 2). This result is consistent with the expectation that the increase in the tax rate on the long-term capital gains of lower-income individuals could reduce capital gains realization activity. Importantly, the different trends for high- versus low-income individuals also support Hypothesis 1: High-income individuals increased capital gains realizations relative to low-income individuals.

3.2.2 Regression Analysis

I next examine differences in the response to the tax reform across individuals while accounting for a large set of control variables. The results from estimating Equation (1) are reported in Table 3. In Columns (1) to (3), I use the *CG_Realized* as the dependent variable. In Columns (4) to (6), I use the amount of realized capital gains (as a natural logarithm) as the dependent variable. Columns (1) and (4) use the full sample, while I exclude the years 1992–1994 from Columns (2) and (5) to demonstrate that the results are not driven by the three years with lower proportional rates. In addition, I run a placebo analysis around the 2001 stock market crash and report the results in Columns (3) and (6).

Overall, the results are consistent with the prediction that, relative to low-income individuals, high-income individuals increase their capital gains realization activity after the 1991 tax reform (Hypothesis 1). The economic effects are significant. The β_2 coefficient estimate from Column (2) indicates that a 1% increase in income is associated with an increase of 0.00076 in the likelihood of realizing capital gains after the reform. This appears to be negligible at first glance, but the effect is equivalent to 0.76% of the sample average of 10%. This is a large effect, since an increase in average income of one standard deviation (SEK 97,430) is equivalent to an increase in income of about 66%. This, in turn, leads to an increase of 50% in the likelihood of realizing capital gains. Importantly, the results are not driven by the lower proportional tax rates during 1992–1994, since the results are quite similar across Columns (1) and (2).

[Insert Table 3 about here]

In addition to being more likely to realize capital gains, the results in Columns (3) and (4) of Table 3 show that, relative to low-income individuals, high-income individuals also realize higher capital gains. Since both income and the amount of capital gains are defined as natural logarithms, the coefficient estimate can be easily interpreted. Using the coefficient estimate from Column (4), I find that, relative to the pre-reform period, a 1% increase in total income increases realized capital gains by 0.37% after the reform.

Finally, there could be concerns that my findings are driven by the Swedish economic crisis of 1991 and 1992. The economic crisis in the early 1990s was the most severe downturn in Sweden since the 1930s, with a GDP drop of 5% between 1991 and 1993 (Agell, Englund, and

Södersten, 1996). If the reaction to the crisis was concentrated among high-income, sophisticated investors, I could misinterpret the crisis effects as tax effects. I address this concern by repeating the regression from Equation (1) around the stock market crash in the years around 2001.¹⁵ If this pseudo tax reform leads to a similar pattern, the effect is very likely driven by the economic downturn. Columns (3) and (6) of Table 3 presents the coefficient estimates from estimating Equation (1) around the 2001 stock market crash using data from 1996–2005. The pattern of response to the pseudo tax reform around 2001 differs substantially from the pattern around the 1991 reform. The reaction is decreasing in income: As income increases, individuals realize lower capital gains (or losses) after the crisis. This observation is in line with the “ostrich effect,” which indicates that investors “put their heads in the sand to shield themselves” from bad news (Karlsson, Loewenstein, and Seppi, 2009). It thus appears that estimated effects are driven by the 1991 tax reform and less by the economic crisis.

3.3 Tax Regimes, Capital Gains Realizations, and Income Changes

3.3.1 Graphical Evidence

The simplest way of providing evidence supporting Hypothesis 2 is to track the capital gains realizations of individuals with high negative and high positive changes in income over time. I sort observations into the deciles of the difference between current income and the three-year average income scaled by the three-year average income separately for each year. I then examine aggregated capital gains realized by individuals with (1) high negative income changes, (2) high positive income changes, and (3) constant income. Aggregated capital gains are normalized by the total capital gains realized by all three groups.¹⁶ Hence, the shares of gains realized by the three groups sum to unity each year. The bottom (top) three deciles form the group of individuals with high negative (positive) income changes.

Figure 4 shows substantial differences in capital gains realization activity with respect to income changes across tax regimes. Under progressive taxation, individuals with negative changes in income (solid black line) realize more capital gains than individuals with positive income

¹⁵ Between 1998 and 2000, the stock market index increased annually by 14.35% to 38.98%. The stock market index fell in 2001, 2002, and 2003 by -37.65%, -28.34%, and -14.16%, respectively.

¹⁶ All the results are qualitatively similar when using unscaled capital gains realizations (see Figure A.5 of the Appendix).

changes (solid gray line) or a constant income (dashed black line). Under progressive taxation, individuals with high negative income changes—or potential liquidity issues—realize about 48% of all capital gains. In contrast, individuals with high positive income changes realize only 32% of all capital gains. This pattern is consistent with the cases outlined in Table 1. Individuals with negative (positive) income changes have tax as well as non-tax incentives to realize (not realize) capital gains.

[Insert Figure 4 about here]

This relation changes considerably after the introduction of the proportional capital gains tax, with only non-tax considerations related to temporary income changes remaining. The share of capital gains realized by individuals with large decreases in income falls to a very low level and is even negative in years with low stock market returns. At the same time, the share of capital gains realized by individuals with excess income increases substantially, by about 60 percentage points, from 32% to 92%. In other words, the share of capital gains realized by individuals with excess income dwarfs capital gains realizations by individuals with a constant income or with a decreasing income under proportional taxation.

Taken together, individuals with positive income changes appear to trade more after the reform than before. In contrast, individuals with negative income changes trade less after the introduction of the proportional tax. The way the difference between the two groups changes around the 1991 tax reform, that is, the difference-in-differences, is consistent with Hypothesis 2.

Since the graphical evidence does not control for other observable characteristics, I now turn to the regression results from estimating Equation (2). Column (1) of Table 4 presents the coefficient estimates. Consistent with the graphical evidence in Figure 4, I obtain a negative coefficient for Δ_Income . That is, under progressive taxation, individuals with positive income changes are less likely to realize capital gains. Further, I obtain a positive coefficient for $\Delta_Income \times Post$ ($\beta_2 > 0$). That is, under proportional taxation, individuals with positive income changes increase capital gains realization activity relative to individuals with negative income changes. Further, the sum of both the coefficient estimates β_1 and β_2 is positive and statistically significant (not tabulated). This shows that individuals with positive income changes are now more likely to

realize capital gains than individuals with income shortfalls, since, taken together, these results are consistent with Hypothesis 2.

To assess whether the change in the relation between Δ_Income and capital gains realizations around the reform is a function of income (Hypothesis 3), Column (2) of Table 4 presents the regression results from the estimation Equation (3). I find a positive and significant β_2 coefficient of 0.019. More importantly, I obtain a positive and significant β_6 coefficient of 0.008 using the full sample. Overall, these results suggest two things. First, the increase in capital gains realization activity around the reform is stronger among individuals with excess income than among individuals with income shortfalls (Hypothesis 2). Second, the response of individuals with high positive income changes relative to individuals with high negative income changes increases as income increases (Hypothesis 3). This result is robust to both the inclusion and exclusion of the years 1992–1994. It is further robust to using the amount of capital gains as the alternative dependent variable (Columns (4) to (6)).

[Insert Table 4 about here]

There is one caveat about this test. The triple interaction makes the interpretation of economic magnitudes very challenging. To this end, I estimate Equation (3) as a difference-in-difference-in-differences approach using a 12-year period around the 1991 tax reform. Table 5 presents the β_2 and β_6 coefficient estimates from estimating this modified version of Equation (3), where I replace the continuous variables with dummy variables as described above in Section 3.4. This triple difference approach simplifies the interpretation of the coefficient estimates. The estimated β_2 coefficient implies that, as opposed to individuals with a decreasing income, the likelihood of lower-income individuals with positive income changes realizing capital gains increases by 7.1 percentage points around the change in tax regime. This is equal to 71% of the sample average. Similarly, relative to individuals with an income shortfall, lower-income individuals with excess income increase the amount of capital gains by SEK 86,100. Both findings are consistent with previous findings and support Hypothesis 2.

The coefficient estimates for β_6 are consistent with Hypothesis 3. Relative to individuals with an income shortfall, individuals with excess income who are also in the top quartile of the income distribution increase the likelihood of realizing capital gains by 24.2 percentage points and

increase the amount of capital gains by SEK 176,377. These responses are 340% ($= 24.2/7.1$) and 205% ($= 176,377/86,100$), respectively, larger than for individuals with excess income outside the top quartile of the income distribution ($High\ Income = 0$). These effects are somewhat larger if I use the top decile to define the group of high-income individuals (Columns (3) and (4) of Table 5).

[Insert Table 5 about here]

Finally, I test the robustness of the triple difference model to the exclusion of the years 1992–1994. The coefficient estimates are reported in Table 6 and show that the main effect (β_2) is very similar. This supports Hypothesis 2. While the magnitude of the triple interaction is slightly smaller, it is still economically and statistically significant. This is in line with Hypothesis 3. One possible implication of these findings is that the tax regime affects the motivations behind capital gains realizations. Under progressive taxation, individual investors appear to realize accrued capital gains when income decreases substantially, that is, when current marginal tax rates are lower than the average tax rate. Under proportional taxation, capital gains realizations are less driven by negative changes in income. In fact, under proportional taxation, individuals with positive changes in income realize capital gains more actively than individuals with decreasing income do. This suggests that temporary tax incentives have a large effect on capital gains realization activity.

[Insert Table 6 about here]

4 Conclusion

This paper shows that progressive versus proportional taxation affects capital gains realization behavior. Using a comprehensive Swedish panel data set for the period 1977–2000, I show that 1) individual capital gains realization activity responds to changes in marginal tax rates, 2) a progressive tax regime provides strong temporary tax incentives to realize (postpone) capital gains realizations when individuals face temporary negative (positive) income shocks, and 3) the responsiveness to such temporary tax incentives is more pronounced among high-income individuals.

My results imply that individual capital gains realizations are sensitive not only to permanent and transitory capital gains tax rates (Auten and Clotfelter, 1982; Burman and Randolph, 1994)

but also to the tax regime. I show that the structure of the tax—progressive versus proportional—has substantial effects on capital gains realizations with respect to income and large changes in income. Under progressive taxation, individuals could sell (hold) shares that they would otherwise hold (sell) to exploit changes in income tax rates arising from temporary changes in total income. Under proportional taxation, taxes do not create an incentive to hold (sell) shares.

My results have potential policy implications because a better understanding of the effect of capital gains taxation is quite topical, given the numerous income tax reforms over the past two decades in OECD countries and ongoing debates about capital gains taxation, for example, in the United States.¹⁷ First, capital gains tax regimes affect trading activity and the volume of the realized capital gains of individual investors. When the capital gains tax rate is independent of overall income, high-income individuals are encouraged to increase their trading activity, at least partly because of the tax wedge between capital and labor income. Further, at the individual level, a progressive capital gains tax sets additional tax incentives for individuals with decreasing income to realize accrued capital gains. This is patently different under proportional taxation, where there are no temporary tax incentives and capital gains are predominantly realized by high-income individuals and individuals with excess income. My findings suggest that a progressive capital gains tax system could create more distortions in capital gains realization activity than a proportional tax system because of the temporary tax incentives and disincentives to trade introduced by a progressive tax regime. These temporary tax incentives could interfere with the productive and exchange efficiency of the economy (Stiglitz, 1983).

¹⁷ For example, long-term capital gains in the United States were taxed at a proportional rate of 15% during 2003–2012, except for taxpayers in the lowest two tax brackets. Since 2013, long-term capital gains have been taxed at a progressive scale ranging from 0% to 20%. Short-term capital gains are added to taxable income and are taxed at the marginal income tax rate.

References

- Agell, Jonas, Peter Englund, and Jan Södersten (1996): Tax Reform of the Century – The Swedish Experiment, *National Tax Journal*, 49 (4): 643–664.
- Andersen, Steffen and Kasper Meisner Nielsen (2016): Fire Sales and House Prices: Evidence from Estate Sales Due to Sudden Death, *Management Science*, forthcoming.
- Auten, Gerald E. and Charles T. Clotfelter (1982): Permanent versus Transitory Tax Effects and the Realization of Capital Gains, *Quarterly Journal of Economics*, 97 (4): 613–632.
- Ball, Ray (1984): The Natural Taxation of Capital Gains and Losses when Income is Taxed, *Journal of Banking and Finance*, 8 (3): 471–481.
- Barber, Brad M., Yi-Tsung Lee, Yu-Jane Liu, and Terrance Odean (2009): Just How Much Do Individual Investors Lose by Trading?, *Review of Financial Studies*, 22 (2): 609–632.
- Barber, Brad M. and Terrance Odean (2000): Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors, *Journal of Finance*, 55 (2): 773–806.
- Blouin, Jennifer L., Jana Smith Ready, and Douglas A. Shackelford (2003): Capital Gains Taxes and Equity Trading: Empirical Evidence, *Journal of Accounting Research*, 41 (4): 611–651.
- Burman, Leonard E. and William C. Randolph (1994): Measuring Permanent Responses to Capital-Gains Tax Changes in Panel Data, *American Economic Review*, 84 (4): 794–809.
- Calvet, Laurent E., John Y. Campbell, and Paolo Sodini (2009): Fight or Flight? Portfolio Rebalancing by Individual Investors, *Quarterly Journal of Economics*, 124 (1): 301–348.
- Dai, Zhonglan, Edward Maydew, Douglas A. Shackelford, and Harold H. Zhang (2008): Capital Gains Taxes and Asset Prices: Capitalization or Lock-In?, *Journal of Finance*, 63 (2): 709–742.
- Daunfeldt, Sven-Olov, Ulrika Praski-Ståhlgren, and Niklas Rudholm (2010): Do High Taxes Lock-in Capital Gains? Evidence from a Dual Income Tax System, *Public Choice*, 145 (1): 25–38.
- Du Rietz, Gunnar, Dan Johansson, and Mikael Stenkula (2013): Swedish Labor Income Taxation (1862–2013), IFN Working Paper No. 977, 2013.
- Edin, Per-Anders and Peter Fredriksson (2000): LINDA - Longitudinal INDividual DATA for Sweden, Working Paper 2000:19, Department of Economics, Uppsala University.
- Green, Rick and Kristian Rydqvist (1999): Ex-day behavior with dividend preference and limitations to short-term arbitrage: the case of Swedish lottery bonds, *Journal of Financial Economics*, 53 (2): 145–187.

- Hanlon, Michelle and Shane Heitzman (2010): A review of tax research, *Journal of Accounting and Economics*, 50 (2-3): 127–178.
- Ivković, Zoran, James M. Poterba, and Scott Weisbenner (2005): Tax-Motivated Trading by Individual Investors, *American Economic Review*, 95 (5): 1605–1630.
- Karlsson, Niklas, George Loewenstein, and Duane Seppi (2009): The ostrich effect: selective attention to information, *Journal of Risk and Uncertainty*, 38 (2): 95–115.
- Lang, Mark H. and Douglas A. Shackelford (2000): Capitalization of Capital Gains Taxes: Evidence from Stock Price Reactions to the 1997 Rate Reduction, *Journal of Public Economics*, 76 (1): 69–85.
- Lundborg, Per and Per Skedinger (1988): Capital gains taxation and residential mobility in Sweden, *Journal of Public Economics*, 67 (3): 399–419.
- Roine, Jesper and Daniel Waldenström (2008): The Evolution of Top Incomes in an Egalitarian Society: Sweden, 1903–2004, *Journal of Public Economics*, 92 (1-2): 366–387.
- Seida, Jim A. and William F. Wempe (2000): Do Capital Gain Tax Rate Increases Affect Individual Investors' Trading Decisions?, *Journal of Accounting and Economics*, 30 (1): 33–57.
- Shackelford, Douglas A. and Robert E. Verrecchia (2002): Intertemporal Tax Discontinuities, *Journal of Accounting Research*, 40 (1): 205–222.
- Sørensen, Peter B. (1994): From the Global Income Tax to the Dual Income Tax: Recent Tax Reforms in the Nordic Countries, *International Tax and Public Finance*, 1 (1): 57–79.
- Stiglitz, Joseph E. (1983): Some Aspects of the Taxation of Capital Gains, *Journal of Public Economics*, 21 (2): 257–294.
- Waldenström, Daniel (2014): Swedish Stock and Bond Returns, 1856–2012, In R. Edvinsson, T. Jacobson, and D. Waldenström, editors, *Historical Monetary and Financial Statistics for Sweden*, volume 2. Stockholm: Sveriges Riksbank and Ekerlids förlag.

Figure 1: Marginal Capital Gains Tax Rates: 1977–2000

This figure illustrates bottom and top marginal income tax rates on short-term as well as long-term capital gains over the 1977–2000 period.

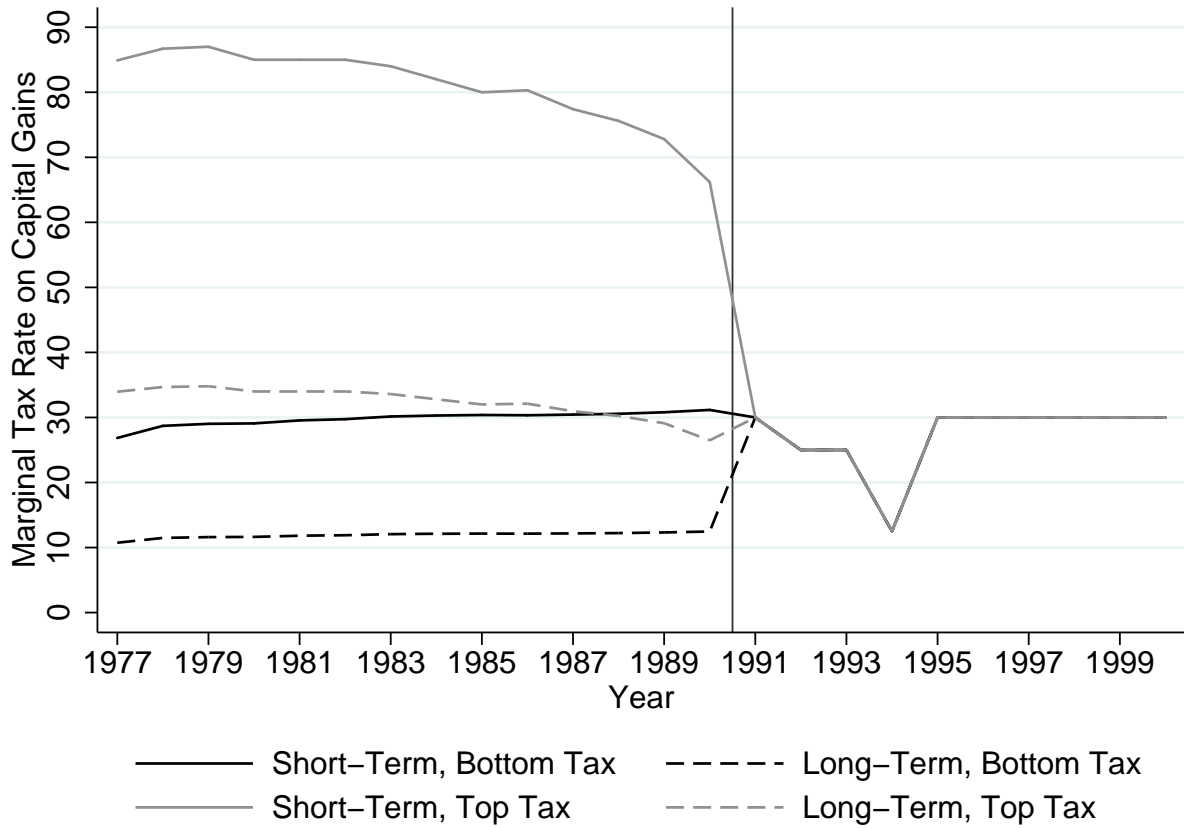


Figure 2: Realized Capital Gains across Individuals: Breakdown by Income Percentiles

This figure plots aggregated realized capital gains over the 1977–2000 period. This figure uses the aggregated capital gains realized by individuals in the top percentile, the top decile, and the remaining taxpayers (P0–P90) in SEK billion. The vertical line separates the years with progressive taxation (before 1991) and proportional taxation (since 1991).

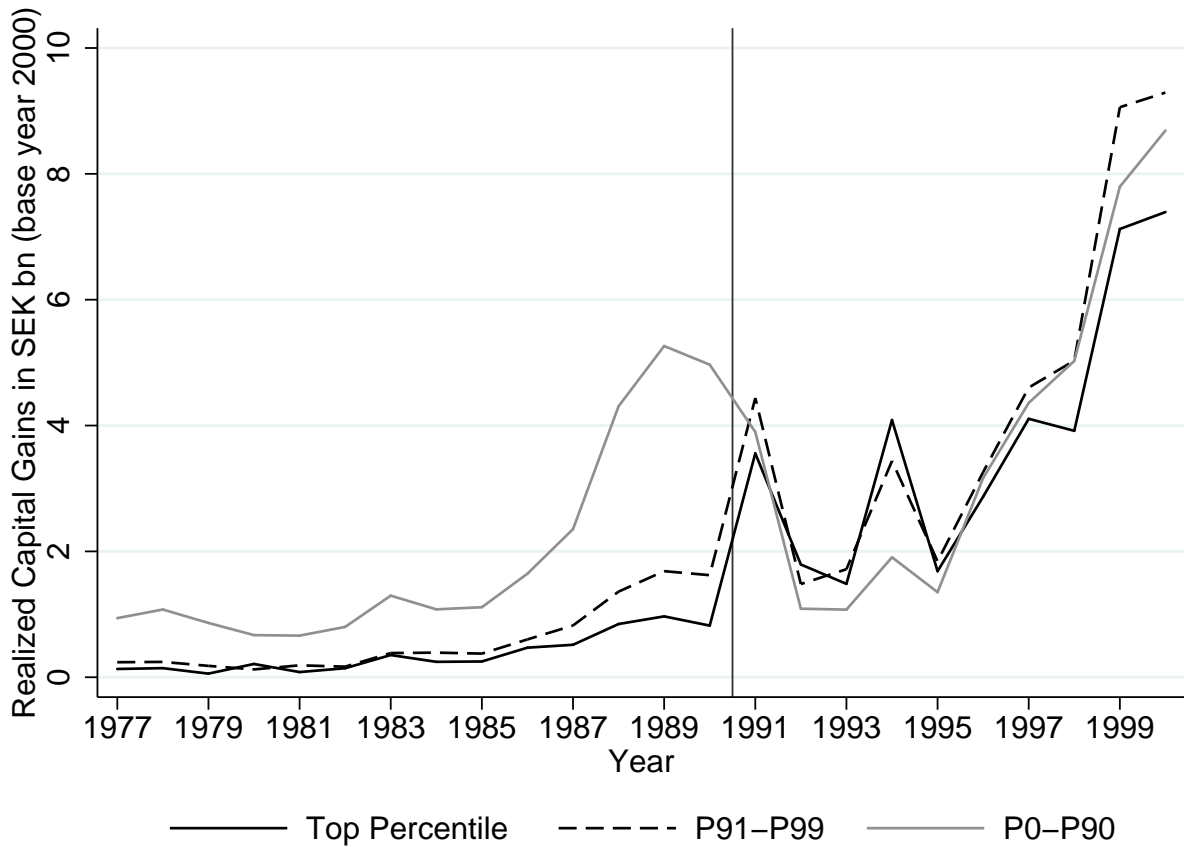


Figure 3: Distribution of Realized Capital Gains across Individuals: Breakdown by Income Percentiles, 1977–2000

This figure plots the distribution of capital gains across individuals. This figure uses the aggregated capital gains realized by individuals in the top percentile, the top decile, and the remaining taxpayers (P0–P90) relative to total realized capital gains by all groups. The vertical line separates the years with progressive taxation (before 1991) and proportional taxation (since 1991).

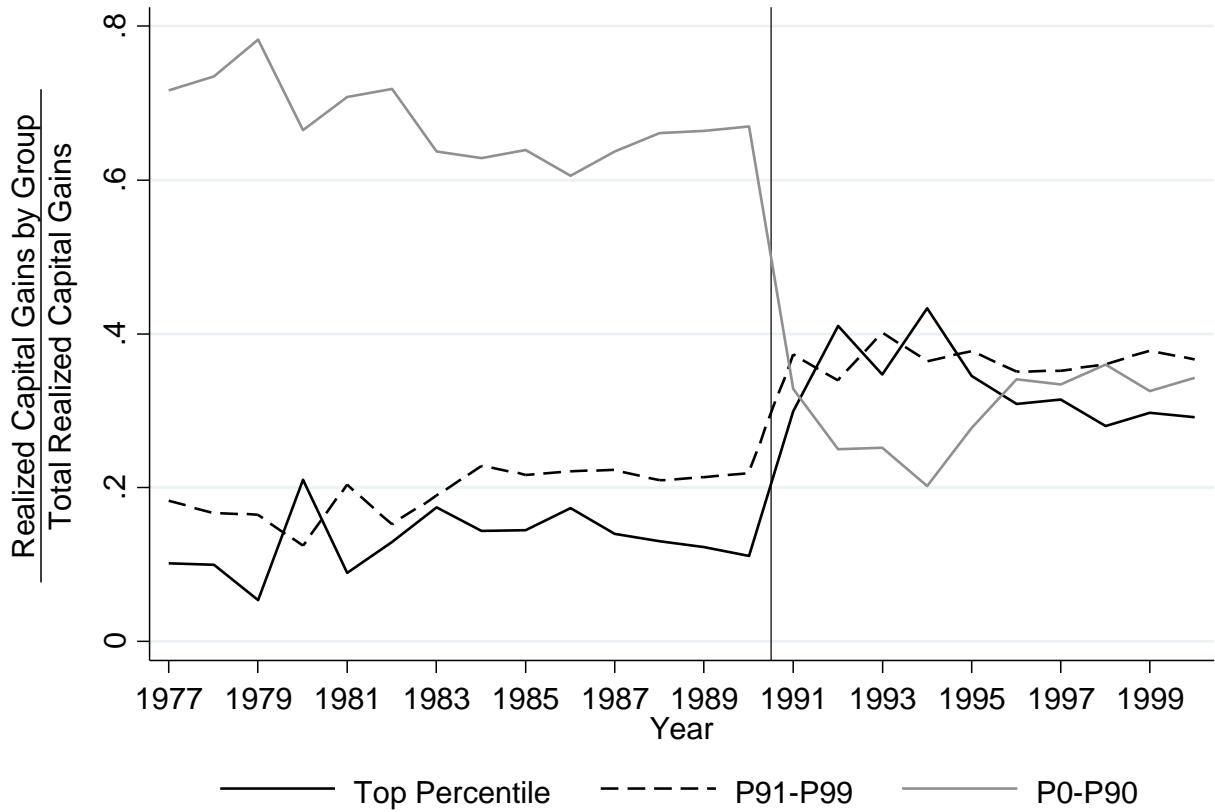


Figure 4: Distribution of Realized Capital Gains across Individuals: Breakdown by Income Change, 1977–2000

This figure plots the distribution of capital gains across individuals. This figure uses capital gains realized by individuals with high negative income changes, individuals with high positive income changes, and individuals with a constant income relative to total realized capital gains by all three groups. The vertical line separates the years with progressive taxation (before 1991) and proportional taxation (since 1991).

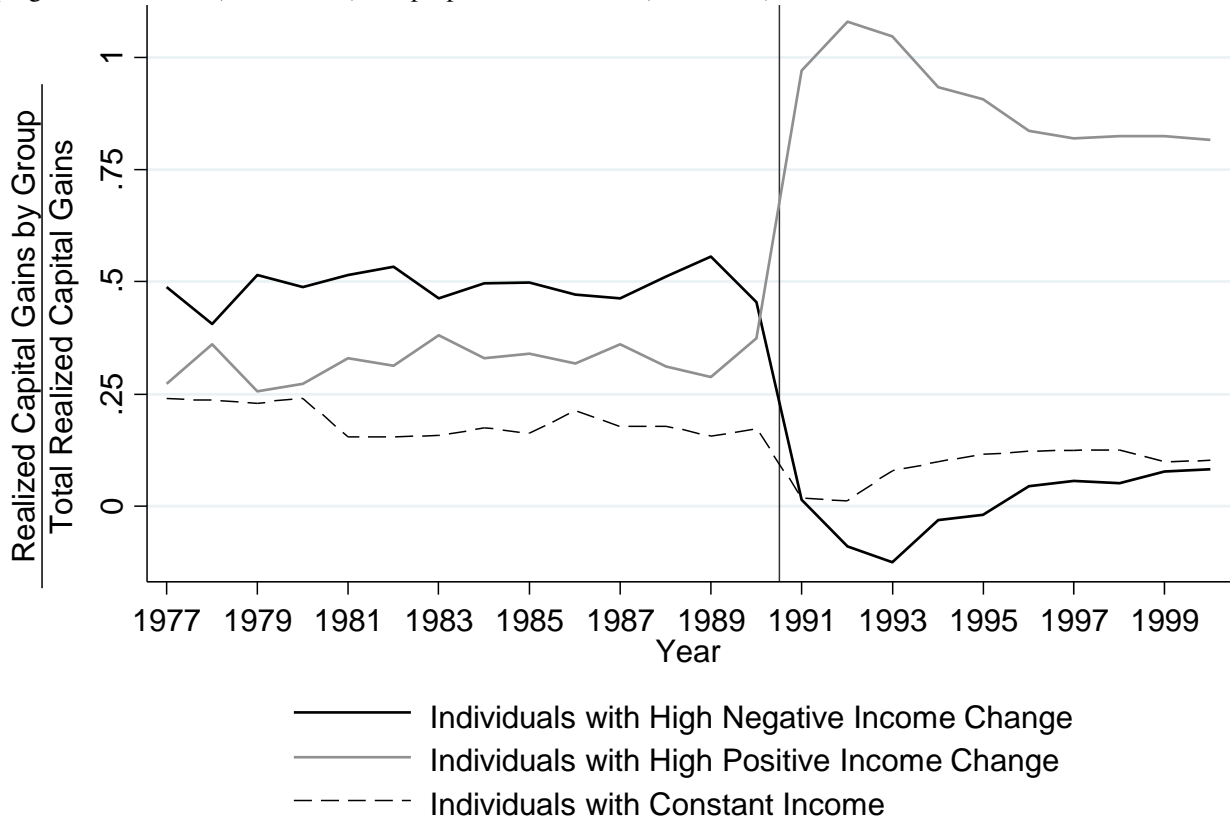


Table 1: Tax Regimes, Income Change, and Expected Trading Responses

	Progressive Tax System	Proportional Tax System	Effect of Regime Change
Negative Change in Income	Tax: Lower rate, more trading Non-tax: More trading because cash is needed	Tax: No tax incentive Non-tax: More trading because cash is needed	Less Trading
Positive Change in Income	Tax: Higher rate, less trading Non-tax: Normal/less trading because cash is not needed	Tax: No tax incentive Non-tax: Normal/less trading because cash is not needed	More Trading

Table 2: Summary Statistics 1977–2000

This table reports summary statistics for the capital gains variables (Panel A) and presents the basic distribution parameters for income, wealth, and demographic controls (Panel B). The variable $CG_Realized$ is an indicator variable equal to one for individuals realizing capital gains and zero otherwise; CG is the amount in Swedish kronor (SEK) of realized capital gains in year t ; $Income$ is the individual's income in year t without capital gains; $AvIncome_{t-2,t}$ is the average income from $t - 2$ to t without capital gains; $\Delta_Income_{t-2,t}$ is the difference between current income ($Income$) and the average income ($AvIncome_{t-2,t}$); and $Wealth$ is reported wealth for tax purposes. All monetary values are reported in thousands of kronor for the base year 2000. The variable Age denotes the taxpayer's age in years; $Female$ is a dummy equal to one if the taxpayer is female and zero otherwise; $Married$ is an indicator variable equal to one if the individual is married and zero otherwise; $Town$ is an indicator variable equal to one for individuals residing in towns (usually) with fewer than 10,000 inhabitants and zero otherwise; $City$ is an indicator variable equal to one for individuals residing in cities with more than 10,000 inhabitants and zero otherwise; $Capital$ is an indicator variable equal to one for individuals residing in the county's capital zero otherwise; $Move$ is an indicator variable equal to one if the individual moved from one municipality to another from $t - 1$ to t and zero otherwise; $Household\ Size$ represents the number of family members in the household; $HS\ Inc$ ($HS\ Dec$) is an indicator variable equal to one if household size increases (decreases) from $t - 1$ to t and zero otherwise; $BusInc$ is an indicator variable equal to one if the individual generates income from business activity and zero otherwise; and $SocAss$ ($Pension$) is an indicator variable equal to one if the individual receives social assistance (pension) and zero otherwise.

Panel A: Capital Gains Variables

Variable	N	Mean	Standard Deviation	10th Percentile	Median	90th Percentile
$CG_Realized$	4,377,477	0.100	0.300	0.000	0.000	1.000
CG	460,186	35.940	171.760	-0.800	5.192	80.333

Panel B: Income, Wealth, and Demographic Controls

$Income$	4,377,477	153.855	114.454	52.331	143.912	253.557
$\Delta_Income_{t-2,t}$	4,377,477	6.127	68.280	-37.182	1.110	53.749
$AvIncome_{t-2,t}$	4,377,477	147.727	97.430	52.833	139.179	241.929
$Wealth$	4,377,477	213.599	2,442.932	0.000	0.000	638.299
Age	4,377,477	49.717	18.368	26.000	48.000	76.000
$Female$	4,377,477	0.510	0.500	0.000	1.000	1.000
$Married$	4,377,477	0.511	0.500	0.000	1.000	1.000
$Town$	4,377,477	0.117	0.322	0.000	0.000	1.000
$City$	4,377,477	0.736	0.441	0.000	1.000	1.000
$Capital$	4,377,477	0.353	0.478	0.000	0.000	1.000
$Move$	4,377,477	0.079	0.270	0.000	0.000	0.000
$Household\ Size$	4,377,477	2.066	1.199	1.000	2.000	4.000
$HS\ Inc$	4,377,477	0.055	0.227	0.000	0.000	0.000
$HS\ Dec$	4,377,477	0.053	0.223	0.000	0.000	0.000
$BusInc$	4,377,477	0.051	0.220	0.000	0.000	0.000
$SocAss$	4,377,477	0.178	0.383	0.000	0.000	1.000
$Pension$	4,377,477	0.350	0.477	0.000	0.000	1.000

Table 3: Income and Capital Gains Realizations

This table presents the coefficient estimates for capital gains realization behavior estimated over 1977–2000. In Columns (1) to (3), I use $CG_Realized$ as the dependent variable. In Columns (4) to (6), I use the natural logarithm of the realized capital gain as the dependent variable. As independent variables, I include the average income as a natural logarithm ($AvIncome_{t-2,t}$), a dummy variable $Post$ equal to one for the years after 1990, and the interaction between the two variables. Further controls include individual-level characteristics. All regressions include individual fixed effects, year fixed effects, and county fixed effects. In Columns (2) and (5), I exclude the years 1992–1994. In Columns (3) and (6), I use a pseudo reform and set $Post$ equal to one for the years after 2000. In this test, I only include the years 1996–2005. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Likelihood to Realize Capital Gains			Average Realized Capital Gain		
	(1)	(2)	(3)	(4)	(5)	(6)
$AvIncome_{t-2,t}$	-0.001** (0.000)	-0.000 (0.000)	0.018*** (0.001)	-0.108*** (0.023)	-0.025 (0.027)	-0.038** (0.015)
$AvIncome_{t-2,t} \times Post$	0.060*** (0.001)	0.076*** (0.001)	-0.004*** (0.001)	0.254*** (0.026)	0.370*** (0.034)	-0.099*** (0.018)
Sample	All Years	w/o 92-94	Pseudo	All Years	w/o 92-94	Pseudo
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,377,477	3,733,780	2,395,634	225,932	176,744	396,867
R-squared	0.304	0.325	0.394	0.641	0.683	0.595

Table 4: Income Change, Capital Gains, and Tax Regimes

This table presents the coefficient estimates for capital gains realization behavior estimated over 1977–2000. In Columns (1) to (3), I use *CG_Realized* as the dependent variable. In Columns (4) to (6), I use the natural logarithm of the realized capital gain as the dependent variable. As independent variables, I include the difference between current income and average income (both measured as the natural logarithm) (Δ_Income), the average income ($AvIncome_{t-2,t}$), a dummy variable *Post* equal to one for the years after 1990, and the interactions between these variables. Further controls include individual-level characteristics. All regressions include individual fixed effects, year fixed effects, and county fixed effects. In Columns (3) and (6), I exclude the years 1992–1994. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Likelihood to Realize Capital Gains			Average Realized Capital Gain		
	(1)	(2)	(3)	(4)	(5)	(6)
Δ_Income	-0.008*** (0.000)	-0.001 (0.001)	0.000 (0.001)	-0.248*** (0.021)	0.134** (0.063)	0.115 (0.071)
$\Delta_Income \times Post$	0.037*** (0.001)	0.019*** (0.001)	0.024*** (0.001)	1.251*** (0.031)	-0.106 (0.100)	0.045 (0.134)
$\Delta_Income \times Post$ $\times AvIncome_{t-2,t}$		0.008*** (0.000)	0.009*** (0.000)		0.333*** (0.022)	0.309*** (0.029)
Δ_Income $\times AvIncome_{t-2,t}$		-0.002*** (0.000)	-0.002*** (0.000)		-0.089*** (0.014)	-0.082*** (0.016)
$AvIncome_{t-2,t}$		-0.002*** (0.001)	-0.000 (0.001)		-0.109*** (0.028)	-0.076** (0.033)
$AvIncome_{t-2,t} \times Post$		0.075*** (0.001)	0.087*** (0.001)		0.494*** (0.030)	0.557*** (0.036)
Sample	All Years	All Years	w/o 92-94	All Years	All Years	w/o 92-94
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,309,077	4,309,077	3,674,840	223,725	223,725	174,752
R-squared	0.302	0.310	0.331	0.667	0.676	0.709

Table 5: Level of Income, Income Changes, and Capital Gains Realizations: Triple Difference Analysis

This table presents the difference-in-differences and difference-in-difference-in-differences coefficient estimates for capital gains realization behavior estimated over 1977–2000. In Columns (1) and (3), I use *CG_Realized* as the dependent variable. In Columns (2) and (4), I use the natural logarithm of the realized capital gain as the dependent variable. The sample includes individuals in the bottom and top deciles of the income change distribution. As independent variables, I include a dummy variable *High Positive Δ* equal to one for individuals in the top decile of the income change distribution, a dummy variable *Post* equal to one for the post-reform years, and the interaction of these two. Additionally, I interact *High Positive Δ \times Post* with a dummy variable equal to one if the individual is in the top 25% (10%) of the average income distribution (*High Income*) in Columns (1) and (2) (Columns (3) and (4)). All other interactions between the three dummy variables and the main effects are included but not tabulated. Further controls include individual-level characteristics. All regressions include individual fixed effects, year fixed effects, and county fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	High Income: Top 25%		High Income: Top 10%	
	CG_Realized (1)	CG (2)	CG_Realized (3)	CG (4)
High Positive $\Delta \times$ Post	0.071*** (0.003)	86.100*** (9.123)	0.078*** (0.003)	100.988*** (8.981)
High Positive $\Delta \times$ Post \times High Income	0.242*** (0.012)	176.377*** (23.765)	0.273*** (0.018)	196.072*** (30.335)
Controls	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	480,320	40,385	480,320	40,385
R-squared	0.515	0.801	0.514	0.801

Table 6: Level of Income, Income Changes, and Capital Gains Realizations: Triple Difference Analysis, Robustness to Exclusion of 1992–1994

This table presents the difference-in-differences and difference-in-difference-in-differences coefficient estimates for capital gains realization behavior estimated over 1985–1996 but excluding the years 1992–1994. In Columns (1) and (3), I use *CG_Realized* as the dependent variable. In Columns (2) and (4), I use the natural logarithm of the realized capital gain as the dependent variable. The sample includes individuals in the bottom and top deciles of the income change distribution. As independent variables, I include a dummy variable *High Positive Δ* equal to one for individuals in the top decile of the income change distribution, a dummy variable *Post* equal to one for the post-reform years, and the interaction between these two. Additionally, I interact *High Positive Δ \times Post* with a dummy variable equal to one if the individual is in the top 25% (10%) of the average income distribution (*High Income*) in Columns (1) and (2) (Columns (3) and (4)). All the other interactions between the three dummy variables and the main effects are included but not tabulated. Further controls include individual-level characteristics. All regressions include individual fixed effects, year fixed effects, and county fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	High Income: Top 25%		High Income: Top 10%	
	CG_Realized (1)	CG (2)	CG_Realized (3)	CG (4)
High Positive $\Delta \times$ Post	0.079*** (0.004)	81.518*** (14.136)	0.085*** (0.004)	94.529*** (13.832)
High Positive $\Delta \times$ Post \times High Income	0.193*** (0.017)	128.764*** (35.826)	0.208*** (0.024)	137.076*** (44.303)
Controls	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	357,756	28,088	357,756	28,088
R-squared	0.572	0.848	0.571	0.847

Online Supplement Material to Tax Regimes and Capital Gains Realizations

Martin Jacob

WHU – Otto Beisheim School of Management

martin.jacob@whu.edu

A Introductory Remarks

This online supplemental material presents additional statistics and alternative specifications for the analysis carried out in the paper “Tax Regimes and Capital Gains Realizations.” The online supplement comprises four parts: The first part provides additional statistics on the importance of lottery bonds in the Swedish economy in the 1980s. The second part presents additional statistics on average portfolio composition. These data are, unfortunately, only available for two years for a small sample of households. Third, I present results on Hypothesis 1 using an alternative research design. Finally, I present an alternative way of providing graphical evidence for Hypothesis 2.

B Additional Statistics on the Importance of Lottery Bonds

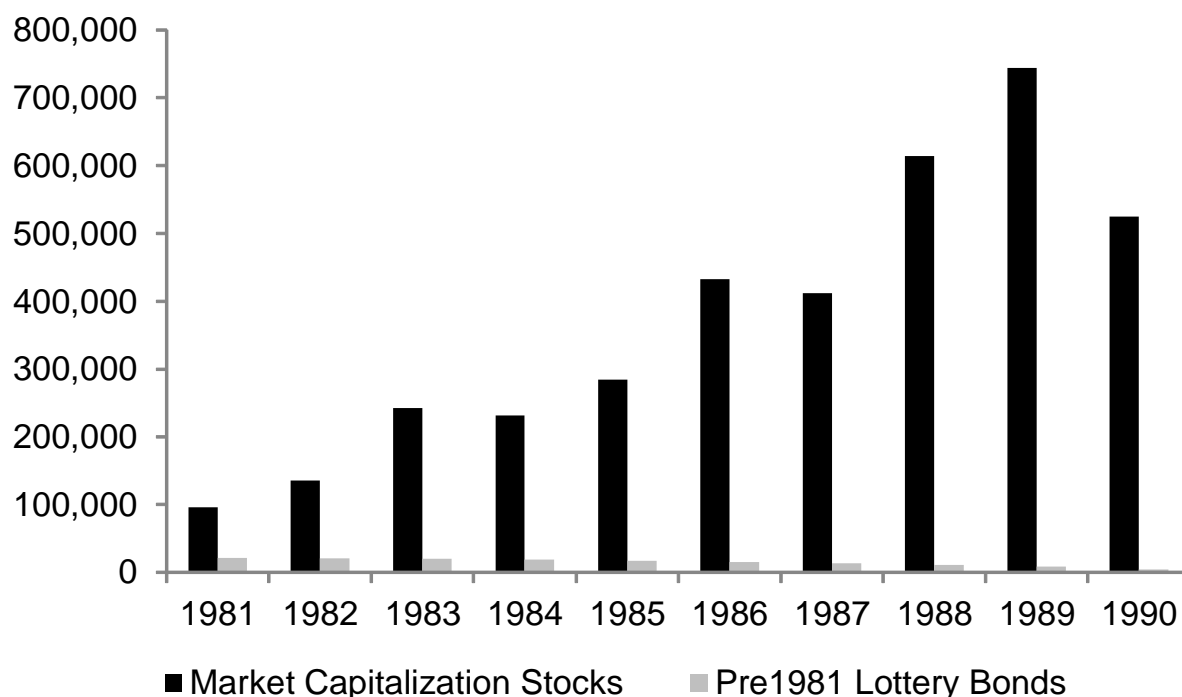
One concern when studying the effect of capital gains taxes on realization activity is the presence of lottery bonds in Sweden. Green and Rydqvist (1997, 1999) show that Swedish taxpayers utilize lottery bonds to offset capital losses against capital gains from selling stocks. However, this tax saving opportunity is only possible if the lottery bond was issued before 1981. For lottery bonds issued in 1981 or later, capital losses from lottery bonds can only offset capital gains from other lottery bonds. Hence, one concern about comparing pre- and post-reform outcomes is that lottery bonds that were issued prior to 1981 could bias my findings.

Figure A.1 plots the volume of eligible lottery bonds. Evidently, the volume of such outstanding lottery bonds that were issued before 1981 gradually declined from SEK 21 billion in 1981 to SEK 15.5 billion in 1986 and to SEK 4.3 billion in 1990. At the same time, the market capitalization of stocks rose from about SEK 96 billion in 1981 to SEK 433 billion in 1986, reaching SEK 525 billion in 1990. In other words, the eligible lottery bond market was equivalent to less

than 1% of the Swedish stock market capitalization (in 1990). Given the relative market sizes, the lottery bond market should not explain the main findings. To additionally test the robustness of my results, I rerun the main analysis around the 1981 change in lottery bond regulations and find no significant changes in capital gains realization behavior around this pseudo-reform.¹⁸

Figure A.1: Lottery Bonds and Stock Market Capitalization, 1981–1990

This figure plots the volume (in SEK million) of outstanding lottery bonds issued before 1981 and the stock market capitalization of Swedish listed firms over 1981–1990.



C Additional Statistics on Portfolio Composition and Short-Term versus Long-Term Gains

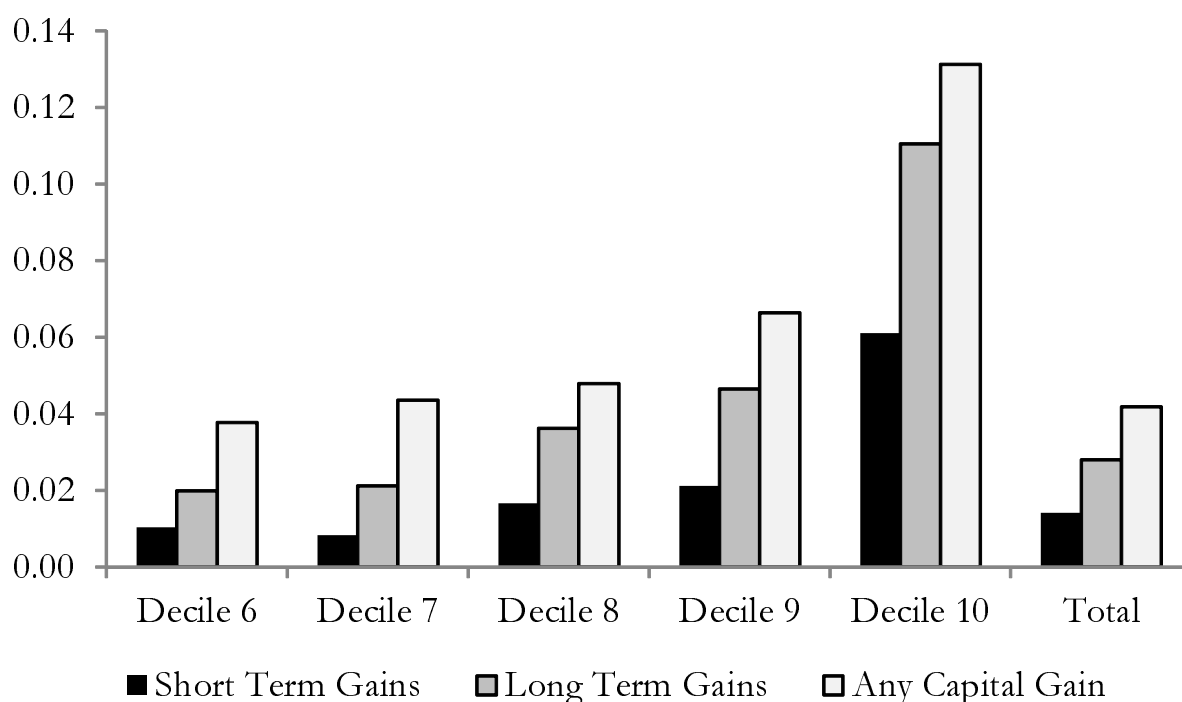
One caveat about my analysis is that my capital gains measure captures all sources of capital gains. Actual short- and long-term capital gains tax rates are not observable in the panel. Therefore, I must define the amount of capital gains as the net realized capital gains over all transactions (gains and losses) in one fiscal year. With respect to the holding period, net capital gains comprise the taxable part of all capital gains in one year, that is, 40% of all long-term gains and 100% of all short-term gains before 1991 and all capital gains as of 1991. This information is available only in another data set, namely, the Household Income Distribution Survey (HINK) data, for

¹⁸ The results are available upon request.

24,080 individuals. However, it is restricted to one cross section of 1989. The composition of long- and short-term capital gains for this subsample is shown in Figure A.2. About 2.8% (1.4%) of all individuals realize long-term (short-term) capital gains in 1989. For the top decile of the income distribution, the percentage of individuals with long-term gains is 11.1%. Despite the high marginal tax rates on short-term gains, about 6% of individuals in the top decile realized short-term gains in 1989. This suggests that short-term as well as long-term capital gains were realized under progressive taxation.

Figure A.2: Short-Term versus Long-Term Capital Gains, 1989–1990

This figure plots the fraction of individuals with short-term, long-term, and any capital gains for different income deciles. The statistics are based on 24,080 individuals in 1989, using the HINK data set.

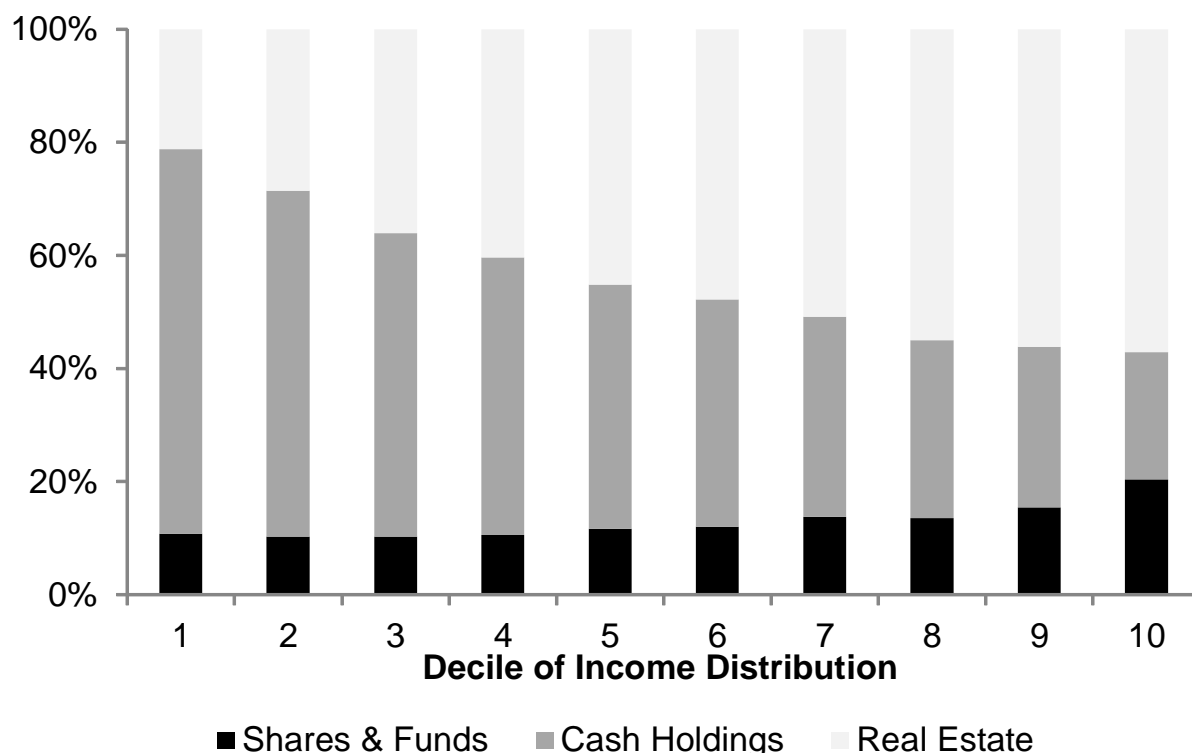


Another caveat about the data in the paper is that I do not have information on the exact portfolio composition for each individual. Again, such wealth data are only available for a subsample, using the HINK data. Specifically, there is some aggregated information on portfolio composition based on 19,708 individuals in 1989 and 1990 from the HINK data. I sort these individuals into deciles in accordance with the income deciles from the Longitudinal Individual Data (LINDA). For these deciles, I then compute the average portfolio shares of stocks and mutual funds, cash holdings, and real estate. The results in Figure A.3 indicate that the relevance of stocks and funds increases in income. Some 10.8% of the average portfolio of individuals in the bottom decile consists of shares and funds. This fraction increases to 20.4% for the top decile. About 44% (70%)

of low-income (high-income) individuals own shares, funds, or other securities. The importance of real estate (cash holdings) increases (decreases) from 21% (68%) in the bottom decile to 57% (23%) in the top decile.

Figure A.3: Average Portfolio Composition, 1989–1990

This figure plots the average portfolio composition (shares and funds, cash holdings, and real estate wealth) for individuals in various deciles of the income distribution. The statistics are based on 19,708 individuals in 1989 and 1990, using the HINK data set.



D Alternative Estimation Specification

In this section, I use an alternative estimation approach to test Hypothesis 1. In the paper, I use a difference-in-differences approach with one continuous variable and one dummy variable. Here, I divide individuals into income percentiles. I then regress the following regression for each income percentile:

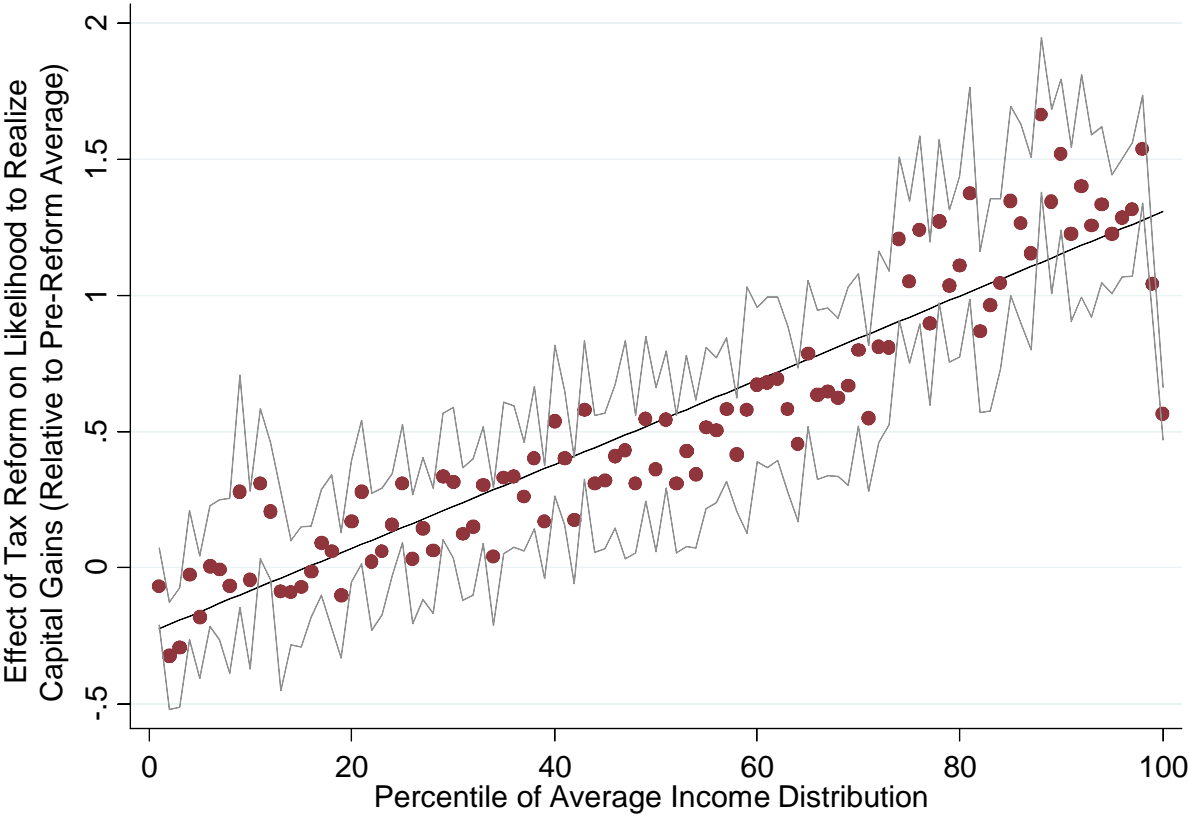
$$CG_Realized_{i,t} = \alpha_0 + \beta \cdot Post_t + \sum_{a=1}^3 \gamma_a \cdot I_{i,t-a} + \chi \cdot X_{i,t-1} + \alpha \cdot County_i + \epsilon_{i,t} \quad (4)$$

where $CG_Realized_t$ is an indicator variable equal to 100 for individuals realizing capital gains in year t . The variable of interest is $Post_t$, a dummy variable for the post-reform period that takes

the value of one after enactment of the reform and zero for years prior to 1991. If the effect of the reform increases in income, the coefficient of *Post* is expected to increase in income. The first set of control variables includes three lags of income and taxable wealth, denoted by vector *I*. The second set of control variables (vector *X*) consists of income deviation, marital status, household size, and indicator variables for pension, social assistance, business income, and increase, as well as decrease in household size. I further include a dummy variable that takes the value one if the individual resides in a small town, a large city, or the county capital. Third, I control for regional disparities between 21 counties in Sweden and include county fixed effects (*County_i*). I restrict the analysis to the years 1988–1993.

Figure A.4: Difference in Capital Gains Realizations by Income Percentile, 1988–1993

This figure depicts the increase in the likelihood of realizing capital gains in each income percentile around the 1991 tax reform. The difference between post-reform (1991–1993) and pre-reform (1988–1990) realization activity is estimated separately for each percentile of the income distribution. Thus, I divide individuals into income percentiles. This figure plots the β coefficients of the propensity to realize capital gains. The gray lines indicate the upper and lower 95% confidence intervals of the point estimates. The estimated coefficients are normalized by the unconditional pre-reform averages. This approach ensures that the results are not misinterpreted. Absolute changes do not recognize differences in stock market participation, the penetration of financial assets, or pre-reform realization activity. By normalizing with pre-reform averages, I find the estimates reflect relative changes in realization behavior and ensure the comparability of the results. I then regress the relative increases against the percentile rank and simply treat relative coefficients as data points.



The results for the β coefficients of the propensity to realize capital gains are illustrated in Figure A.4. The estimated coefficients are normalized by the unconditional pre-reform averages. This approach ensures that the results are not misinterpreted. Absolute changes do not recognize differences in stock market participation, penetration of financial assets, or pre-reform realization activity. By normalizing with pre-reform averages, the estimates reflect relative changes in realization behavior and ensure the comparability of results. I then regress the relative increases against the percentile rank and simply treat relative coefficients as data points. The effect increases in income percentile rank. The linear regression yields a point estimate of 0.015 and a very high t-statistic. The R-squared value of the 100-data point regression is 85%.

For the first 40 percentiles, the difference between post- and pre-reform realization activity is small and often insignificant. I find positive and statistically significant results for higher percentiles. The likelihood that individuals in the top 20th percentile of the income distribution realize capital gains more than doubles after the reform (relative change $\geq 100\%$). The results are very similar when the 1985–1996 sample is analyzed. Still, the magnitude of the effect is surprising, since the tax rates on long-term capital gains are almost constant in the top tax brackets around the reform. The tax wedge between capital gains income and labor income, as well as the salience of the flat capital gains tax, could explain this effect.

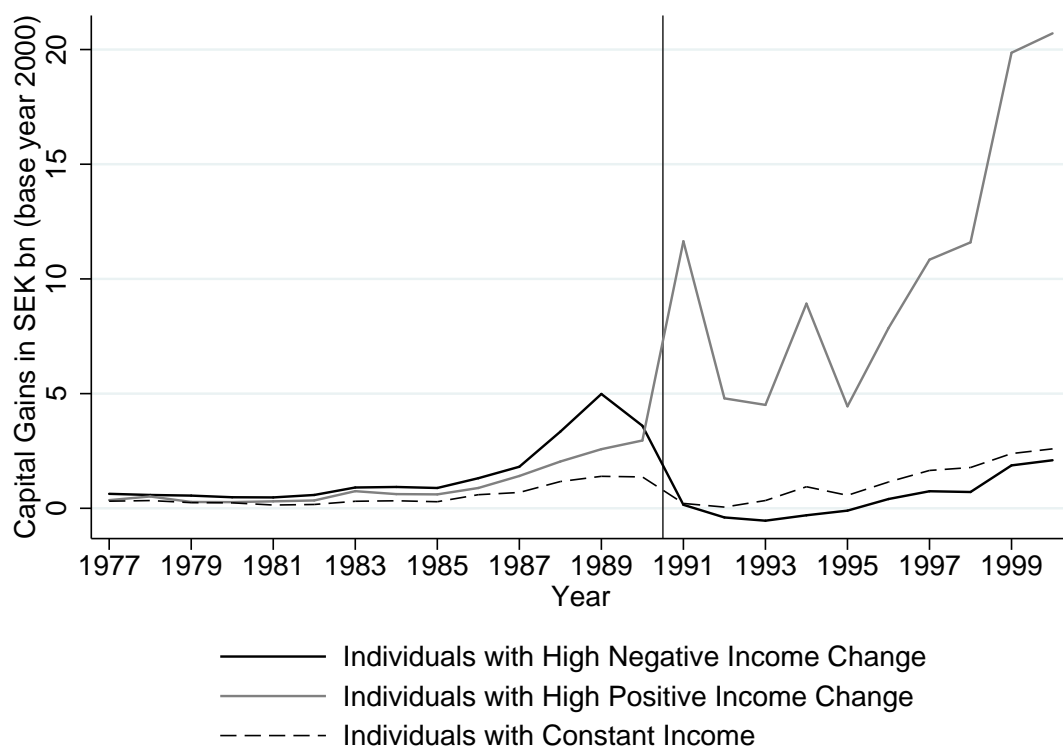
E Tax Regimes, Capital Gains Realization, and Income Changes

The final section of the online supplement material presents graphical results supporting Hypothesis 2. I follow the approach in the paper and track the capital gains realizations of individuals with high negative and high positive changes in income over time. I sort observations into the deciles of the difference between current income and the three-year average income scaled by the three-year average income separately for each year. I then examine aggregated capital gains realized by individuals with (1) high negative income changes, (2) high positive income changes, and (3) constant income. In contrast to the paper, aggregated capital gains are not normalized. Instead, Figure A.5 uses unscaled capital gains. Figure A.5 supports the main analysis from the paper. It shows substantial differences in capital gains realization activity with respect to income changes across tax regimes. Under progressive taxation, individuals with negative changes in income (solid black

line) realize more capital gains than individuals with positive income changes (solid gray line) or a constant income (dashed black line) in each sample year. Under progressive taxation, individuals with high negative income changes—or potential liquidity issues—realize more capital gains than the other two groups. In contrast, individuals with high positive income changes realize less capital gains than individuals with positive income changes (solid gray line) or a constant income (dashed black line). This pattern is consistent with Hypothesis 2.

Figure A.5: Realized Capital Gains across Individuals: Breakdown by Income Change

This figure plots aggregated realized capital gains over 1977–2000. This figure uses capital gains realized by individuals with high negative income changes, individuals with high positive income changes, and individuals with a constant income, in billions of Swedish kronor, for all three groups. The vertical line separates the years with progressive taxation (before 1991) and proportional taxation (since 1991).



References used in the Online Supplemental Material

Green, Rick and Kristian Rydqvist (1997): The Valuation of Non-Systematic Risks and the Pricing of Swedish Lottery Bonds, *Review of Financial Studies*, 10 (2): 447–479.

Green, Rick and Kristian Rydqvist (1999): Ex-Day Behavior with Dividend Preference and Limitations to Short-Term Arbitrage: The Case of Swedish Lottery Bonds, *Journal of Financial Economics*, 53 (2): 145—187.