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Taxing Wealth: Evidence from Switzerland
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ABSTRACT

We study the effects of wealth taxation on reported wealth. Our analysis is based on data for Switzerland, which has the highest rate of annual wealth taxation in the developed world. While the wealth tax base is defined at the federal level, tax rates vary considerably across locations and over time. We use aggregate data on wealth holdings by canton and individual-level data for the canton of Bern. Our estimated behavioral elasticities substantially exceed those of the taxable income literature. We also find that taxpayers bunch below the tax threshold, that observed responses are driven by changes in wealth holdings rather than mobility, and that financial wealth is somewhat more responsive than non-financial wealth.

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The rise in inequality seen in many developed nations over the past four decades has spurred new interest in the taxation of wealth. Inequality has increased in terms of both income (Atkinson, Piketty and Saez, 2012) and wealth (Piketty, 2014; Saez and Zucman, 2014). This has led economists to advocate increased taxation of wealth levels, either annually or at death. Most prominently, Piketty, Saez and Zucman (2013) have proposed the adoption of an "ideal" combination of taxes on capital, covering annual net worth in addition to capital income and bequests.

Yet, there is as yet very little evidence on the behavioral responses triggered by regular wealth taxation. This lack of evidence is seen by some economists as a cause for caution. For example, according to McGrattan (2015, p. 6), "(w)ithout a quantitatively valid theory or previous experience with taxing financial wealth, economists cannot make accurate predictions about the impact that such taxes will have on either aggregate wealth or its dispersion. Thus, any proposals to tax wealth are, at this point, premature". Auerbach and Hassett (2015, p. 41) argue that "we find little support for Piketty's particular approach … elsewhere in the literature".

A number of countries have taxes on wealth in its various forms. Most common are regular taxes on physical property, which are levied by every OECD nation and amount to 3.3 percent of total tax revenue for the average country.[1] More than half of OECD nations have taxes on bequests, but these taxes amount on average to only 0.4 percent of tax revenue. Less common still are recurrent taxes on personal wealth holdings – the focus of this paper. Such taxes are levied by only five OECD nations, raising 0.6 percent of tax revenue on average.[2] As shown in Table 1, wealth taxes loom largest in Switzerland (3.3% of tax revenue), followed at some distance by Luxembourg (1.6%) and Norway (1.1%). Sizeable increases in these wealth taxes could offset wealth inequality. But they may also significantly distort wealth accumulation and location choices. Wealth taxes appear to be losing, rather than gaining, political support: Table 1 shows that of the 14 OECD nations that raised recurrent taxes on wealth in 1995, only 5 still did so in 2014.

There are a host of studies to show that reported income is only modestly elastic with respect to income taxation (see Saez, Slemrod and Giertz, 2012, for a review). *Ex ante*, it is unclear whether taxable wealth will be more or less elastic than taxable income. On the one hand, for

[1] Real estate taxes account for fully 11.4 percent of tax revenue in the United States but only 0.6 percent in Switzerland. We return to this issue below. All statistics from http://stats.oecd.org/Index.aspx?DataSetCode=REV, for the year 2012.

[2] The other major category of property taxation is taxes on financial and capital transactions, which are levied by virtually every nation (the U.S. being the major exception) and amount to 0.4% of GDP on average.

most taxpayers, income is predominantly labor income, which is at least partially in the control of their employers and not themselves, while wealth levels are arguably more fully in the control of the taxpayer. Moreover, labor income for the employed is easier for tax authorities to monitor than are wealth levels. On the other hand, most taxpayers hold the majority of their wealth in illiquid form (their home), and that is hard to adjust as tax rates change, at least in the near term. In addition, even liquid assets may be difficult to adjust in large quantities in a short period. Ultimately, the size of the elasticity of wealth to wealth taxation is therefore an empirical question.

As reviewed below, the effect of wealth taxation, either through bequests or through annual wealth taxes, on taxable wealth has received much less scientific attention. This to some extent reflects the fact that many countries tax only the very wealthiest individuals, and administrative data on wealth holdings are not available below the taxable threshold, making it difficult to measure behavioral responses.

In this paper we address this shortcoming by studying Switzerland, the country with the largest level of annual wealth taxation, relative to the size of government, in the developed world. More importantly for our purposes, these wealth taxes are levied from fairly low exemption levels so that data are available for a large share of households. And, even more importantly, these taxes are all raised at the cantonal level, with no centralized federal wealth taxation. This leads to sizeable variation both across cantons and within cantons over time. Moreover, within cantons, different municipalities have "multipliers" which shift wealth taxation up and down over time.

The final advantage of the Swiss case is that we have available two complementary data sets that can allow us to study how wealth responds to taxation. The first dataset contains aggregate taxable wealth by canton and wealth bracket over the decade 2003-2012. This allows us to consider aggregate responses of wealth holdings to rich inter-cantonal time variation in wealth tax levels and schedules, which is the ultimate response of policy interest. But they do not allow us to fully understand the underlying dynamics through which wealth changes as tax rates change.

We therefore supplement the national data with individual-level data on wealth holdings from the canton of Bern. These data provide information for the decade 2001-2011. For each taxpayer they contain data on wealth holdings as well as a long list of additional items that feature in tax declarations. These data allow us to understand certain mechanisms through which wealth responds to taxation.

Our results from both approaches are consistent: reported wealth holdings in Switzerland are very responsive to wealth taxation. We estimate that a 0.1 percentage-point rise in wealth taxation lowers reported wealth by 3.5% in aggregate. Expressed relative to taxable capital income flows, this implies a net-of-tax elasticity of roughly 1.2, which is large compared to the elasticities typically estimated in the income literature. The elasticity of tax revenues with respect to tax rates is only -0.2, however, implying that current rates are well below the revenue maximizing rate.

This result is robust to variation in the empirical model, and appears fairly constant throughout the wealth distribution. We also find no effect of wealth holdings to income taxation. We find a significant and quantitatively comparable response to taxes on bequests on a per year basis.

Using the Bern micro data, we also estimate a sizeable response, although one that is only about two-thirds as large as in the aggregate data. We show that some of this response occurs through bunching below taxable income thresholds. We also find that this response is driven by changes in reported wealth and not by mobility. Finally, we show that the response is somewhat larger for financial assets than for non-financial assets. Taken together, our aggregate and micro-data results suggest that there is little distortion to wealth holdings from income taxation, but that the annual wealth tax has a considerable impact on wealth accumulation.

Our paper proceeds as follows. We begin in Section I with a literature review of the relevant studies. Section II describes the Swiss institutional context. Section III presents our data and Section IV the empirical strategy. In Section V we show our results from the aggregate data analysis, while Section VI shows results from the Bern data and discusses the comparability of results. Section VII concludes.

I Background: Literature Review

While there is a sizable literature on the measurement and interpretation of reported income responses to income taxation, research on the impact of taxation on the level of wealth holdings remains scant.

In writing this paper, we became aware of two recent papers that in some respects parallel our analysis. Seim (2015) uses behavioral responses at tax kinks and detailed administrative data

for Sweden to infer the elasticity of taxable wealth with respect to the net-of-tax rate. He finds elasticities with respect to net-of-tax-wealth that range from 0.1 to 0.3. Those responses however seem to be attributable entirely to evasion and avoidance. No evidence is found of real responses.

We feel that this approach has a number of limitations relative to our own. First, Sweden being a unitary state, there is no within-country variation, and moving responses cannot therefore be estimated. Second, bunching-based estimates have been shown to be potentially less revealing of long-run (frictionless) responses than reform-based estimates (Kleven and Schultz, 2014). Third, this approach does not allow the authors to jointly consider the impact of both wealth and other taxes. Finally, the individuals at the kinks may not be representative of taxpayers at large, the Swedish wealth tax having applied only to the top four percent of the wealth distribution.[3]

Zoutman (2015) uses a recent tax reform in the Netherlands for a difference-in-difference analysis of the response of household savings to changes in the taxation of financial wealth across samples of different household types. Translated into an elasticity with respect to the net-of-tax-rate on an assumed 6% capital return, his results imply a maximum elasticity of about 1.1. While interesting, the Dutch data offer a similarly limited laboratory to the Swedish case: there is no intra-national variation, and the impact of wealth and income taxes cannot be separately identified. Moreover, housing wealth is exempt from the Dutch wealth tax.[4]

Also related is research on the impact of bequest taxation on wealth holdings at death. This small literature is reviewed in Kopczuk (2009), who concludes that studies based on U.S. data point to a modest elasticity of taxable estates with respect to the bequest tax rate of between 0.1 and 0.2.

The impact of capital income taxation on the composition of wealth holdings has been studied as well (e.g. Poterba and Samwick, 2003; see Poterba, 2001 for a review). This research tends to find that the form of savings is fairly sensitive to its taxability, for example with rising taxes on capital income leading to more savings in tax preferred channels, and with taxes impacting the riskiness of portfolio holdings. But this literature did not focus on the impact of taxation on the total stock of wealth accumulation.

[3] The wealth tax raised 0.7 percent of Swedish tax revenue on average over the sample period 2000-2006. This tax was abolished in 2007. Due to data constraints, the study omits households with children and wealth in the form of closely held business assets.

[4] Martinez (2016) estimates net-of-tax elasticities of the stock of wealthy taxpayers ranging from 1.9 to 2.4 following a cut in top income and wealth tax rates in the Swiss canton of Obwalden. Her analysis does not allow separate identification of the effect of wealth taxes. Moreover, Obwalden is a very small canton with a small initial base of wealthy taxpayers, which likely explains the rather large estimated responses.

More broadly, a large literature has emerged on the impact of income taxation on total income (see Saez *et al*., 2012, for an overview). This literature has generally found modest elasticities of taxable income with respect to net-of-tax rates, with a central range of estimates of 0.1 to 0.4. These studies have furthermore shown that the summary elasticity estimate can mask considerable heterogeneity across various dimensions, such as the income distribution (Gruber and Saez, 2002; Kleven and Schultz, 2014). A number of studies have suggested that this response is largely driven by exclusions and deductions from income, rather than real savings or labor supply behavior. But there has been little attempt to decompose the impact of tax changes into capital and labor income.[5] And none of this literature has examined the impact of taxation on wealth holdings.

II Swiss Institutional Context

As noted earlier, Switzerland is unique in the extent of its reliance on wealth taxation and in the sub-national nature of that taxation. Switzerland is divided into 26 cantons and some 2,500 municipalities. These sub-federal jurisdictions taken together autonomously raise some 54 percent of total tax revenue.[6]

Wealth taxes are cantonal and municipal; there is no federal taxation of wealth. Cantons have been taxing wealth since the early 18th century.[7] Wealth taxes are paid annually on self-reported net wealth, submitted to the tax authorities as an integral part of income tax filings. There is no institutional reporting of wealth, and tax authorities have no direct access to bank information except in criminal cases. This in principle offers scope for tax evasion through non-reporting. However, a 35 percent federal withholding tax is applied to income from all financial assets (mainly interest and dividends). Withholding tax payments are returned upon declaration of the assets in tax filings (backed up with bank statements). This implies an incentive for declar-

[5] A notable exception is Kleven and Schultz (2014), who find capital income to be two to three times as elastic to income taxes as labor income.

[6] Cantons and municipalities are also largely autonomous in terms of public expenditure. Federal revenue represents 46% of consolidated (federal, cantonal and municipal) tax receipts. The main federal-level tax instruments are value added taxes (37% of federal tax revenue and the sole prerogative of the federal government), personal income taxes (16% of federal tax revenue, 17% of consolidated personal income tax revenue) and corporate income (13% of federal tax revenue, 46% of consolidated corporate income tax revenue). The revenue percentages reported in this section are calculated over our main sample period, 2001-2011, and taken from http://www.efv.admin.ch/e/dokumentation/finanzstatistik/index.php.

[7] The federal government raised such taxes intermittently between 1915 and 1957, after which wealth taxation again became the sole prerogative of the cantons and municipalities (see Dell, Piketty and Saez, 2007).

ing financial assets. The strength of this incentive depends on the assets' rate of return. As long as the combined capital income and wealth tax bills amount to less than 35 percent of asset returns, it pays to report financial assets. Tax authorities in addition carry out randomized audits and request documentation for all changes in wealth holdings that are not evidently compatible with changes in other positions of the tax declaration (income, inheritance, real estate transactions, etc.). To our knowledge, no rigorous estimates exist of the extent of wealth tax evasion in Switzerland.

Residents aged 18 and over are legally obliged to submit an annual tax filing. All types of wealth (cash, financial assets, real estate and luxury durable goods) are subject to the same tax, net of debt (mortgage or other). Standard durable household goods, compulsory pension assets and a limited amount of voluntary pension savings are exempt from the wealth tax.[8] Wealth is taxed by the municipality and canton of a taxpayer's main legal residence irrespective of their nationality, except for real estate, which is taxed where it is located.[9] Married couples are taxed jointly, subject to a different schedule from that applied to single households.

Exemption levels vary by canton. In 2014, they ranged from CHF 25,000 (USD 27,500) in the canton of Obwalden to CHF 200,000 (USD 220,000) in the canton of Ticino. In the canton of Bern, which our analysis will mainly focus on, the exemption level stood at CHF 97,000 (USD 107,000) in 2014. Over our 2001-2011 sample period, 30 percent of all Bern taxpayers, and 41 percent of married households, owed a non-zero wealth tax. The wealth tax thus affects much of the middle class in addition to the wealthiest families. Moreover, in the canton of Bern the wealth tax is inframarginal: taxpayers above the wealth threshold pay tax on their entire wealth holdings (less a very small exemption). This creates a "notch" in the wealth tax schedule, which we will discuss below.

The map of Figure 1 illustrates the considerable variation in wealth tax rates that exists across cantons. In 2012, top wealth tax rates varied by a factor of almost eight, ranging from 0.13

[8] In 2012, the maximum tax-exempt annual contribution to voluntary pension schemes was CHF 6,682 for employees and CHF 33,408 for the self-employed. This ceiling is changed annually in line with inflation.

[9] This means that foreign residents (including Swiss nationals) are liable for Swiss wealth taxes only to the extent that they own real estate in Switzerland. Conversely, Swiss residents do not owe Swiss wealth taxes on real estate located abroad.

to 1.00 percent.[10] Wealth taxes are generally highest in the French-speaking cantons of western Switzerland and lowest in the small German-speaking cantons of central Switzerland.

Figure 2 shows that wealth taxes have been on a general downward trend in recent years, but there is considerable variation in the size and timing of tax changes. The cumulative changes in the top wealth tax rate range from -0.46 percentage points to +0.01 percentage points.[11] Tax changes are most pronounced in the central Swiss cantons, among which tax competition has been particularly intense in the early 2000s; but other, more outlying cantons such as Solothurn (SO) or Graubünden (GR) have significantly lowered their wealth tax rates as well. The high-tax western cantons left their rates largely unchanged over the sample period.

The annual wealth tax is the most prominent form of wealth taxation in Switzerland, accounting for 9 percent of tax revenues of cantonal governments. However, other types of wealth taxation exist. Various taxes on real estate account for 5 percent of cantonal revenues. The complicated nature of these taxes and data limitations make it impossible for us to control for them effectively in the regressions. [12] Bequest taxes are much smaller, accounting for 2% of revenues. Tax rates are low in international comparison: the representative tax rate on inheritance (effective average tax rate) was 3.3 percent in 2003 and 3.0 percent in 2008 (data from Brülhart and Parchet, 2014). Exemptions are relatively low as well: the maximum tax-free bequest to siblings, for example, is CHF 20,000 (canton of Nidwalden), and the maximum tax-free bequest to non-related heirs is CHF 10,000 (several cantons). We will incorporate cross-cantonal variation in the bequest tax in our aggregate analysis, although there is no variation in this tax to use in our micro-data estimates. Over the sample period we study, 17 cantons had no bequest tax on direct descendants, 5 cantons had an bequest tax in all years, and 4 had a tax in some years.

The most important source of sub-federal tax revenues is the tax on personal income, which accounts for 67% of those revenues.[13] The personal income tax includes all capital income other than capital gains, and as such may also have important implications for wealth accumulation.

[10] The lowest top wealth tax rate applied in the canton of Nidwalden (NW), while the highest rate applied in the canton of Geneva (GE).
[11] The largest cumulative reduction in the top wealth tax rate was implemented in the canton of Uri (UR), while the largest increase was implemented in the canton of Neuchâtel (NE). See also Figure 2.
[12] Real estate taxes come in three forms that are of similar importance in revenue terms: land taxes (amounting to a top-up on wealth taxes on real estate), real-estate capital gains taxes (a tax on real estate speculation with rates decreasing in the length of time over which an asset is held) and real estate transaction taxes (akin to stamp duties).
[13] See http://www.efv.admin.ch/efv/en/home/themen/finanzstatistik/berichterstattung.html.

We will therefore control for income tax rates in our aggregate analysis as well as (implicitly) in the micro-data estimations.

Cantons have almost complete autonomy over taxation and public spending. The Swiss constitution assigns taxation rights to the cantons by default, with the federal government allowed to raise taxes only subject to explicit legal provisions to be approved in nationwide referenda. The main constraint on the fiscal autonomy of cantons is a federal law in force since 1993 that standardizes the definitions of tax bases and sets out assignment formulas for taxable income and assets that need to be allocated across cantons.

Municipalities in most cantons are bound to apply the canton-level tax schedule but are free to choose the level of taxation by adding their own "multipliers" to the canton-level taxes.[14] Arrangements for allocating expenditure responsibilities between the canton and the municipalities differ, but within their assigned remits, municipalities are largely unconstrained in their expenditure decisions.[15]

For our aggregate cross-cantonal analysis, we will use data from 2003 to 2012. Over this period, as shown earlier, there is sizeable variation both across and within cantons, against an overall trend toward lower wealth tax rates. Over all possible sets of three-year periods in our data set, the mean change in marginal wealth tax rates is -0.042 percentage points, and the standard deviation of those changes is 0.067 percentage points (see Table 2). Scaled to the mean marginal wealth tax rate in the sample of 0.476 percentage points, this implies an average three-year change of 8.8 percent, with a standard deviation of 14.1 percent. There is sizeable variation in income taxation over this period as well, with a mean three-year change in the marginal income tax rate of -0.79 percentage points. Scaled to the mean marginal income tax rate of 14.69 percentage points, this implies an average three-year change in the representative sub-federal income tax burden of 5.4 percent.

[14] Catholic and Protestant parishes are also entitled to apply multipliers to the cantonal schedule. Our data therefore retain for every municipality the parish multiplier of the denomination that is more strongly represented among the municipal population, and we consider this as part of the "municipal multiplier". On average, church tax rates represent around 4 percent of the consolidated (municipal and cantonal) tax rates.

[15] The three biggest expenditure items for both cantons and municipalities are education, health and social protection, together accounting for some 60 percent of spending both by cantons and by municipalities. Assignments within these categories are different. Within education, for instance, cantons are mainly in charge of funding secondary and higher education, while municipalities are responsible for pre-school and primary education.

Our second analysis considers individual-level variation in wealth and income taxation in Bern, the second largest canton in Switzerland, over the 2001-2011 period.[16] Figure 3 shows the variation in top marginal rates across the 382 municipalities in Bern.[17] The range is much smaller than it is nationally, varying from 0.55% to 0.7%. There is not much of a spatial pattern, except for the fact that the northern, French-speaking municipalities generally have somewhat higher taxes. During the period of our study, many municipalities changed their multipliers: Figure 4 shows the variation in top marginal rates over our study period. There is no apparent spatial regularity to changes in municipal multipliers.

III Data

We work with two complementary datasets. The first one covers all 26 cantons over the 2003-2012 period. This dataset has the advantage of offering a maximum of identifying variation on wealth and personal income tax rates, as cantons frequently change their entire tax schedules.

The data report taxable wealth as well as the number of taxpayers in each of 11 brackets of taxable asset holdings per canton and year, ranging from a bracket for zero net wealth to one for more than ten million Swiss francs (see Appendix 1 for details). Our main dependent variable is a canton-year measure of total wealth holdings, taken directly from the original data source.

As our main explanatory variable, we use consolidated (cantonal + municipal) tax rates. We create a weighted average across wealth intervals using the number of taxpayers in each interval. We compute both marginal and average tax rates, as behavioral responses might not be the same with respect to those two measures. For details on the computations, see Appendix 1.

Given the importance of personal income taxes, we also control for those tax rates. As income and wealth are not perfectly correlated, our wealth-interval specific income tax rates are averages weighted across income intervals, based on a cross-tabulation of wealth and income levels computed from our individual-level data on the canton of Bern. Finally, given their potential relevance for wealth accumulation, we control for representative bequest tax rates by canton and year. See Appendix 1 for further details and Table 2 for summary statistics.

[16] The population of Bern was one million in 2014, representing some 12 percent of the country as a whole (8.2 million).

[17] This is the count of municipalities in 2011. There were a number of mergers over our sample period. We take care to eliminate potential artificial effects from municipal mergers in our estimations.

Our second dataset exploits the universe of individual-level administrative tax records for the canton of Bern over the period 2001-2011. These confidential data, containing the majority of items recorded in individual tax declaration, were made available to us in anonymized form by the cantonal tax administration of the canton of Bern.

In total, this dataset contains 6.84 million observations (taxpayer-years). Married couples are treated as one taxpayer. However, we lose observations with zero or negative reported wealth (about a third of taxpayers), and in our main analysis we focus only on taxpayers with initial wealth above the taxable threshold (also about a third of taxpayers).[18] We further reduce the sample size by computing three-year differences using taxpayers whose marital status did not change over a given three-year interval, and eliminating all observations from municipalities that were involved in municipality mergers at some point during our sample period. We are thus left with a dataset containing up to 1.164 million observations for our baseline estimation.[19] We observe a host of useful information, including net wealth, taxable wealth, residence municipality and marital status.

Summary statistics for these data, aggregated to the municipality-year level for comparability with the cross-canton data, are shown in the second panel of Table 2. The table shows that Bern is a relatively high-tax canton. The mean marginal top wealth tax rate is 0.73 percent. The corresponding mean marginal wealth tax rate for a taxpayer with average wealth is 0.53 percent, which compares to a mean rate of 0.48 percent across all cantons. We also see that the standard deviation of log wealth tax rates in Bern after conditioning on jurisdiction and year fixed effects is significantly smaller than that in the cross-canton data (0.012 percent versus 0.047 percent).

The advantage of the Bern data is that they allow us to estimate behavioral responses at a smaller spatial scale and at the individual level. Most importantly, this makes it possible to estimate moving responses separately from responses by non-movers. We can moreover decompose

[18] There seems little reason to be concerned about sample selection bias due to dropping observations with non-positive wealth, since zero wealth is so far below the taxable threshold of between CHF 92,000 and CHF 97,000 CHF over this time period. It seems highly unlikely that individuals would drop to zero wealth in response to a tax above this level. Indeed, we find no effect of municipal tax variation on the incidence of having zero wealth holdings.

[19] Out of 6.8 million observations in our sample, 4.7 million have positive wealth and 2.2 million have wealth above the threshold. We use three-year differences, hence we lose the years 2009-2011, leaving us with 1.6 million observations. Moreover, taxpayers leave the sample for various reasons so that we do not observe them three years after the base year. We also drop taxpayers who change marital status, who move municipalities, or who live in a municipality that was at some point involved in a merger. All these eliminations cost us another 430,000 observations.

responses by types of wealth holdings. The major disadvantage of these data is that they offer considerably less identifying variation than the cross-canton data.

IV Empirical Methodology

Cross-Cantonal Data

As discussed above, we use data on total taxable wealth as well as weighted-average wealth, income and bequest tax rates. Those data allow us to estimate several different models of the impact of wealth taxation on wealth holdings.

We begin with fixed effects estimation of the following log-levels specification:

$$\ln(W_{ct}) = \alpha_0 + \alpha_1 T_{ct}^W + \alpha_2 T_{ct}^Y + \alpha_3 T_{ct}^B + \gamma_c + \delta_t + \theta_c \cdot t + \epsilon_{ct}, \quad (1)$$

where W_{ct} is aggregate taxable wealth in canton *c* and year *t*; T_{ct}^W, T_{ct}^Y, and T_{ct}^B are representative tax rates respectively on wealth, personal income and bequests; γ_c denotes canton fixed effects; δ_t denotes year fixed effects; $\theta_c \cdot t$ denotes canton-specific linear time trends; α_0 to α_3 are parameters to be estimated; and ϵ_{ct} is a stochastic error term. In some models we consider only the wealth tax, while in other models we control for the income and bequest taxes. The canton-specific linear time trends capture any underlying trends that might be driving both wealth accumulation and tax rates. We make the standard assumptions of the fixed-effects panel data model: strict exogeneity of all explanatory variables and independence of observations across cantons. All standard errors are therefore clustered at the canton level to account for serial correlation.

In particular, we assume that the wealth tax rate that is the focus of our analysis is exogenous to wealth accumulation. One may be concerned that wealth tax rates are set in response to wealth holdings, so we consider a variety of approaches to allay this concern. First, we control explicitly for other taxes that may pick up general tastes for taxation in the canton. Second, we estimate models both with fixed effects and in first differences, to control for any canton- specific factors that are correlated with both wealth holdings and tax setting. Third, we include canton-specific trends, so that our results do not reflect underlying secular trends in canton-specific wealth and taste for taxation. Fourth, we estimate similar models using both cross-canton variation (in the aggregate data) and using cross-municipality data (in the Bern-specific analyses).

Finally, we provide a specification check in the Bern data using a group that is exempt from wealth taxation to show that there is no impact on their wealth holdings.

To parallel our later analysis in the micro data, we also consider equation (1) in three-year differences. Relative to the baseline model (1), the differences models capture shorter-term adjustments in wealth as opposed to trend changes over time (relative to a canton linear trend). They also allow us to partition the data more easily according to initial conditions, which we consider below. A sort of consensus has emerged in the taxable income literature that three-year intervals strike the optimal balance between allowing sufficient time for the relevant behavioral responses without excessively blurring the identifying variation (Gruber and Saez, 2002; Kleven and Waseem, 2013; Kleven and Schultz, 2014).

Bern Micro Data

The major advantage of the micro data for Bern is that we can observe individuals longitudinally. This allows us to model individual-level changes in wealth directly. Our tax rate measure for Bern is the maximum combined (cantonal + municipal) rate in each municipality and year. This is the wealth tax rate according to the cantonal schedule, times the cantonal and local multipliers.

Within Bern, we estimate first-differences models to allow us to separate the impact of wealth accumulation among stayers versus mobility effects. We regress three-year changes in log wealth on three-year changes in top wealth tax rates in the taxpayer's residence municipality, as well as on municipality and year fixed effects. The cantonal wealth tax schedule was changed twice during our sample period, in 2008 and in 2011; and the cantonal multiplier changed three times, in 2002, 2008, and 2009. Given the inclusion of year fixed effects in our differences regressions, however, the identifying variation is almost entirely due to changes in municipal tax multipliers.[20] All standard errors are clustered at the municipality level, given that the key coefficient is identified through time variation in municipal multipliers.

[20] See Appendix 1 for details. Just like in the between-canton analysis, we do not account explicitly for real estate taxation in the Bern data. The real estate transfer tax has remained constant over our sample period and does not vary across municipalities. The real estate capital gains tax has remained constant over the sample period and varies across municipalities in proportion to their multipliers. The annual real estate and land tax, while subject to some idiosyncratic variation across municipalities, falls primarily on corporations and other legal entities such as pension funds. We also omit bequest taxes, which have become almost insignificant in the canton of Bern, municipal bequest tax revenues amounting to less than 10 percent of municipal wealth tax revenues.

V Aggregate Results

Base Results

Our main cross-canton estimates are reported in Table 3. We express all taxes in percentage-point terms, which implies that our estimated coefficients are semi-elasticities with respect to a one percentage-point rise in the respective tax rate. This choice facilitates comparisons across coefficients, but it is important to note that a one percentage-point change in the wealth tax corresponds to a very large policy experiment, given that the highest observed wealth tax rate in our data is 0.87 percent.

Our estimate in the first column indicates that a percentage-point rise in wealth tax rates leads to a reduction in declared wealth holdings of 34.5 percent, which is statistically significant. More realistically, a 0.1 percentage-point tax change would lead to a 3.5 percent change in taxable wealth.

In the second column, we include the canton-level marginal income tax rate. This has an insignificant and substantively small impact on wealth holdings. The third column in addition controls for inheritance taxes. This tax has a statistically significant effect, with each percentage-point rise in the inheritance tax lowering wealth holdings by 1.1 percent.

Comparing the magnitudes of these tax coefficients to each other and to existing estimates in the elasticity of taxable income literature is not straightforward: the wealth tax is an annual tax on a stock of wealth; the income tax is an annual tax on a flow of wealth; and the bequest tax is a one-time tax on a stock of wealth.

One means of interpretation is to ask how large the wealth response is relative to the implied net-of-tax rate on the annual flow of capital income. We do not have exact measures of asset returns in Switzerland, but evidence from similar nations suggests returns in 2010 of 4-4.5% in France and 7-7.5% in Germany (Piketty and Zucman, 2014). For the purpose of this illustrative calculation, we assume a rate of return of 6%. The representative marginal (municipal + cantonal + federal) income tax rate on high-income households in Switzerland is around 35%. To this we add the mean average wealth tax rate of 0.5%, which corresponds to 8.3% of a 6% capital return. Hence, the "keep rate" after consolidated income + wealth taxes is 1-(0.35+0.083) = 56.7%. A 0.1 percentage-point rise in the wealth tax would represent an increase in the tax rate on capital return by 1.7 percentage points from 8.3% to

(0.5%+0.1%)/6% = 10%. This in turn implies a fall in the keep rate by 1.7%/56.7% = 3.0%. So, our estimates imply that a 3% reduction in the keep rate lowers wealth by 3.5%, or an elasticity of 3.5%/3.0% = 1.16. This is large relative to previously estimated taxable income elasticities.[21] It is important to note that this keep-rate elasticity is sensitive to what we assume about the rate of return. If we assume 3% instead of 6%, the elasticity drops to 0.5; and if we instead assume 10%, the elasticity rises to 2. Interestingly, even the elasticity implied by a 3% return is larger than the upper bound of the range of estimates for the net-of-tax elasticity of taxable income (ETI) of 0.12-0.40 reported by Saez *et al*. (2012).

While keep-rate elasticities are comparable to those in the ETI literature, policy makers primarily care about the elasticity of the tax base with respect to the tax rate. According to our baseline estimate and at the mean wealth tax rate of 0.5%, the tax rate elasticity is (-0.345·0.5=) -0.18 and hence far to the left of the maximum on the Laffer curve at existing tax rates.

In contrast, we find little effect of the income tax on wealth holdings. We estimate that a 1 percentage-point rise in the marginal capital income tax lowers wealth holdings by 0.1%. This same percentage-point rise in the capital income tax reduces the keep rate by 1 percentage-point or 1% / 56.7% = 1.8%. This implies a net-of-tax elasticity of 0.1%/1.8% = 0.06 - only about five percent as large as the wealth tax elasticity.

It is not surprising that the response of wealth to (capital) income taxation is smaller than the response to annual wealth taxation, for two main reasons. First, the wealth tax burden is much more certain than the capital income tax burden. For a given stock of wealth, the change in tax payments from year to year for a wealth tax will be small. But the change in tax payments on the return to that capital can swing wildly from year to year based on variation in the rate of return. Second, the wealth tax applies to all holdings (other than pensions), while the income tax excludes capital gains.

We also find a statistically significant effect of bequest taxes. Although the estimated coefficients appear small, the behavioral responses they imply are not necessarily smaller than those to the annual wealth tax, since the annual tax is levied many more times than the bequest tax. To compare the coefficients, we need to consider the pattern of wealth accumulation by age. If all wealth is accumulated in the year before death, then the coefficients are directly comparable; if

[21] According to Saez *et al*. (2012), the best available estimates point to a net-of-tax elasticity of taxable income (ETI) in the range 0.12-0.40.

all wealth is accumulated 60 years before death, then the annual wealth tax coefficient should – at a first approximation – be 60 times as large as the bequest tax coefficient. Comparing the coefficients therefore requires computing the years until death for the average dollar of wealth that is taxed by the bequest tax.[22]

To do so, we use the micro data from Bern. We calculate average wealth by age and weight this by the odds of mortality at each age to compute the years until death for the average dollar of accumulated wealth. For mortality we use the rates we observe in our tax data for Bern. In particular, at each age we compute the ratio of the cumulative sum of wealth to that age divided by wealth at that age, yielding the years until death for the average dollar of wealth taxed at that age of death. We then multiply this by the probability of death at each age. This is an imperfect calculation for a number of reasons: we ignore cohort effects in wealth accumulation (although the age-specific averages are ten year averages); we do not use wealth-weighted life tables; we ignore attitudes to uncertainty and bequest motives; and we do not account for intergenerational linkages through bequest tax effects on previous generations. Nevertheless, it should give us a rough order of magnitude in order to compare these estimates.

We find that the years until death for the average dollar of wealth is 38 years. This suggests that to compare the bequest tax and annual wealth effects, we should multiply the bequest tax semi-elasticity by 38, yielding an income-tax equivalent net-of-tax elasticity of 1.4. This implied effect is very similar to that of the annual wealth tax, suggesting comparable effects of the two types of wealth tax on a per-year basis.

Sensitivity

We consider the sensitivity of these results to a variety of specifications and measurements. We begin in the remaining columns 4-6 of Table 3 by using the average rather than marginal wealth tax. We find slightly larger, but overall similar, responses with this alternative tax measure.

Table 4 considers the impact of varying the specification in our aggregate data estimation. We consider fixed-effects estimates as well as first differences with three-year intervals, which parallel the micro-data analysis. We also consider models with and without canton-specific time trends. Our results are very similar in every case. Removing the canton-specific trends leads to

[22] We are grateful to Jim Poterba for suggesting this framing.

slightly higher estimates, but larger standard errors as well. The estimates in differences are almost identical to those from fixed-effects models.

Table 4 also reports alternative approaches to computing inference. The baseline standard errors in Tables 3 and 4 are the usual robust (Eicker-Huber-White) asymptotic standard errors clustered for 26 cantons.[23] Tables 3 and 4 report asymptotic *p*-values and significance levels associated with these asymptotic standard errors based on the *t* distribution as motivated by Stock and Watson (2008).[24] Table 4 also reports bootstrap *p*-values from a wild block bootstrap-*t* that resamples cantons as clusters. Cameron, Gelbach and Miller (2008) show that this is the optimal procedure for 20 to 50 clusters as in our case with 26 cantons. The revised *p*-values generally lead to marginally more significant estimates.

Mechanisms

The canton-level data allow us to make some initial conjectures as to mechanisms that are driving the results. We can explore those mechanisms further in the micro data from Bern. We begin in Table 5 by looking at the effect on the number of wealth taxpayers in the canton, in order to investigate whether the results are driven by mobility rather than wealth accumulation. We find no significant impact on the total number of taxpayers, either using fixed effects or first-differences models. This suggests that mobility out of the cantons is not driving our findings.

Of course, a mobility response would imply that higher taxes deliver no offsetting utility gains to residents through higher spending. In a Tiebout sorting model, higher taxes may not increase mobility because they lead to higher spending that is valued by residents. To address this, we include cantonal plus municipal public expenditures per capita as a control variable in columns 2 and 5 of Table 5.[25] The coefficient on this variable is not statistically significant, and its inclusion does not substantively alter the estimated effects of wealth taxation.

Another alternative is that the wealth response may be driven by a response of asset prices; house prices may adjust in the short run to higher wealth taxes, even if the mobility response is muted. To investigate this explanation, we include a measure of single-family house prices by

[23] We also apply a small sample degree of freedom adjustment, multiplying the variance by $N_c/(N_c - 1)$, where N_c is the number of cantons.

[24] This is the correct asymptotic distribution as $T \to \infty$ and a conservative measure as $N \to \infty$.

[25] Public expenditures per canton and year are provided by the Swiss Federal Finance Administration online at http://www.efv.admin.ch/d/dokumentation/finanzstatistik/. We use total expenditures of the canton and its municipalities („Kantone und ihre Gemeinden“) divided by the cantonal population.

canton and year.[26] We show the results of using this asset price measure as a dependent variable in columns 3 and 6 of Table 5. We find a negative effect of wealth taxes on housing prices, but this effect is not statistically significant. Changes in real estate prices therefore do not appear to drive our estimated elasticities of taxable wealth.[27]

In Table 6, we further decompose our results for taxpayer counts by wealth. In order to do so, we use the first difference estimator cut by wealth category. Here we find that there is an increase in the number of taxpayers with wealth below 100,000, while there is a corresponding decrease in those with wealth above 100,000. Given that there are about twice as many taxpayers with wealth below 100,000 as above 100,000, these two coefficients average to the zero overall coefficient we see in column 1. This suggests that some of the reaction that we see for wealth may be driven by individuals shifting wealth from above to below taxable thresholds, an issue we will explore further within Bern. At the same time, we find effects above 500,000 and above 1,000,000 that are very similar to those above 100,000, suggesting fairly uniform responses of wealth taxpayers throughout the wealth distribution.

To summarize these results, we find that higher wealth taxation has a sizeable and significant impact on stocks of wealth holdings. This is in contrast to the insignificant effect of annual taxes on capital income. Our results do not appear to be driven by canton-level mobility, but there is a suggestion of individuals responding by dropping below taxable thresholds.

VI Micro-Data Results from Bern

We next turn to analysis of micro data from the canton of Bern. As noted earlier, we will use within-canton longitudinal variation in top wealth tax rates, driven by changes in 361 municipalities. We will also exploit these data to more rigorously study bunching below the taxable wealth threshold, the movement of taxpayers to below the threshold, and moving in and out of municipalities in response to tax changes.

The first column in Table 7 presents our baseline estimates from the three-year difference specification for "stayers", meaning those who do not change municipality of residence over any

[26] We use a municipality-year-level single family house price index based on hedonic pricing regressions by the real estate consultancy firm Fahrländer Partner and compute population-weighted means for all cantons using population data for 2010. The hedonic regressions do not include fiscal variables (for a detailed description, see http://www.fpre.ch/en/06_immoi/fpre_Indizes_Immo_Methodenpapier.pdf).

[27] We do, however, observe significant effects on housing prices of bequest taxes. It would be interesting to investigate this further in future research.

given three-year period and who have initial wealth above the taxable threshold. We find that a 0.1 percentage point rise in the annual wealth tax reduces wealth accumulation by 2.3%, which is roughly two-thirds as large as the corresponding aggregate estimate of 3.4%. This is still a large effect, and the aggregate estimate is within its confidence interval, which confirms using different data and identifying variation that wealth accumulation is sensitive to wealth taxation.

The next two columns of Table 7 decompose this result into the response of financial and non-financial wealth. *Ex ante*, it is unclear which type of wealth should be more responsive. Financial wealth is presumably more liquid and easier to adjust to tax changes. On the other hand, non-financial assets, and in particular real estate, have values that are harder to "mark to market" for tax authorities, so if the response is through misreporting, it may show up more readily for non-financial assets.

In fact, we find somewhat stronger impacts on financial than non-financial wealth. For financial wealth we find that a 0.1 percentage point reduction in the tax burden lowers wealth holdings by a statistically significant 3%. For non-financial wealth, we find a reduction that is about half as large and is marginally significant. Given the estimated standard errors, however, we cannot rule out that these effects are the same.

Movements Around the Taxable Threshold

We next consider responses through movements around the tax threshold. Figure 5 shows the distribution of taxpayers by thousand Swiss franc buckets around the tax filing threshold, relative to a fitted polynomial.[28] There is obvious bunching at the threshold, with excess mass to the left of the notch; there is less obvious missing mass to the right of the threshold. To illustrate this more clearly, Figure 6 zooms to the number of taxpayers within CHF 10,000 of the threshold.

While bunching is evident, the magnitude of the excess mass is fairly small. There are 6,404 taxpayers in the excess mass, or 582 taxpayers per year. This is 0.3% of the 203,000 filers on average above the notch. Assuming equal movement from the wealth distribution above the notch to below the notch, this suggests that bunching at the notch accounts for a mere 0.3% reduction in wealth.

[28] Following Chetty, Friedman, Olsen and Pistaferri (2012), the counterfactual frequencies were estimated using a 7-degree polynomial, where we included all observations outside the bunching area of CHF 15,000 to the left of the notch value.

The first column of Table 8 assesses whether changes in municipal taxes lead to movement to below the threshold. Specifically, we take the sample of 1.2 million taxpayers who start above the notch and model the odds of moving below the notch as a function of municipal tax rates. We find that there is a significant response, with each 0.1 percentage point rise in the tax leading 4% of wealth holders to move below the threshold. This is consistent with the movements of population from above to below 100,000 that we saw in the cross-canton data.

Of course, even if there were just a uniform reduction in wealth holdings of 2.3% for each taxpayer following a 0.1 percentage-point rise in the tax, we would expect some movement from above to below the threshold without any particular response of bunching to higher tax rates. Over our sample, the simulated share of filers dropping below the threshold from a uniform 2.3% decrease in wealth accumulation is 0.9% for each 0.1 percentage point rise in the wealth tax. This implies that more than three-quarters of the effect we show in the first column of Table 8 is not mechanical.

Impact on Mobility

The next two columns of Table 8 show the effect of changes in municipal taxation on the odds of moving out of the municipality (where we expect a positive coefficient) or the odds of moving into the municipality (where we expect a negative coefficient). In fact, we find an insignificant impact on the odds of moving both in and out of the municipality. Both coefficients are substantively small. The wealth of movers corresponds to 2.6 percent of the wealth of stayers. So a 0.4% increase in outmoving as a result of a 0.1% increase in wealth tax rates would amount to a 0.01% change in wealth - very small compared to the overall 2.3%. The estimated effect is even smaller for wealth changes due to inmoving.

Therefore, we confirm using the longitudinal data that mobility is not a major driver of the wealth accumulation response.

Specification Check: Non-Wealth Taxpayers

The last column of Table 8 proposes a specification check for our Bern results: looking at the response of those initially below the taxable threshold. For those taxpayers, there should be little impact of the change in tax rates. The only effect should be for the small share of taxpayers who

would move above the threshold if there were a cut in taxes. At the same time, if municipal multiplier changes are responding endogenously to other local factors, then there could be a strong correlation with the wealth of this exempt group.

In fact, as we see in the last column, there is a zero coefficient on the wealth holdings of those below the threshold. Unfortunately, the standard error on this estimate is rather large, so that it is not statistically different from the main estimate. But the result is at least suggestive that there are not unobservable correlates of tax rates that are driving the wealth response that we measure for those above the threshold.

Splits by Initial Wealth

Finally, Table 9 exploits another feature of our micro data: it allows us to decompose the savings response by initial wealth holdings. We split the sample at the median wealth level of wealth-tax payers in Bern, which is CHF 308,951. We show effects on total assets for stayers, and divide that into financial and non-financial assets.

In line with the aggregate data, we find no significant evidence of differential response intensities across wealth levels. The availability of longitudinal data in Bern makes this a more direct test of initial wealth heterogeneity, but the basic finding remains unchanged.

VII Conclusions

The growth in wealth inequality in the developed world has led to a renewed focus on redistributive taxation. This focus has included the notion of expanding the package of redistributive tax tools used by nations to include an annual wealth tax. In fact, OECD nations have been moving in the opposite direction over the past decade, with most nations abandoning annual wealth taxation. The major exception is Switzerland, which has by far the largest wealth tax in the OECD relative to the size of government. Despite the policy interest in this area, there is no evidence on how annual wealth taxes impact wealth accumulation based on variation across multiple jurisdictions.

In this paper we explore the role of annual wealth taxes using policy heterogeneity within Switzerland. We can draw both on aggregate data reporting wealth holdings across cantons, matched to cantonal variation in wealth taxes, and on micro data reporting individual-level

wealth holdings in one canton (Bern), matched to within-Bern variation in wealth taxes. Both data sets deliver the same bottom line: wealth holdings are highly sensitive to wealth taxation. A 0.1 percentage-point increase in wealth taxes leads to 3.4% lower wealth holdings in the cross-canton data, and 2.3% lower wealth holdings in the within-Bern data. While comparisons to the literature on the elasticity of taxable income require some assumptions that allow us to convert stocks to flows, under reasonable assumptions the response of wealth holdings to wealth taxes exceeds standard estimates of the elasticity of taxable income. Nevertheless, the elasticity of revenues with respect to the tax rate suggests that the current rate is below the revenue maximizing rate.

We have a number of other findings as well. First, there is no significant effect of cross-cantonal variation in capital income taxes on wealth holdings. As we discuss, this may reflect the greater certainty of wealth taxes, greater salience, or the exclusion of capital gains from income but not wealth taxes. Second, there is a significant effect of the bequest tax on wealth holdings. On a per-year basis, the effects of a bequest tax and an annual wealth tax are comparable. Third, little of the response appears to arise through taxpayer mobility, either within or across cantons. Fourth, some of the response is through dropping below the taxable threshold, although most of the response occurs above the threshold. Finally, financial assets appear more responsive to taxation than do non-financial assets.

Of course, the results from the Swiss context may not fully generalize to other nations. But the fact that the response occurs primarily through reduced wealth holdings and not mobility suggests that the localized structure of the Swiss tax does not reduce the applicability of these findings to other developed nations. Indeed, Swiss cantons and municipalities are mostly small enough for taxpayers to have a range of jurisdictional (and thus fiscal) options within the same commuting area: if the mobility response to wealth taxation is weak in such a setting, it is even likelier to be weak in larger and less decentralized nations.

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Tables and Figures

Table 1: Wealth Taxes in OECD Countries

	1995	2000	2005	2010	2014
Switzerland	2.87	3.10	3.40	3.42	3.32
Luxembourg	1.59	1.77	1.45	1.39	1.47
Norway	1.31	1.09	1.02	1.12	0.76
Iceland	1.16	0.00	0.00	0.00	0.00
Netherlands	0.54	0.50	0.02	0.01	0.00
Spain	0.44	0.55	0.42	0.03	0.33
Sweden	0.41	0.69	0.36	0.00	0.00
Germany	0.26	0.03	0.01	0.00	0.00
France	0.25	0.38	0.40	0.53	0.53
Italy	0.21	0.00	0.00	0.00	0.00
Denmark	0.19	0.00	0.00	0.00	0.00
Finland	0.08	0.28	0.18	0.00	0.00
Austria	0.06	0.00	0.00	0.00	0.00
Greece	0.05	0.00	0.00	0.00	0.00

Notes: in percent of total tax revenue; only OECD countries that had non-zero wealth taxes in 1995; source: OECD Revenue Statistics (code 4210, Individual Recurrent Taxes on Net Wealth)

Table 2: Summary Statistics

	Obs	Levels						First differences, 3-year intervals			
		Mean	Standard deviation			Min	Max	Mean	Std. dev.	Min	Max
			Overall	One-way	Two-way						
A. Cross-canton data											
Taxable wealth (in million CHF)											
level	260	50,005	62,941	10,131	7,819	2,717	366,768	6,671	9,413	-2,657	57,108
log	260	10.226	1.141	0.161	0.083	7.907	12.812	0.143	0.116	-0.061	0.739
Number of taxpayers											
level	260	183,791	188,324	11,662	9,020	8,816	873,247	7,665	9,789	-2,150	50,056
log	260	11.591	1.119	0.040	0.019	9.084	13.680	0.037	0.022	-0.019	0.126
Marginal wealth tax rate (in %)											
level	260	0.476	0.177	0.063	0.047	0.126	0.855	-0.042	0.067	-0.302	0.009
Average wealth tax rate (in %)											
level	260	0.401	0.151	0.053	0.038	0.121	0.742	-0.037	0.056	-0.245	0.008
Marginal income tax rate (in %)											
level	260	14.692	2.748	0.904	0.489	8.247	21.121	-0.786	0.724	-3.460	0.318
Inheritance tax rate (in %)											
level	260	0.655	1.470	0.667	0.637	0	5.900	-0.187	0.851	-5.900	0.000
Public expenditures per capita (CHF)											
level	260	13,977	3,293	825	720	9,864	28,324	298	1,327	-5,573	7,140
log	260	9.522	0.209	0.054	0.047	9.197	10.251	0.020	0.086	-0.255	0.290
Housing price index											
level	260	166.3	58.7	29.1	16.4	83.6	440.6	24.8	18.7	3.2	97.5
log	260	5.064	0.305	0.140	0.048	4.425	6.088	0.137	0.059	0.028	0.332
B. Bern data											
Aggregate wealth (in million CHF)											
level	3'971	335	1'243	221	219	1	20'857	27	293	-1'865	8'887
log	3'971	4.627	1.393	0.106	0.079	0.223	9.945	0.067	0.108	-0.334	1.502
Number of taxpayers											
level	3'971	1'078	3'448	106	99	12	58'930	36	106	-712	1'877
log	3'971	6.078	1.232	0.052	0.041	2.485	10.984	0.031	0.053	-0.258	0.348
Marginal top wealth tax rate (in %)											
level	3'971	0.728	0.077	0.032	0.012	0.517	0.873	-0.054	0.065	-0.227	0.087
C. Bern data individual level											
Wealth (in million CHF)											
level	2'864'958	0.362	7.315	7.311	7.311	0	3'543	0.041	6	-2'017	3'535
log	2'521'365	11.346	1.907	1.890	1.890	0	21.988	0.161	0.879	-12.782	13.079
Wealth if initial wealth above tax threshold (in million CHF)											
level	1'213'008	0.767	9.010	8.999	8.999	0	3'345	0.059	6	-2'017	1'950
log	1'207'834	12.739	1.052	1.034	1.034	0.000	21.931	0.017	0.478	-12.185	8.730
Marginal top wealth tax rate (in %)											
level	2'864'958	0.747	0.058	0.049	0.015	0.517	0.873	-0.053	0.063	-0.227	0.087

Notes: One-way standard deviation means the variation after controlling for canton fixed effects (cross-canton data) or municipality fixed effects (Bern data); two-way standard deviation means variation after controlling for both canton/municipality and year fixed effets.

Table 3: Effect of Wealth Tax Rate on Taxable Cantonal Wealth

	[1]	[2]	[3]	[4]	[5]	[6]
Marg. wealth tax rate (%)	**-0.345** **	**-0.336**	**-0.347** *			
	(0.163)	(0.200)	(0.198)			
Avg. wealth tax rate (%)				**-0.415** *	**-0.405**	**-0.423** *
				(0.208)	(0.248)	(0.246)
Marg. income tax rate (%)		**-0.002**	**-0.001**		**-0.002**	**-0.001**
		(0.013)	(0.013)		(0.013)	(0.013)
Inheritance tax rate (%)			**-0.011** **			**-0.012** ***
			(0.004)			(0.004)
Year fixed effects	x	x	x	x	x	x
Cantonal linear time trends	x	x	x	x	x	x
N	260	260	260	260	260	260
N cantons	26	26	26	26	26	26

Notes: Fixed effects regressions of aggregate wealth (in logs) on tax rates. Standard errors in parentheses clustered for cantons. Significance * p<0.10, ** p<0.05, *** p<0.01.

Table 4: Effect of Wealth Tax Rate on Taxable Cantonal Wealth, Comparing Specifications and P-Values

	Cantonal time trends			No cantonal timetrends		
	[1]	[2]	[3]	[4]	[5]	[6]
A. Fixed effects estimation						
Marg. wealth tax rate (%)	**-0.345** **	**-0.336**	**-0.347** *	**-0.388**	**-0.424**	**-0.428**
(asymptotic stand. error)	(0.163)	(0.200)	(0.198)	(0.240)	(0.336)	(0.332)
[asymptotic p-value]	[0.044]	[0.106]	[0.092]	[0.118]	[0.219]	[0.210]
[bootstrap p-value]	[0.006]	[0.075]	[0.054]	[0.112]	[0.253]	[0.251]
Marg. income tax rate (%)		**-0.002**	**-0.001**		**0.006**	**0.007**
(asymptotic stand. error)		(0.013)	(0.013)		(0.029)	(0.029)
[asymptotic p-value]		[0.899]	[0.937]		[0.840]	[0.823]
[bootstrap p-value]		[0.919]	[0.936]		[0.842]	[0.832]
Inheritance tax rate (%)			**-0.011** **			**-0.008**
(asymptotic stand. error)			(0.004)			(0.007)
[asymptotic p-value]			[0.011]			[0.266]
[bootstrap p-value]			[0.000]			[0.103]
N	260	260	260	260	260	260
N cantons	26	26	26	26	26	26
B. First difference estimation with 3-year intervals						
Marg. wealth tax rate (%)	**-0.362** **	**-0.359** *	**-0.385** *	**-0.401** **	**-0.409**	**-0.423** *
(asymptotic stand. error)	(0.167)	(0.207)	(0.205)	(0.179)	(0.241)	(0.239)
[asymptotic p-value]	[0.040]	[0.095]	[0.072]	[0.034]	[0.102]	[0.089]
[bootstrap p-value]	[0.005]	[0.043]	[0.032]	[0.014]	[0.126]	[0.105]
Marg. income tax rate (%)		**-0.001**	**0.001**		**0.001**	**0.003**
(asymptotic stand. error)		(0.016)	(0.016)		(0.018)	(0.018)
[asymptotic p-value]		[0.967]	[0.930]		[0.936]	[0.874]
[bootstrap p-value]		[0.962]	[0.930]		[0.927]	[0.876]
Inheritance tax rate (%)			**-0.013** ***			**-0.011** **
(asymptotic stand. error)			(0.004)			(0.004)
[asymptotic p-value]			[0.006]			[0.012]
[bootstrap p-value]			[0.000]			[0.001]
N	182	182	182	182	182	182
N cantons	26	26	26	26	26	26
Year fixed effects	x	x	x	x	x	x
Cantonal linear time trends	x	x	x			

Notes: Fixed effects regressions of aggregate wealth (in logs) on tax rates. Cluster-robust asymptotic standard errors in round parentheses, clustered for cantons. P-values (asymptotic and wild bootstrap-t with 5000 replications) in square parantheses. Asymptotic significance *p < 0.10, **p < 0.05, *** p < 0.01.

Table 5: Effect of Wealth Tax Rate on Number of Taxpayers and on Housing Price

Estimator:	Fixed effects			First differences, 3-year interval		
Dependent variable:	Number of taxpayers (log)		Housing price (log)	Number of taxpayers (log)		Housing price (log)
	[1]	[2]	[3]	[4]	[5]	[6]
Marg. wealth tax rate (%)	**-0.0044**	**-0.0056**	**-0.0206**	**-0.0098**	**-0.0112**	**-0.0254**
	(0.0218)	(0.0214)	(0.0622)	(0.0255)	(0.0257)	(0.0697)
Marg. income tax rate (%)	**-0.0022**	**-0.0023**	**0.0045**	**-0.0019**	**-0.0021**	**0.0072**
	(0.0020)	(0.0020)	(0.0063)	(0.0022)	(0.0021)	(0.0087)
Inheritance tax rate (%)	**0.0015**	**0.0015**	**-0.0066** ***	**0.0007**	**0.0007**	**-0.0053** *
	(0.0012)	(0.0012)	(0.0021)	(0.0015)	(0.0015)	(0.0027)
Public expenditures, total (log)		**0.0081**			**0.0086**	
		(0.0188)			(0.0211)	
Year fixed effects	x	x	x	x	x	x
Cantonal linear time trends	x	x	x	x	x	x
N	260	260	260	182	182	182
N cantons	26	26	26	26	26	26

Notes: Standard errors in parentheses clustered for cantons. Significance * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 6: Effect of Wealth Tax Rate on Number of Taxpayers, Effect by Wealth Groups

	All		Wealth ≤ 100,000		Wealth > 100,000		Wealth > 500,000		Wealth > 1,000,000	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Marg. wealth tax rate (%)	**-0.0201**	**-0.0098**	**0.0947** **	**0.1056** **	**-0.2423** **	**-0.2296** **	**-0.2919** **	**-0.2169** **	**-0.2455** **	**-0.1780**
	(0.0234)	(0.0255)	(0.0396)	(0.0449)	(0.0927)	(0.0917)	(0.1109)	(0.1021)	(0.1119)	(0.1244)
Marg. income tax rate (%)		**-0.0019**		**-0.0016**		**-0.0032**		**-0.0143**		**-0.0108**
		(0.0022)		(0.0052)		(0.0083)		(0.0109)		(0.0109)
Inheritance tax rate (%)		**0.0007**		**0.0025**		**-0.0035**		**-0.0056**		**-0.0011**
		(0.0015)		(0.0025)		(0.0030)		(0.0035)		(0.0034)
Mean of aggregate wealth (in m CHF)	50,005		2,306		47,700		12,456		20,203	
Mean of number of taxpayers	183,791		122,212		61,579		164,410		175,547	
Mean of marg. wealth tax rate (%)	0.48		0.50		0.50		0.54		0.55	
Year fixed effects	x	x	x	x	x	x	x	x	x	x
Cantonal linear time trends	x	x	x	x	x	x	x	x	x	x
N	182	182	182	182	182	182	182	182	182	182
N cantons	26	26	26	26	26	26	26	26	26	26

Notes: First difference estimation with 3-year intervals of number of taxpayers (in logs) on tax rates. The marginal wealth and income tax rates are weighted average tax rates for wealth intervals above 100k in columns [3] to [6], above 500k in columns [7] and [8] and above 1m in columns [9] and [10]. Standard errors in parentheses clustered for cantons. Significance *p < 0.10, **p < 0.05, *** p < 0.01.

Table 7: Effect of Wealth Tax Rate on Wealth by Type

	Stayers, initial wealth above threshold		
	Δ log(net wealth)	Δ log(financial wealth)	Δ log(non-financial wealth)
	[1]	[2]	[3]
Δ top wealth tax %	**-0.226 *** **	**-0.296 ** **	**-0.156 * **
	(0.074)	(0.108)	(0.088)
Municipality fixed effects	x	x	x
Year fixed effects	x	x	x
N	1,164,056	1,104,284	889,080

Notes: The dependent variable is 3-year change in indicated type of wealth. The explanatory variable is the 3-year change in top wealth tax rate in 361 municipalities. Standard errors clustered at the municipality level are in parentheses. Significance * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 8: Odds of Dropping and Moving, and a Placebo Test

	Initial wealth above threshold			initially below
	Stayers	Stayers and movers		Stayers
	dropping below threshold	odds of moving out	odds of moving in	Δ log(net wealth)
	[1]	[2]	[3]	[4]
Δ top wealth tax %	**0.039 * **	**0.042**		**0.005**
	(0.023)	(0.198)		(0.129)
Δ top wealth tax % destination			**-0.017**	
			(0.023)	
Municipality fixed effects	x	x	x	x
Year fixed effects	x	x	x	x
N	1,158,725	1,207,417		979,483

Notes: The dependent variable is an indicator for whether somenody dropped below the wealth tax threshold if they were initially above in column [1], an indicator for moving in columns [2] and [3], and the 3-year change in indicated type of wealth in column [4]. The explanatory variable is the 3-year change in top wealth tax rate, either in original or in destination municipalities. Standard errors clustered at the municipality level are in parentheses. Significance * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 9: Effect of Wealth Tax Rate on Wealth by Type and Group

	Stayers		
	Δ log(net wealth)	Δ log(financial wealth)	Δ log(non-financial wealth)
	[1]	[2]	[3]
A. Taxpayers with wealth 308,951 CHF or less			
Δ top wealth tax %	**-0.202 *** **	**-0.237 * **	**-0.172**
	(0.071)	(0.127)	(0.158)
N	581,957	545,316	393,382
B. Taxpayers with wealth above 308,951 CHF			
Δ top wlth tax %	**-0.230 ** **	**-0.327 ** **	**-0.161**
	(0.098)	(0.138)	(0.102)
N	582,099	558,968	495,698
Municipality fixed effects	x	x	x
Year fixed effects	x	x	x

Notes: The dependent variable is 3-year change in indicated type of wealth. The explanatory variable is the 3-year change in top wealth tax rate in 361 municipalities. Standard errors clustered at the municipality level are in parentheses. Significance * p < 0.1, ** p < 0.05, *** p < 0.01.

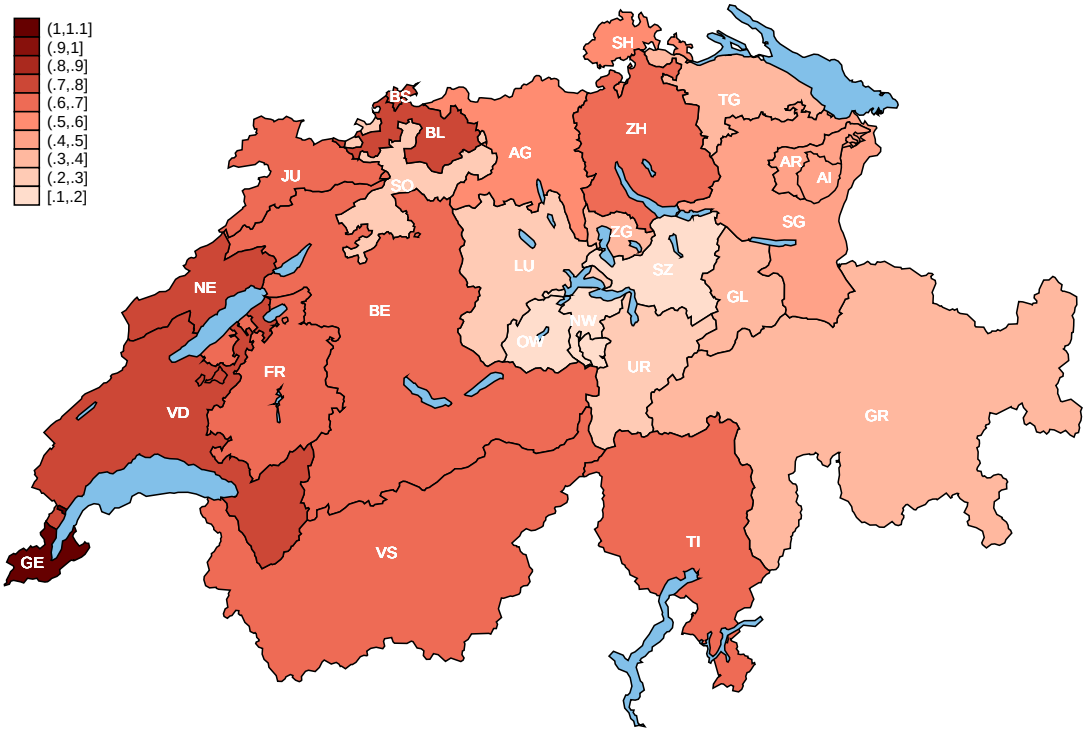

Figure 1: Top marginal wealth tax rates across Swiss cantons, 2012. Marginal tax rate on wealth > CHF 10 million, in percent. Tax rates are consolidated across municipal and cantonal levels, with municipal rates calculated as averages across each canton's municipalities weighted by the number of taxpayers. White areas are lakes.

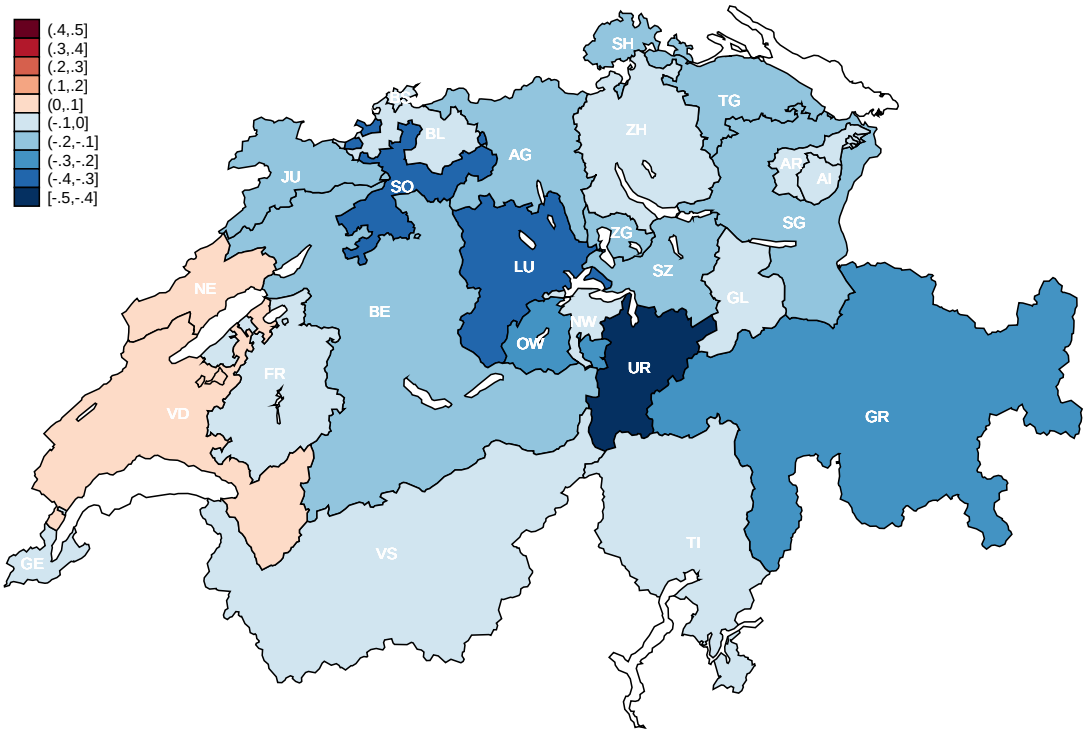

Figure 2: Change in top marginal wealth tax rates across Swiss cantons, 2003-2012. Change in marginal tax rate on wealth > CHF 10 million, in percentage points. Tax rates are consolidated across municipal and cantonal levels, with municipal rates calculated as averages across each canton's municipalities weighted by the number of taxpayers. White areas are lakes.

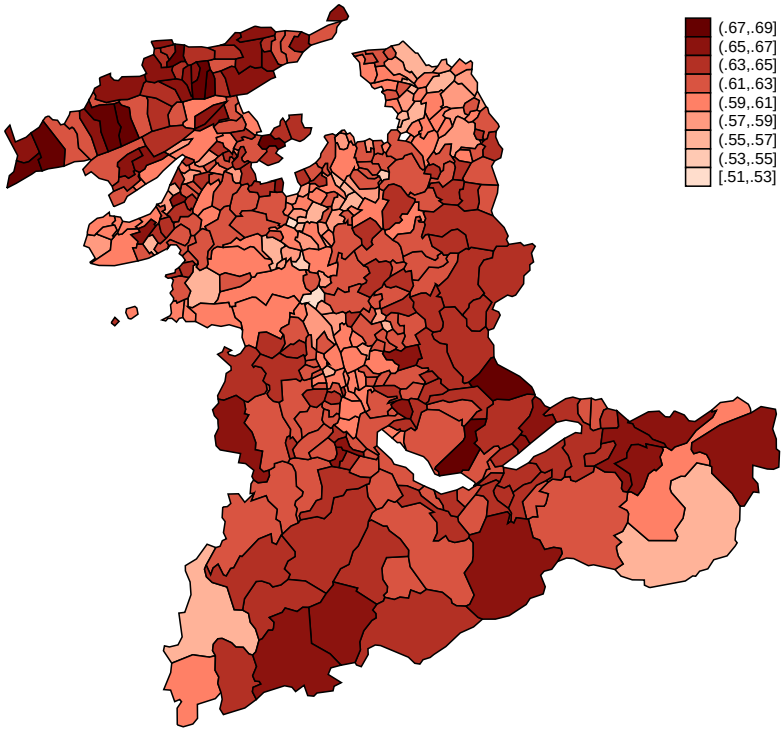

Figure 3: Top marginal wealth tax rates across municipalities in the canton of Bern, 2011. Marginal tax rate on wealth > CHF 10 million in percent. White areas are lakes.

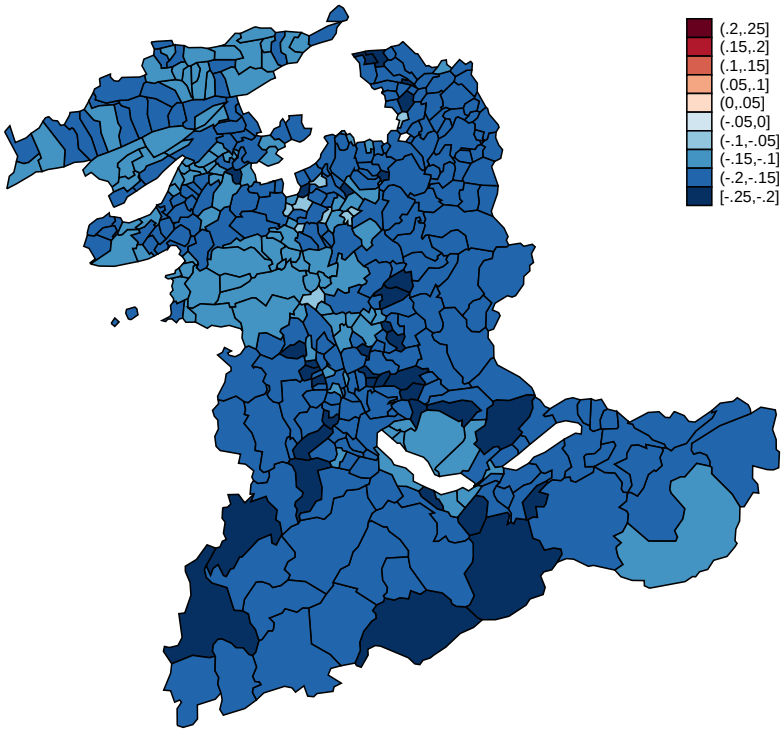

Figure 4: Change in top marginal wealth tax rates across municipalities in the canton of Bern, 2001-2011. Change in marginal tax rate on wealth > CHF 10 million in percentage points. White areas are lakes.

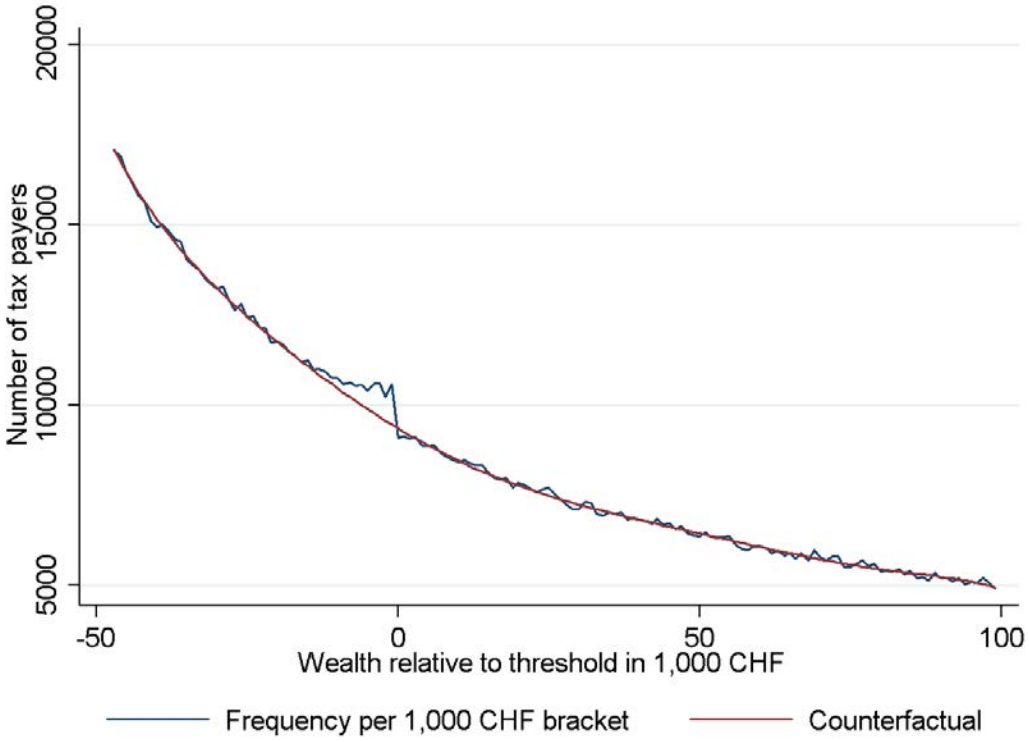

Figure 5: Bunching below the threshold. Frequency of taxpayers per 1,000 CHF bracket relative to the notch compared to a counterfactual distribution based on a 7-degree polynomial regression, including all observations outside the bunching area of CHF 15,000 to the left of the notch value.

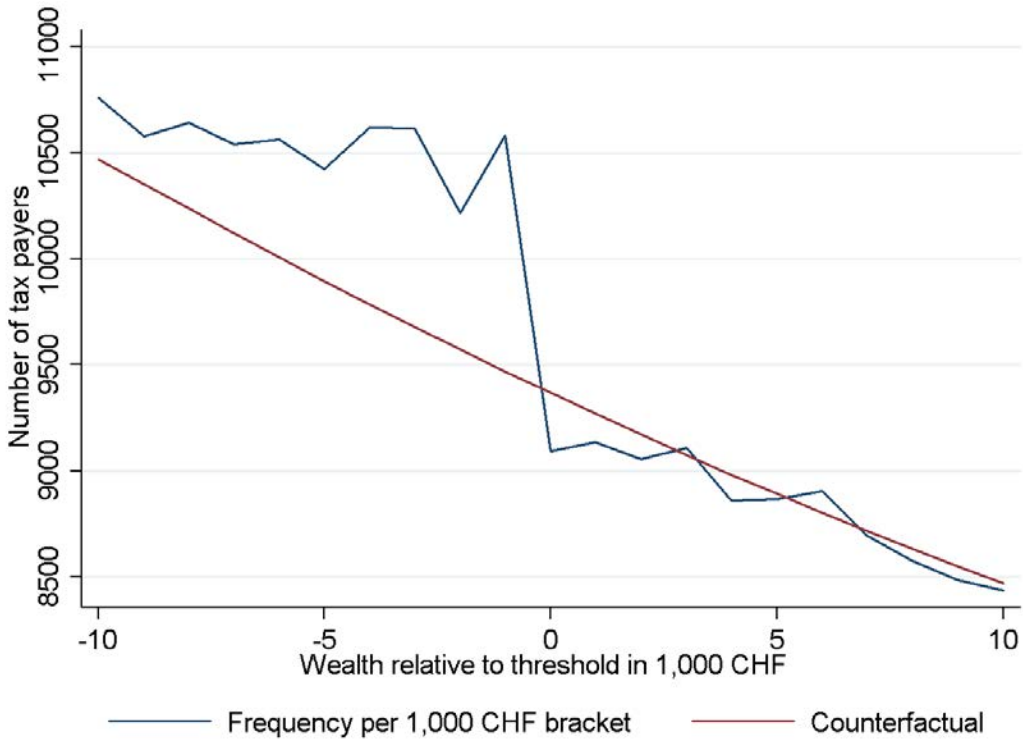

Figure 6: Bunching within CHF 10,000 around the threshold. Same as in Figure 5, but for a smaller window.

Appendix 1: Data

Cross-Canton Data

Data on aggregate taxable wealth by canton are taken from the Swiss Federal Department of Finance ("Gesamtschweizerische Vermögensstatistik der natürlichen Personen" available online at https://www.estv.admin.ch/estv/de/home/allgemein/dokumentation/zahlen-und-fakten/steuerstatistiken/gesamtschweizerische-vermoegensstatistik-der-natuerlichen-person.html). These data report the number of taxpayers as well as the aggregate taxable wealth per canton and year in 11 different brackets of taxable wealth (0, 1 - 50k, 51 - 100k, 101 - 200k, 201k - 500k, 501k – 1,000k, 1,001k - 2,000k, 2,001k – 5,000k, 5,001k – 10,000k, over 10,000k). We use the sum over the 11 wealth brackets as dependent variable.

Data on tax rates are taken from the Swiss Federal Tax Administration ("Steuerbelastung in den Gemeinden" available online at https://www.estv.admin.ch/estv/de/home/allgemein/dokumentation/zahlen-und-fakten/steuerstatistiken/steuerbelastung.html). These data report average tax rates (cantonal, municipal and parish) on wealth and income for 3 types of taxpayers (unmarried taxpayers without children, married couples without children, married couples with 2 children), 20 wealth levels (20k, 25k, 30k, 40k, 50k, 75k, 80k, 100k, 150k, 200k, 250k, 300k, 400k, 500k, 600k, 800k, 1,000k, 2,000k, 5,000k, 10,000k) or 8 income levels (6k, 10k, 20k, 50k, 100k, 200k, 500k, 1,000k), respectively, for a sample of municipalities. Parchet (2014) completes these data to cover all municipalities, allowing us to work with the universe of municipalities within each canton. We use the parish tax rate of the dominant religious denomination in the municipality. We first aggregate the combined municipal average tax rates to the level of the canton by calculating averages of the municipal rates, weighted by the number of taxpayers per municipality. We then approximate marginal tax rates on wealth and income by calculating finite differences of the implied tax payments at the observed levels of wealth and income, respectively. We then take a weighted average of the prevailing average and marginal wealth tax rates within each wealth bracket. We also assign average and marginal income tax rates to wealth brackets by using a cross-tabulation of wealth and income from the individual-level data from the canton of Bern. We finally calculate the main explanatory variables as weighted averages of the average and marginal income and wealth tax rates across wealth brackets. We use time-averaged aggregate wealth in each wealth bracket and canton as weights.

For bequests, we take statutory rates on an inheritance of CHF 500,000 (USD 550,000) by a direct descendant. This measure has been found to be highly correlated with a broader weighted average of statutory bequest tax rates across multiple bequest sizes and heir types (Brülhart and Parchet, 2014).

Cantonal population figures are taken from the Swiss Statistics ("Bilanz der ständigen Wohnbevölkerung nach Kantonen" available online at http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/02/blank/data/01.html).

In our estimations, we do not take account of real estate taxation, even though three such taxes exist in Switzerland: real estate transfer taxes, real estate capital gains taxes, and annual taxes on the value of real estate and land. However, within our sample period there was minimal panel variation in all three types of taxes at the cantonal level. The one significant change was that the

real estate transfer tax was abolished in three cantons (Zurich in 2005, Schwyz in 2009, Solothurn in 2011). We have explored the implication of adding a dummy variable for the existence of this tax and found it to have no discernible impact on our results.

The only substantial change in the real estate capital gains tax during our sample period occurred in the canton of Schwyz, where the tax was lowered substantially. Apart from this reform, there were no changes in legislation, and all variation that there may have been, was due to cantonal and municipal tax multipliers. We, therefore, do not control for this tax.

Finally, there are regular real estate and land taxes. Seven cantons (Zurich, Schwyz, Glarus, Zug, Solothurn, Basel-Land, Aargau) did not use this tax throughout our sample period. In the other cantons, the tax is levied either by the canton or by the municipalities. In the cantons with municipal property taxes, these can be either compulsory or optional up to an upper limit set by the canton. We observe little variation in the cantonal legislation during our sample period. The canton of Graubünden raised the upper limit of the range allowed for municipal property taxes from 0.1 to 0.2 percent, but the overall effect of this change is unclear. Similarly, the canton of St. Gallen changed the admissible range for the municipality property tax rates from 0.03-0.1 percent to 0.02-0.08 percent. Other than that, there were no changes.

Note that real estate taxes are likely less relevant for individual behavioral responses in Switzerland than in other countries. A major share of property taxes in Switzerland is paid by corporations and other legal entities, such as pension funds. In many cantons, tax rates differ between private individuals and legal entities. In the canton Valais, for example, municipalities levy a property tax of 1 tenth of a percent on property held by private individuals and of 1.25 tenths of a percent on property held by legal entities. On top of that, the canton itself levies a property tax of 0.8 tenths of a percent on legal entities only. In the canton of Neuchâtel, there are a cantonal property tax and an optional municipality property tax, which are both, however, collected from legal entities only.

Bern Data

The data set from the canton of Bern contains information on all tax returns filed over the period 2001 to 2011. By default, each entry in the database contains all information from a tax filer's tax declaration for a given year. In total, the file includes 6,842,924 entries, i.e. on average 622,084 entries per year.

Entries do not necessarily coincide with calendar years. If a taxpayer's characteristics that may affect their marginal tax rates change during a calendar year, then there will be separate entries within calendar years. Each entry therefore has a starting date, which can be either January 1 or the day following an event that is relevant for the taxpayer's marginal tax rate, and an end date, which can be either a tax-relevant event or December 31. Events that affect marginal tax rates include changes in family status (marriage, divorce, death of spouse), birth of children or children leaving the household, relocations to and from other countries, relocations to and from other cantons within Switzerland, relocations across municipalities within the canton of Bern, and own death.

We ignore all entries that do not end with December 31, because only information at the end of the year is relevant for our study. In our baseline regressions, we look at behavioral responses that happen over three-year intervals. We only use taxpayers whose marital status did not change during the revenant observation period. As tax rates depend on marital status, marriage and divorce could be endogenous to taxation. Moreover, married couples also file their tax returns jointly, which makes it impossible to follow individuals as they change marital status.

Wealth in principle includes everything a taxpayer owns valued at market prices, with the exception of tax exempt private retirement savings up to an annual cap (CHF 6,682 in 2011). Real estate values are officially established by cantonal appraising officers. These appraisals are made at the moment of transactions and after major transformation or renovation work. Our main dependent variable is "net wealth", which reflects a household's wealth after subtracting debt. From net wealth, we subtract CHF 17,000 (CHF 18,000 in 2011) if the taxpayer is married, and CHF 8,500 (CHF 9,000 in 2011) for each minor in the household, in order to obtain taxable wealth, which will determine taxpayers' position relative to the exemption level.

Net wealth includes real estate located outside the canton of Bern and hence not taxed in Bern. The database therefore also contains a variable "effective wealth", which equals net wealth excluding all real estate holdings outside the canton of Bern. This is the wealth measure we use to compute our baseline dependent variable. The data allow us to decompose this variable into financial assets (Wertschriftenvermögen), other assets (gross wealth minus financial assets), and debt.

There are one basic schedule for wealth tax rates and two basic schedules for income tax rates, one for married couples and one for singles. During our period of interest, the basic income and wealth tax schedules have changed twice, from 2007 to 2008 and from 2010 to 2011. These changes were simultaneous. In order to obtain actual tax rates, the rates of the respective basic schedule are multiplied by two scalars, one set by the canton and one set independently by each municipality (the "multipliers").

The cantonal multiplier was changed three times between 2001 and 2011. First, from 2001 to 2002, a number of tasks were shifted from the municipalities to the canton, which led to an increase in the cantonal multiplier from 2.3 to 3.06, whereas the population-weighted average municipal multiplier fell from 2.62 to 1.88. The cantonal multiplier was lowered again to 2.96 in 2008, and raised back to 3.06 in the following year. The population-weighted average municipal multiplier decreased constantly and slightly during the observation period to 1.81 in 2011. There was, however, substantial variation in movements in municipal multipliers across municipalities and years.

In addition to their basic multipliers, municipalities apply specific shifters to households declaring themselves to be Protestant or Catholic. As we do not know individual-level religious affiliations, we multiply the basic marginal tax rates with the sum of the municipal multiplier and a church tax multiplier applied by the majority denomination of the respective municipality. The only municipality with a Catholic majority (throughout the 11 years in our panel) was Moutier; all other municipalities had Protestant majorities.

Due to mergers, the number of municipalities in the canton of Bern decreased from 400 in 2001 to 383 in 2011. We exclude observations on taxpayers based in municipalities affected by the 15 municipal mergers during two-year windows before and after these mergers took place. In some cases, the newly created municipalities received the name and identifier of one of the original municipalities. In other cases, the new municipalities were given new names and identifiers. In total, we have 401 municipality identifiers in our sample, of which we use the 361 that were unaffected by mergers.

Bern taxpayers have to pay wealth taxes only if their taxable wealth exceeds a certain threshold. During our sample period, this threshold increased from CHF 92,000 to CHF 94,000 in 2008, and then again to CHF 97,000 in 2011. Once the exemption level is exceeded, the marginal tax rate at the threshold applies also for wealth below the exemption. This leads to a jump in average tax rates and a spike in marginal tax rates at the threshold.

A number of high net worth taxpayers are attracted to Bern by the canton's generous use of tax exemptions on "non-dom" foreign nationals (most pronouncedly in the high-end resort of Gstaad). These taxpayers pay wealth taxes only on their tangible assets (real estate, luxury goods) at their tax residence but are not obliged to report their worldwide wealth and earnings. We therefore drop those taxpayers from the sample.