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The long run effect of taxes on the distribution of top income shares: an empirical investigation

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**The long run effect of taxes on the
distribution of top income shares:
an empirical investigation**

Working Paper No. 2012-22

The long run effect of taxes on the distribution of top income shares: an empirical investigation ^{*}

Christoph Gorgas[†] and Christoph A. Schaltegger[‡]

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Abstract

We provide empirical evidence on the impact of personal income taxes and tax competition on income concentration in Switzerland. The fact that Swiss cantons have considerable taxing power enables us to study the effect of differences in the tax burden as well as in the pressure of tax competition on the distribution of top income shares within Switzerland. Using panel regressions covering all 26 Swiss cantons over the years 1917 to 2007 we find substantial evidence that tax competition is a major driving force behind the cantonal tax setting behaviour shaping cantonal income concentration for the very top incomes significantly.

1 Introduction

In the course of the current global economic downturn and the resulting persistence in government indebtedness, questions on the development of top incomes and their adequate contribution for financing the government have attracted much attention in politics as well as in economic research. It seems that the increase of income inequality in the OECD countries is part of a recent global trend (OECD, 2011). For example, the top 1% income share in the U.S.A. increased from 8% to 17% during the period 1979 to 2007 (Congressional Budget Office, 2011). However, as recent studies show the development of top income shares over the 20th century is rather diverse differing from country to country (Atkinson, Piketty und Saez, 2011). What could possibly be the reason for the heterogenous development in income concentration for the different countries?

It is reasonable to assume that tax policy determines a significant part of the trend in income concentration in a country. In fact, studies like those by Roine, Vlachos and Waldenström (2009) and others support the view that the income tax burden has a considerable impact on the development of top income shares. However, one open question is still whether tax competition is a major driving force of the differences in the country's tax burden yielding to different developments in income concentration. In addition, the existing studies are based on cross-country panel data for top income shares as well as for

^{*}We are grateful for helpful comments from participants of the annual meeting of the Verein für Socialpolitik in Göttingen, the Ifo-workshop on regional policy in Dresden, and seminar participants of the Universities of Lucerne, Lugano, ETH Zürich and St. Gallen.

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the income tax burden which are in some cases difficult to compare due to a very diverse definition of the tax base and the tax burden.

One way to cope with these two questions is to use data from sub-federal governments. Switzerland is a federalist country with far-reaching sub-federal autonomy by the 26 cantons, where not only the federal government can levy taxes but also the cantons. Thus, we use data from Swiss cantons for two reasons. First, we have homogenously defined data for both the tax burden of top incomes as well as the income concentration for the 26 cantons on the sub-federal level of Switzerland over the 20th century.¹ In Switzerland the federal income tax (Direkte Bundessteuer) is levied by the federal level but assessed by the cantons, which in turn levy an own tax (Staatssteuer) on the same income. This solves the challenge of comparability of income data to a large extent.² Second, the cantonal tax burden is varying considerably between the cantons as well as over time which is the results of an intense tax competition (Feld, 1999). Based on these two facts, cantons provide a good data base for investigating the effect of taxes and tax competition on top incomes.

The main contribution of our paper is to empirically investigate the long-run effect of taxes and tax competition on income concentration. Our results confirm the important role of tax competition in determining top income tax rates, which in turn shape the extent of income concentration. The estimated effect is robust for different specifications and sub-samples but has shifted towards the very top incomes over time.

The paper proceeds as follows. Section 2 provides a literature overview of existing country and cross-country studies. Section 3 outlines the evolution of top incomes in the Swiss cantons over the 20th century. In addition, we describe the development of the tax burden and tax competition for top incomes over the same period. In Section 4 the empirical analysis is presented followed by the results in Section 5. The concluding remarks are offered in Section 6.

2 Literature overview

The seminal contribution on the long-term development of the top income shares has been developed by Piketty (2001, 2003). He constructed a novel time series of income concentration over the 20th century for the case of France showing a considerable decrease of top incomes until the 1980s and a rather constant development from then on. Up to date, 26 country-studies³ over the 20th century exist and are assembled in Atkinson, Piketty and Saez (2011). The results can be summarized as follows. The English-speaking countries reveal a distinct U-shaped pattern of income concentration over the 20th century, with a sharp recovery in top income shares since the 1980s. Southern European countries as well as Nordic countries also experience an increase of income concentration though less pronounced. In contrast, Continental European countries can be characterized as countries with a rather flat evolvement of top income shares (Atkinson and Piketty, 2010).

With this rich cross-country dataset on the long-run development of income concentration, it became possible to empirically investigate determinants of income inequality such as for example economic growth, population growth, financial development, trade openness, sectoral shifts in the economy, government spending as well as taxes. Up to date, a couple of studies have empirically assessed the impact of taxes on the development of top income shares. According to Piketty and Saez (2003) in a study for the U.S.A. covering

¹See Schaltegger and Gorgas (2011) for detailed description of the data.

²Atkinson and Leigh (2010) stress the problem of comparable data in cross-country studies.

³See also <http://g-mond.parisschoolofeconomics.eu/topincomes>, update 31.08.2012.

tax returns over the years 1913 to 1998, high and progressive income and estate taxes after World War II have prevented large fortunes fully recovering from the shocks of the wars and the great depression. Saez (2004) confirms these findings with income tax return data from 1960 to 2000 in more detail: the top 1 per cent of income earners significantly reacted to changes in the tax burden. However, the upward trend of top incomes after the 1980s can only be explained partly by the reduction of marginal tax rates.

Very much the same can be concluded from Saez and Veall (2005) using personal income tax data from Canada over the period from 1960 to 2000. They argue that the surge of only the very top income shares and only after 1990 indicates that tax changes are an aspect but not the sole cause of income concentration in Canada. In the case of Japan, marginal income tax rates also account partly for income concentration according to Moriguchi und Saez (2008). Concerning the case of Sweden, Roine and Waldenström (2008) show the importance of the treatment of capital gains for the recent increase in top incomes. Also New Zealand's top incomes are positively associated with the after-tax share, based on the top marginal tax rate (Atkinson and Leigh, 2008).

While the above reported studies concentrate on the evolution of top incomes for a single country, others use cross-country panel regressions. Roine, Vlachos and Waldenström (2009) provide empirical evidence that tax progressivity reduces top income shares for an unbalanced panel of 16 countries over the 20th century. Saikat and Matti (2010) empirically evaluate the impact of taxes on income inequality for the Anglo-Saxon countries Australia, Canada, New Zealand, the U.K. and the U.S.A. They conclude that top marginal tax rates and government expenditure have an equalizing effect on income concentration. Also Atkinson and Leigh (2010) focus on the Anglo-Saxon countries in their panel-regression analysis. The results confirm that reductions in marginal tax rates can explain one-third to one-half of the rise in top incomes shares among 1970 to 2000.

3 Top incomes, taxes and tax competition in Switzerland

Income concentration in Switzerland has been assessed first by Dell, Piketty, and Saez (2007). Their results indicate that at the federal level, Switzerland's top incomes were negligibly hit by the shocks of World War II but stayed relatively stable over time. Today, the level of income concentration is comparable to other countries like France, Italy or Norway: the top 1 per cent income shares in Switzerland concentrate almost 9 per cent of total income.⁴

However, Schaltegger and Gorgas (2011) show a rather different picture for the sub-federal level in Switzerland: there is a U-shaped pattern of top income shares over the period from 1917 to 2007 for some cantons, while in others a relatively flat or even an increasing development of income concentration can be observed. Interestingly, in most cantons, there is a downward trend in income concentration. Thus, while the development of top incomes in Switzerland as a whole seems to be very stable the cantons on the sub-federal level show a similar diversity as the cross-country comparisons.

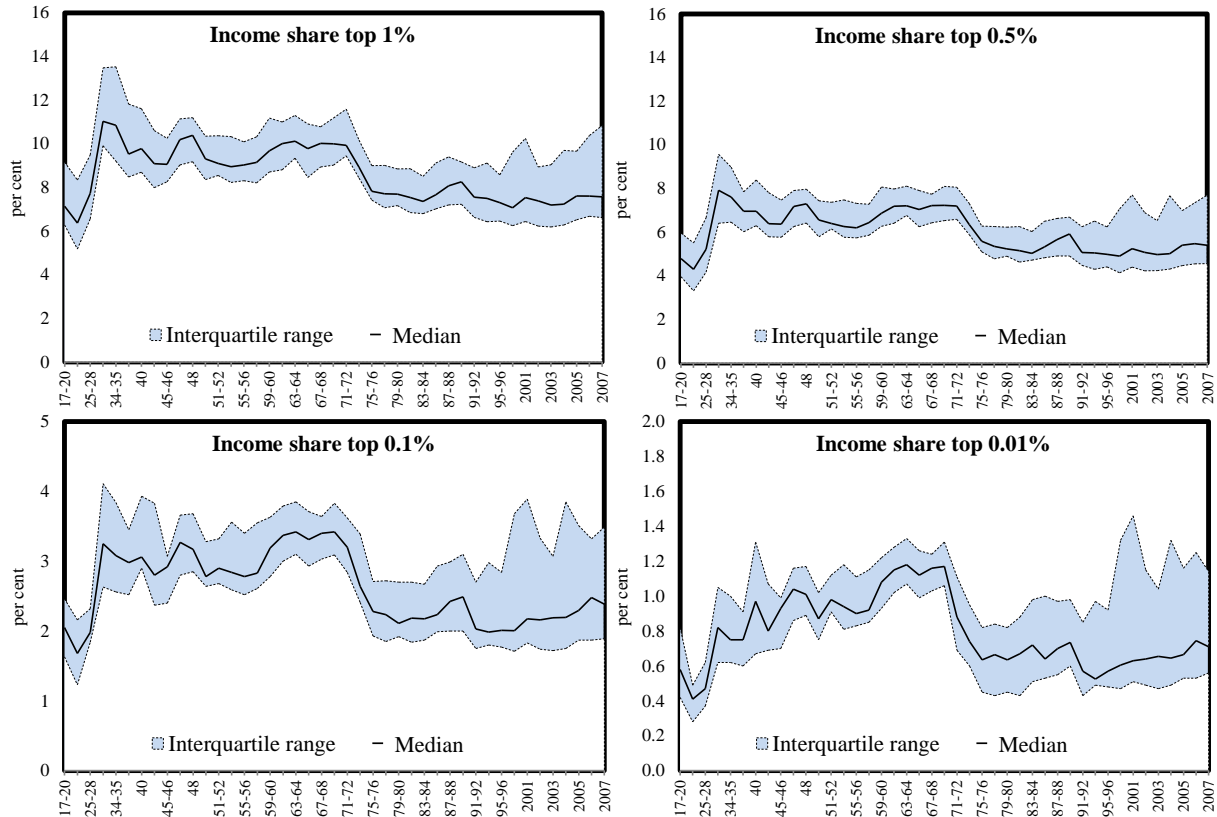
Figure 1 shows the development of income concentration for the median canton and the interquartile range between the cantons for the top 1 %, top 0.5 %, top 0.1 % and top 0.01 % for all Swiss cantons.⁵ It becomes obvious, that the development of the interquartile range between the cantons over time is narrowing until the 1980s and widening up again

⁴In the survey by Atkinson, Piketty and Saez (2011), the top 1 % income shares in 22 countries in 2006 range between 6 and 18 per cent of total income.

⁵The median value and the interquartile range (75/25) were calculated to account for outliers.

afterwards, especially for the very top income shares. A very large heterogeneity for the cantons is particularly true for the top 0.1 % and top 0.01 % of income earners – namely for the last 30 years.

Figure 1: Top income shares, 26 Swiss cantons, 1917-2007



An important advantage of our data is that the tax base for all 26 cantons is homogeneously defined by the law for personal income (Art. 2 DBG). A reasonable comparison between the cantons and over a long period of time is thus possible. Comprehensive income taxation exists since 1933 in Switzerland on the federal level.⁶ According to the law, the tax base for personal income is defined as labour income including pension benefits plus capital income. However, private capital gains are not part of the tax base with few exceptions (Art. 16 DBG). Additionally, a legally defined number of allowances (social deductions) are excluded from the tax base.⁷ The taxable unit in Switzerland is always the household level, where different tariffs apply for married and single persons.

The 26 cantons not only offer rich heterogeneity in income concentration but due to their considerable tax autonomy also rich heterogeneity in the cantonal tax burden for top incomes. The federal level levies a progressive federal income tax on personal income and a profit tax on companies (so called: Direkte Bundessteuer, DBG). In addition, the federal level levies a value added tax on consumption, a withholding tax on certain capital income and stamp duties. However, it is important to note that the federal government may only levy those taxes that have been enumerated in the federal constitution (Bundesverfassung,

⁶Before 1933, the tax base consisted of labour income, only.

⁷The most important tax allowances consist of social security contributions: AHV-, IV-, EO- contributions, insurance contributions (e.g. pensions and life insurances), an amount of 5 % of gross income and deductions for married couples. However, social security benefits are taxed.

BV) and have been explicitly approved by the voters. Additionally, the federal income tax is subject to “sunset legislation” and has to be renewed regularly. For example, the current fiscal constitution from 28. November 2004 is expiring to the end of 2020 (Art. 196 para. 13 BV).

In contrast to the limited power to tax for the federal government, the cantons may run all rights of a sovereign state under the federal constitution according to Article 3 BV, as far as their sovereignty is not limited by the federal constitution. Therefore, the cantons have a far reaching autonomy for the taxation of personal income, wealth and company profits. According to Art. 129 para. 2 BV tax tariffs, tax rates and tax exemptions are part of the cantonal competence, only restricted by the federal harmonization law, the general principles of the federal constitution as well as the prevailing legal practice by the federal court. Furthermore, local communities can raise a surcharge on the cantonal tax rate. They are bound by the cantonal legislation. In sum, cantons enjoy a rather extended tax autonomy, which resulted not only in a cantonal varying tax burden but also in extended tax competition between cantons.

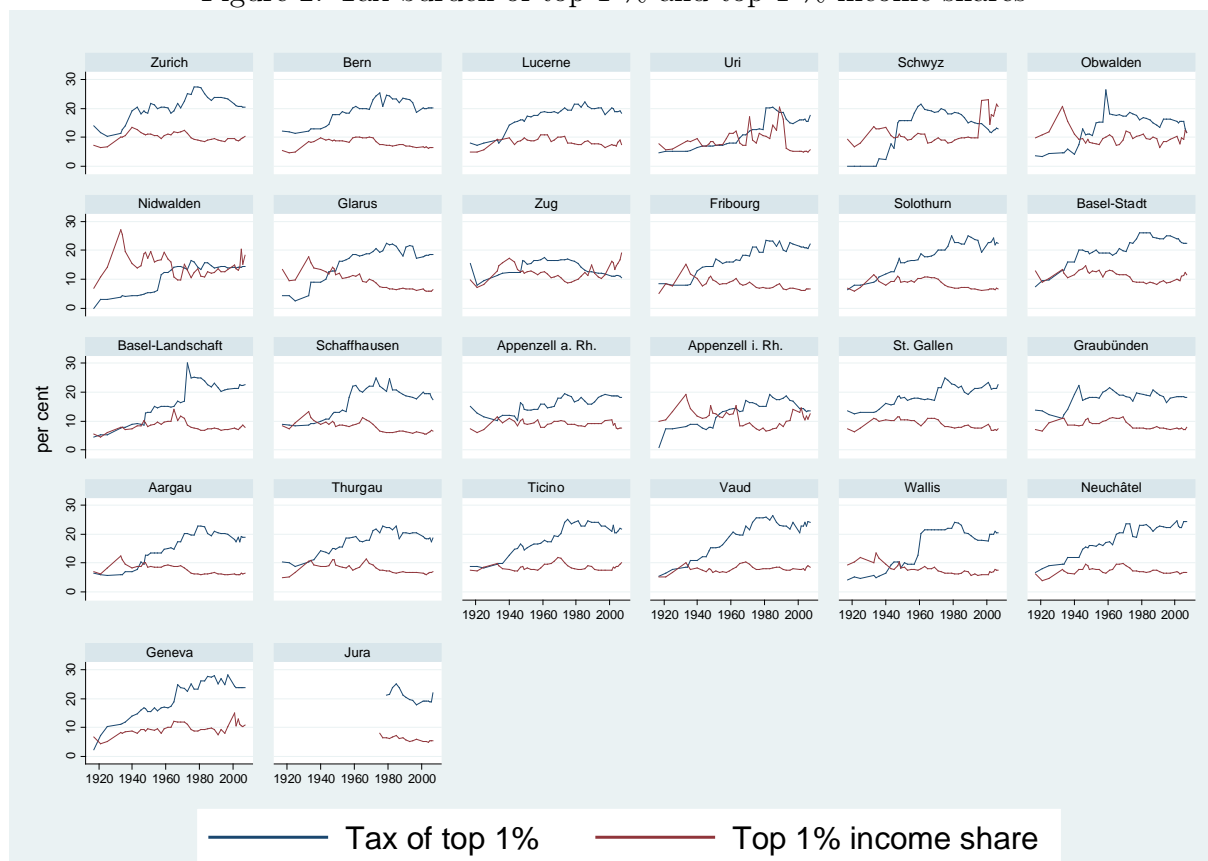
A further advantage of our data is that also the calculations for the cantonal tax burden are based on a homogenously defined comprehensive income. Cantonal tax rates for personal income are progressive but differing in its extent from canton to canton. We thus calculated the tax burden for each top income share – in our case a married couple – in each canton and each year. It should be noted, however, that in some cantons progressive income taxation was enacted only during the 20th century: 1937 in Schwyz, 1922 in Nidwalden, 1920 in Glarus, 1919 in Bern, Geneva and Appenzell i. Rh.⁸

Figure 2 shows the combined cantonal, local and church average income tax rate for the top 1% income shares for the 26 cantons over the whole period from 1917 to 2007. Two interesting patterns arise. First, it is obvious that the cantonal tax policy over the period has developed differently. For example until the 1940s urban cantons like Basel-Stadt, Geneva and also Zurich levied the highest personal income tax rates for the top 1%. The rural, more conservative cantons charged in contrast considerably lower tax rates. For the period until the early 1980s the majority of the cantons steadily increased the tax burden of the top 1% of income earners, followed by a decrease afterwards.

Second, Figure 2 shows that the increase in the tax burden was accompanied by a decline or a constant development for the top 1% income shares. The negative simple correlation between the average tax burden of the top 0.1% and the top 0.1% income shares is also shown by the scatter plot in the Appendix (Figure 5) for all Swiss cantons over the whole time period.

⁸It can be discussed whether marginal tax rates would be a more appropriate indicator. However, the statistics of the Federal Tax Administration only provides the average tax rates over the whole time span of all 90 years.

Figure 2: Tax burden of top 1 % and top 1 % income shares



A general view of the long-run development of the average income tax in the cantons is given by Figure 3 in the Appendix D. This Figure shows the median value and the interquartile range for the average tax burden to the top 1 %, 0.5 %, 0.1 % and 0.01 % by cantonal, local and church taxes in the 26 cantons from 1917 to 2007. Looking at Figure 3, a significant increase of the tax burden until the early 1980s is obvious for all considered top income shares. During the last 30 years the trend came to an end with a more or less stable development for the top 1 % income earners.⁹ For the top 0.5 %, top 0.1 % and top 0.01 % of the income earners the average tax burden has been stagnating or declining only marginally. The interquartile range also shows a limited cantonal variation until the early 1980s for all considered tax rates followed by a spreading up of tax rates afterwards. The largest cantonal variation around the median value since the early of the 1980s can be found for the very high income earners (top 0.1 % and 0.01 % income earners).

As Figure 4 (in the Appendix) shows, the cantonal tax burden for top income earners seems to more or less follow the development of the tax setting behaviour in neighbouring cantons. This could be interpreted as an indication of the presence of tax competition. A reasonable explanation for the strategic tax setting behaviour of cantonal governments is in fact seen in the pressure created by tax competition. Empirical evidence that tax competition plays an important role for Switzerland is given by Pommerehne et al. (1996), Kirchgässner and Pommerehne (1996), Schmidheiny (2006) and Feld and Reulier (2008). It implies that if a canton engages in tax cuts, the voters in the neighbouring cantons will try to persuade their governments to do the same.

Finally and similar to other countries with a federalist constitution and sub-federal tax

⁹Compared to the U.S.A. and U.K. with their sharp decrease of the top marginal taxes from the 1980s on (Piketty, Saez and Stantcheva, 2011).

competition, equalizing grants also play an important role in Switzerland. Traditionally, the economic literature on intergovernmental grants focuses on efficiency and equity reasons (Gramlich, 1977; Oates, 1999). For example, externalities might result from tax competition between jurisdictions causing migration into a jurisdiction, which reduces the tax burden of the domiciled, and increases the burden of those remaining in the original jurisdiction. A well designed system of intergovernmental grants is perceived as an efficient instrument for internalizing such inter-jurisdictional externalities. In addition, fiscal equalization across jurisdictions is also targeted to improve the fiscal capacity of the poorer regions. In Switzerland, the system of intergovernmental grants was legally introduced in 1959 on the federal level. In 2008 the old system of transfers was renewed by a system with less adverse incentives in order to limit the moral hazard of cantonal governments receiving grants from the federal level to finance cantonal public goods (Schaltegger and Frey, 2003).

4 Empirical analysis

4.1 Method

To investigate the impact of taxes on the estimated income shares we use a fixed-effects model (1) as our baseline estimate in order to capture time and canton specific heterogeneity. In addition, to account for a possible endogeneity bias, we run also instrumental variables estimates (2) including tax competition in the following form:

$$\text{Top \% income share}_{it} = \alpha_i + \mu_t + X'_{it}\beta_1 + \text{tax}_{it}\beta_2 + \epsilon_{it} \quad (1)$$

$$\text{Top \% income share}_{it} = \alpha_i + \mu_t + X'_{it}\beta_1 + \text{tax}_{it}^{IV}\beta_2 + \epsilon_{it} \quad (2)$$

where $i = 1, \dots, 26$ stands for each canton and $t = 1917, \dots, 2007$ depicts the considered time period. Top % income share_{it} indicates the respective income shares for the top income earners, α_i and μ_t account for the time – invariant cantonal effects and the cantonal – invariant time effects (time and canton fixed-effects) and ϵ_{it} is the error term.

The variable of most interest is tax, which incorporates the cantonal tax burden for the different income shares as explained in Section 3 in detail. Further, X is a vector, which contains the following explanatory variables to account for socio–demographic changes, sectoral shifts and politico–institutional trends and decisions: *Sector* is the share of the employed by the services sector on the whole working population, *Population* (age 20 to 64) is the proportion of the working population on the whole resident population. *Crime* defines the share of those convicted criminal according to the law on the whole resident population. *Foreigner* is the proportion of foreigners on the whole resident population and *Religion* is the proportion of protestants on the whole resident population. In addition, we use cantonal per capita spending (*Expenditure*), the federal transfers to the cantons per capita (*Transfers*), the population density per km^2 (*Population density*) and as a political variable the share of voters for the Social Democratic Party of Switzerland (*Social Democrats*) in the National Council elections.¹⁰ The unemployment rate measures the proportion of the unemployed population which at a given time and in a certain canton are unemployed. In addition, we use dummy variables for the period of World War I (*WW I*, 1914 to 1918), World War II (*WW II*, 1939 to 1945), the introduction of the federal income tax (*direct federal tax*, 1944), the introduction of the AHV (*federal old age and survivors insurance*, 1948) and the federal tax harmonization law (*federal tax harmonization*, 1993).

¹⁰National elections are held after a period of four years. That's why we took the values of the previous election to the national council. A similar procedure can be found in Leigh (2007).

For the sensitivity analysis, we also use the number of municipalities (*communities*) and the number of registered companies (*companies*) in each canton.

To show the stationarity of the 26 time series for the top income shares for the different periods (1917-2007, 1933-2007 and 1981-2007) of our analysis we performed the Fisher-type test for each panel (Appendix A). Results for level-data, level-data with trend and level-data with a lag show that the null hypothesis of a unit root cannot be rejected. The pairwise correlation of all used variables (Appendix B) also shows that there is no strong multicollinearity and the variables in the majority of the cases are statistically significant at the 5 % significance level.

4.2 Identification strategy

Our *tax* variable could possibly be subject to an endogeneity bias: it is ex ante not clear whether taxes determine the share of top income earners in a specific canton or whether a large number of high income earners are a good explanation for low taxes. The resulting identification problem can be addressed using instrumental variables (IV).¹¹ However, IV-estimates are sensitive to the choice of appropriate instruments. The instrument must be correlated with the endogenous variable but uncorrelated with the error term. Admittedly, finding a suitable instrument for determinants fluctuating over 90 years is not an easy task. Over such a long time-span influences are often interdependent.

Theoretically, two major driving forces of cantonal tax rates should play a role: first, competition on tax rates in the form of tax mimicking with neighbours. Second, the development of the tax base.

As it concerns tax rate competition: If tax mimicking is a good explanation for the cantonal tax setting behaviour, tax competition could serve as an appropriate instrument for cantonal tax rates. As argued in Section 3, there are some indications of tax mimicking among Swiss cantons according to a simple comparison of the neighbouring tax rates over time. More systematically, Feld and Reulier (2008) provide empirical evidence that tax mimicking in deed is an important explanation for cantonal tax policy decisions in Switzerland using the concept of geographical neighbourhood. Very much the same applies for other countries like the U.S.A. (Ladd, 1992; Brueckner and Saavedra, 2001), Belgium (Heyndels and Vuchelen, 1998), the U.K. (Reveli, 2001) or Germany (Büttner, 2001) – with differing concepts of neighbourhood. For Swedish municipalities Edmark and Ågren (2008) show that a tax cut of 1 per cent point in the neighbouring municipalities is correlated with a decrease of 0.74 per cent point in the own tax rate. We follow Heyndels and Vuchelen (1998) and Feld and Reulier (2008) assuming that the average income tax rate in a canton is affected by the income tax rates of a direct geographically neighbour canton (*neighbour tax*). For each canton the neighbouring tax rate is calculated as the sum of the tax rates in cantons with a common border divided by the number of neighbours. In addition, the neighbourhood variable was lagged by one period since we assume that tax payers need at least one period to react (Feld and Reulier 2008).¹²

A caveat has to be made: our tax competition variable is arguably a suitable instrument for cantonal tax rates in the case that taxes affect incomes earned by work-leisure or capital allocation decisions. However, if taxpayers move their residence because of tax incentives, tax competition should be treated as an additional determinant rather than as an instrument for cantonal tax policy. In order to cope with this problem, we excluded

¹¹The Hausman-test for endogeneity confirms that average tax rates cannot be taken as exogenous in all cases.

¹²Furthermore, we follow Baum, Schaffer and Stillman (2003) and implement in our IV-estimates, no degrees of freedom correction.

the migrating taxpayers from the income concentration measures so that our top income shares only consist of taxpayers staying in the respective canton of the given period. The exclusion of the migrated taxpayers from our top income shares was possible due to the fact that they are listed separately in the direct federal tax under the special cases (so called: Zwischenveranlagung; Art. 45 DBG; until 2001). That implies that if a taxpayer moves to another canton in period t , he or she is considered in the original canton until period $t - 1$ and appears in the data of the new location from period $t + 1$ on ($t + 2$ in the case of biannual assessment).¹³

As it concerns tax base development, the argument is that the tax setting behaviour on the sub-federal level is also determined by the development of the tax base. From historical studies for example by Straumann (2012) there is casual evidence that cantons like Schwyz or Zug as pioneers in the low tax strategy in Switzerland first lowered the corporate income tax with preferential tax regimes in the late 1950s and early 1960s in order to attract firms and consequently also employees with their families. In fact, the resident population of these cantons grew much above the Swiss average during the last quarter of the century. With this expanding effect of the tax base it became possible from the 1980s on to lower also the personal income tax for those targeted income groups. Hence, a good proxy for the development of the tax base for personal incomes of the top income earners might be the development in *apartment construction*. It includes all single-family households, apartment buildings, residential and commercial buildings and other buildings with apartments on the cantonal level divided by the citizens in the canton. We argue that an increase in the apartment construction in a canton expands the tax base, which in turn opens space for tax reforms. This is especially important for top incomes, where housing conditions are an important reason to migrate.

5 Results

The results of our regression analyses are presented as follows: in all specifications we considered three different sub-samples to check the robustness of our results. The first period always covers the whole possible time span from 1917 to 2007. The second period covers the years from 1933 to 2007 in order to restrict the time span on comprehensive income taxation in Switzerland. Note, before 1933 labour income was assessed, only. The third period lasts from 1981 to 2007 to evaluate to latest developments in isolation with a clear widening of the spreads of the cantonal tax burden (see Figure 2).

Table 1 reports the results of our baseline estimates. The results for the different income shares show that the average tax burden has a highly significant negative impact on the declared income for the top 1 % to the top 0.01 % income shares. Interestingly, while the distribution of the top 1 % income earners is affected by the tax burden for the periods 1917-2007 and 1933-2007 the negative effect of taxes concentrates on the top 0.1 % and top 0.01 % income shares for the latest period from 1981 on. From the 1980s on, the lower top income shares are not any more significantly affected by the average tax burden.

Also some other determinants in our regressions turn out to have a significant negative impact over the whole period. For example, the unemployment rate, the share of social democrats in the parliament, dummy-variables for World War I and World War II reduce the share of top income earners in Swiss cantons. In contrast, a significant positive influence on the top income shares come from the share of foreigners, the population density as well as from public expenditure per capita.

¹³From 2001 on migrants are not systematically counted in the Zwischenveranlagung any more. However, restricting our analysis to the year 2001 does not change the results significantly.

The results of our instrumental variables estimates are shown in Table 2. The first-stage regression results are presented in the table and confirm the validity of the instruments used. Both, the last year tax burden of neighbouring cantons as well as the increase in apartment construction explain the evolution of cantonal tax rates significantly over the entire period and the two sub-periods from 1933 and 1981 on. The coefficient of the neighbouring tax variable implies that an average neighbour tax increase (decrease) by one percentage point will increase (decrease) the own tax rate by 0.1 to 0.4 percentage points. The variable apartment construction has a significant negative impact on the cantonal tax burden for the whole period and for the period from 1933 to 2007, which implies that an increase in apartment building and thus an increase in population in a specific canton has a dampening effect on the own cantonal average tax burden for top income shares. This result supports the assumption that an expansion of the tax base – *ceteris paribus* – can increase the cantonal revenue and thus opens the scope for governments to cut taxes. However, the tax base effect does not seem to play an important role in the latest time period from 1981 on in explaining the cantonal tax burden. Moreover, the F-test of excluded instruments over the considered periods shows that our instruments are mostly significant on the 1 % level. Altogether, the results of our IV regressions suggest that tax competition is a considerable driving force of cantonal tax policy for Swiss cantons and thus a major determinant of income concentration.

Most importantly, the general results of our baseline regressions are confirmed: Taxes play a most prominent role for the cantonal distribution of very high income earners. For all three considered periods the declared incomes of the top 0.1 % and top 0.01 % income shares are negatively influenced by the average cantonal income tax burden. As the instrumental variable estimates suggest the significant negative influence of the average tax burden has expanded since the 1980s to the top 1 % and top 0.5 % income shares and is mainly driven by tax competition.

To check the robustness of our results Appendix D contains two additional model estimations for the time period 1917 to 2007. We first estimate a lagged dependent variables (LDV) model, where the respective top income shares are lagged by one period. The other exogenous variables in this model are the same as in our baseline estimates. As expected, the lagged top income shares have a significantly positive impact on the top income shares on a significance level of 1 %. However, the impact of the average tax rate on the income of the top income shares remains robust and confirms the results of our baseline model: the top 0.5 % to top 0.01 % income shares are negatively influenced by the cantonal tax burden.

Second, as a further robustness check we extended the baseline model with additional variables, which theoretically could play a role: the number of local communities and the number of companies in each canton. Both determinants play an important role for the distribution of top income shares: more local communities open space for local tax incentives targeted on the top incomes. The number of companies also plays an important role by attracting high income earners in the respective canton. However, also with these additional controls the significantly negative impact of the average tax rates on the income shares prevails.

6 Conclusions

With this paper we analyze the impact of taxes and tax competition on the distribution of top income shares on the sub-federal level in Switzerland over the 20th century. Currently, there are only few cross-country studies which analyze the influence of taxes on income concentration. These studies are subject to cross-country heterogeneity in the definition of income, the tax base and the tax burden. Our panel data in contrast offer rather homogenously defined incomes for the 26 cantons with a common tax base but differing tax rates by exploiting income tax returns in Switzerland. In addition, with a time span of 90 years, the data set allows for a long-term perspective. Second, the role of tax competition in the determination of top income shares is hardly analyzed so far. Our paper takes tax competition as a major driving force of the tax setting behavior of governments into account and thus allows insights on the driving forces behind taxes and its impact on high income earners.

First, our results indicate that differences in the personal income tax rates in Swiss cantons over the 20th century are an important aspect in determining cantonal top income shares. More precisely, we show that tax competition between the cantons is a determinant factor for cantonal tax policy having an impact on the distribution of the top income shares in Switzerland. Specifically, since 1917 the average tax burden for the top incomes has a significantly negative impact on the top incomes with an expanding effect during the last years. For example, in the period 1981 to 2007, the negative impact of taxes expanded on the top 1 % income earners, while before it was concentrated on the top 0.5 % and 0.1 % income shares, only.

Second, our instrumental variables estimation show that cantonal tax competition is a major driving force for cantonal tax policy which in turn affects the distribution of top income shares significantly.

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Table 1: Baseline regressions for cantonal income concentration

Variables	1917-2007				1933-2007				1981-2007			
	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
Tax top 1 %	-0.0883*** (-3.57)				-0.0906*** (-3.33)				0.0385 (0.55)			
Tax top 0.5 %		-0.107*** (-5.35)				-0.115*** (-5.14)				-0.105 (-1.46)		
Tax top 0.1 %			-0.0797*** (-5.88)				-0.0927*** (-5.98)				-0.222*** (-3.62)	
Tax top 0.01 %				-0.0391*** (-4.84)				-0.0449*** (-4.81)				-0.163*** (-3.52)
Unemployment rate	-0.451*** (-4.24)	-0.324*** (-3.54)	-0.227*** (-3.23)	-0.100** (-2.30)	-0.490*** (-4.16)	-0.353*** (-3.45)	-0.252*** (-3.19)	-0.113** (-2.25)	0.000240 (0.00)	-0.0394 (-0.19)	-0.00817 (-0.05)	0.0832 (0.70)
Sector	0.0237 (0.96)	0.0000342 (0.00)	-0.0118 (-0.72)	-0.0245** (-2.42)	0.0202 (0.72)	0.00347 (0.14)	-0.00358 (-0.19)	-0.0210* (-1.78)	-0.0342 (-0.48)	-0.0565 (-0.84)	-0.0558 (-1.02)	-0.0250 (-0.63)
Population (20-64 age)	0.0321 (0.60)	0.0319 (0.70)	-0.00329 (-0.09)	-0.00132 (-0.06)	0.0489 (0.82)	0.0250 (0.48)	-0.0152 (-0.38)	-0.00585 (-0.23)	-0.369** (-2.44)	-0.322** (-2.25)	-0.222* (-1.88)	-0.121 (-1.40)
Crime	0.207 (0.30)	0.617 (1.03)	0.272 (0.59)	-0.0585 (-0.21)	0.653 (0.86)	0.712 (1.08)	0.199 (0.39)	-0.131 (-0.41)	-3.166* (-1.94)	-2.319 (-1.50)	-1.275 (-1.01)	-0.389 (-0.42)
Foreigner	0.193*** (5.69)	0.169*** (5.79)	0.102*** (4.58)	0.0518*** (3.72)	0.201*** (4.98)	0.171*** (4.87)	0.0945*** (3.48)	0.0488*** (2.85)	0.345*** (3.37)	0.314*** (3.26)	0.242*** (3.07)	0.160*** (2.81)
Religion	0.0310** (2.27)	0.0449*** (3.81)	0.0442*** (4.88)	0.0304*** (5.37)	0.0322** (2.08)	0.0444*** (3.27)	0.0416*** (3.95)	0.0298*** (4.48)	0.258*** (5.41)	0.216*** (4.79)	0.126*** (3.32)	0.0658** (2.40)
Population density	0.00182*** (4.48)	0.00122*** (3.49)	0.000667** (2.49)	0.000355** (2.13)	0.000107* (1.83)	0.000104** (2.05)	0.0000978** (2.48)	0.0000598** (2.41)	0.00633** (2.42)	0.00508** (2.06)	0.00293 (1.45)	0.00142 (0.97)
Social Democrats	-0.0252*** (-3.53)	-0.0200*** (-3.25)	-0.0109** (-2.33)	-0.00394 (-1.35)	0.0000253 (0.20)	0.0000660 (0.61)	0.0000769 (0.93)	0.0000647 (1.24)	0.00949 (0.85)	0.00748 (0.71)	0.00604 (0.70)	0.00615 (0.98)
Expenditure	0.000102* (1.87)	0.000109** (2.34)	0.0000965*** (2.69)	0.0000583*** (2.61)	0.00196*** (4.23)	0.00131*** (3.25)	0.000703** (2.26)	0.000358* (1.83)	0.000171 (1.45)	0.000129 (1.17)	0.0000249 (0.27)	0.00000391 (0.06)
Transfers	0.0000188 (0.16)	0.0000619 (0.61)	0.0000860 (1.11)	0.0000764 (1.58)	-0.0226*** (-2.99)	-0.0170*** (-2.59)	-0.00828 (-1.63)	-0.00259 (-0.81)	-0.000785*** (-3.84)	-0.000690*** (-3.59)	-0.000497*** (-3.16)	-0.000295*** (-2.58)
WW I	-5.062*** (-6.39)	-4.464*** (-6.54)	-2.782*** (-5.32)	-1.265*** (-3.88)								
WW II	-1.052** (-2.08)	-0.808* (-1.85)	-0.450 (-1.35)	-0.210 (-1.01)	-1.320** (-2.24)	-0.500 (-0.97)	-0.149 (-0.38)	0.0290 (0.12)				
Federal old age and survivors	-3.832*** (-4.55)	-2.244*** (-3.10)	-0.538 (-0.97)	0.451 (1.31)	-0.818 (-1.59)	-0.652 (-1.46)	-0.355 (-1.03)	-0.136 (-0.63)				
Federal Tax	-0.346 (-0.55)	-0.327 (-0.60)	-0.218 (-0.52)	-0.104 (-0.40)	-3.393*** (-3.42)	-2.066** (-2.39)	-0.519 (-0.78)	0.286 (0.68)	0.671 (0.58)	0.741 (0.68)	0.423 (0.47)	-0.297 (-0.45)
Harmonization	-0.600 (-1.16)	-0.582 (-1.31)	-0.475 (-1.40)	-0.163 (-0.77)	-0.928 (-1.49)	-0.311 (-0.58)	-0.184 (-0.44)	0.0796 (0.30)				
Direct federal tax												
N	1091	1091	1091	1091	1016	1016	1016	1016	416	416	416	416
R ²	0.343	0.310	0.214	0.157	0.328	0.275	0.179	0.127	0.227	0.212	0.195	0.152

Notes: t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 2: Instrumental variables estimation for cantonal income concentration

Variables	1917-2007				1933-2007				1981-2007			
	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %	Top 1 %	Top 0.5 %	Top 0.1 %	Top 0.01 %
Tax top 1 %	-0.306 (-1.31)				-0.344 (-1.56)				-1.664* (-1.81)			
Tax top 0.5 %		-0.217 (-1.57)				-0.229* (-1.72)				-0.932** (-2.19)		
Tax top 0.1 %			-0.219** (-2.32)				-0.195** (-2.25)				-0.618** (-2.39)	
Tax top 0.01 %				-0.130** (-2.44)				-0.116** (-2.33)				-0.597* (-1.82)
Unemployment rate	-0.402*** (-3.07)	-0.299*** (-2.88)	-0.184** (-2.28)	-0.0669 (-1.31)	-0.409*** (-2.96)	-0.313*** (-2.82)	-0.212** (-2.46)	-0.0800 (-1.45)	-0.982 (-1.56)	-0.463 (-1.46)	-0.159 (-0.80)	0.0154 (0.11)
Sector	0.0269 (0.96)	0.00219 (0.09)	-0.00176 (-0.09)	-0.0179 (-1.52)	0.0367 (1.16)	0.0112 (0.44)	0.00735 (0.35)	-0.0141 (-1.10)	-0.313* (-1.66)	-0.150* (-1.65)	-0.0897 (-1.46)	-0.0571 (-1.14)
Population (20-64 age)	0.0749 (0.96)	0.0447 (0.78)	0.00371 (0.09)	0.00540 (0.22)	0.0988 (1.32)	0.0462 (0.81)	-0.00521 (-0.13)	-0.0000832 (-0.00)	-0.212 (-0.83)	-0.0990 (-0.49)	-0.103 (-0.71)	0.0555 (0.34)
Crime	1.062 (1.05)	1.060 (1.40)	0.503 (0.98)	-0.0164 (-0.05)	1.386 (1.39)	1.084 (1.39)	0.388 (0.73)	-0.0665 (-0.20)	-0.432 (-0.14)	0.154 (0.07)	-0.498 (-0.35)	0.719 (0.55)
Foreigner	0.205*** (5.36)	0.179*** (5.61)	0.103*** (4.16)	0.0528*** (3.37)	0.211*** (5.02)	0.177*** (5.00)	0.0929*** (3.43)	0.0491*** (2.85)	0.461*** (2.65)	0.309*** (2.77)	0.248*** (2.99)	0.170*** (2.68)
Religion	0.00879 (0.31)	0.0321 (1.52)	0.0235 (1.33)	0.0156 (1.42)	0.00557 (0.20)	0.0302 (1.43)	0.0257 (1.52)	0.0179* (1.68)	0.00135 (0.01)	0.0897 (1.09)	0.0461 (0.72)	-0.0174 (-0.25)
Population density	0.00184*** (4.14)	0.00124*** (3.36)	0.000690** (2.40)	0.000371** (2.03)	0.00168*** (3.15)	0.00119*** (2.82)	0.000654** (2.09)	0.000339* (1.71)	0.00706* (1.69)	0.00427 (1.48)	0.00276 (1.30)	0.000976 (0.59)
Social Democrats	-0.0279*** (-3.54)	-0.0204*** (-3.19)	-0.0116** (-2.28)	-0.00421 (-1.32)	-0.0252*** (-3.15)	-0.0179*** (-2.73)	-0.00928* (-1.81)	-0.00314 (-0.97)	-0.0112 (-0.53)	-0.00535 (-0.39)	-0.000309 (-0.03)	0.000777 (0.10)
Expenditure	0.000116* (1.90)	0.000110** (2.21)	0.000110*** (2.71)	0.0000644*** (2.62)	0.000123** (2.01)	0.000111** (2.18)	0.000110*** (2.72)	0.0000645** (2.56)	-0.00000166 (-0.01)	0.0000985 (0.76)	-0.0000499 (-0.47)	-0.0000554 (-0.65)
Transfers	0.000124 (0.77)	0.000114 (0.98)	0.000124 (1.47)	0.0000967* (1.82)	0.000164 (0.94)	0.000123 (0.99)	0.000115 (1.30)	0.0000915* (1.65)	-0.000765** (-2.35)	-0.000783*** (-3.44)	-0.000460*** (-2.75)	-0.000181 (-1.18)
WW2	-1.323** (-2.21)	-0.954** (-2.00)	-0.729* (-1.85)	-0.463* (-1.75)	-1.378** (-2.33)	-0.973** (-2.04)	-0.682* (-1.77)	-0.425 (-1.64)				
Federal old age and survivors	-3.086*** (-2.83)	-1.851** (-2.26)	-0.189 (-0.31)	0.645* (1.70)	-3.238*** (-3.07)	-1.971** (-2.38)	-0.381 (-0.62)	0.561 (1.45)				
Federal Tax Harmonization	-1.052 (-0.98)	-0.705 (-0.90)	-0.795 (-1.31)	-0.529 (-1.39)	-1.322 (-1.22)	-0.817 (-1.03)	-0.755 (-1.25)	-0.489 (-1.29)	2.203 (1.09)	0.849 (0.67)	0.267 (0.28)	-1.089 (-1.17)
Direct federal tax	-0.321 (-0.52)	-0.470 (-0.99)	-0.407 (-1.14)	-0.114 (-0.51)	-0.322 (-0.53)	-0.493 (-1.03)	-0.454 (-1.28)	-0.137 (-0.61)				
Neighbour tax (t-1)	0.114** (2.28)	0.153*** (3.16)	0.0897* (1.89)	0.102** (2.17)	0.0929* (1.82)	0.1461*** (2.98)	0.0913*** (1.92)	0.104** (2.19)	-0.209** (-2.30)	-0.358*** (-3.75)	-0.436*** (-4.84)	-0.289*** (-2.95)
Apartment construction (t-1)	-1.101*** (-2.64)	-1.529*** (-3.47)	-2.216*** (-4.48)	-2.431*** (-4.71)	-1.384*** (-3.31)	-1.753*** (-3.97)	-2.471*** (-5.04)	-2.666*** (-5.18)	-0.0894 (-0.17)	-0.270 (-0.56)	-0.424 (-0.93)	0.214 (0.48)
N	1066	1066	1066	1066	1016	1016	1016	1016	416	416	416	416
F	9.101	7.760	4.143	2.790	8.252	6.469	3.327	2.252	1.741	2.924	2.843	1.803
F test of excluded instruments	6.40***	11.68***	12.46***	14.43***	7.57***	13.22***	15.37***	17.12***	2.67*	7.16***	11.95***	4.55**
Sargan test (p-value)	0.0111	0.0317	0.9397	0.4261	0.0811	0.0976	0.9865	0.4522	0.7581	0.8639	0.7802	0.7613

Notes: z statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Appendix A

Panel Unit Root Test – Fisher Type Test

Income share	Level	Level with trend	Level with Lag 1
1917-2007			
Top 1 %	123.038***	136.954***	166.627***
Top 0.5 %	129.246***	132.017***	156.009***
Top 0.1 %	132.599***	127.916***	129.932***
Top 0.01 %	161.309***	142.301***	113.838***
1933-2007			
Top 1 %	139.923***	250.636***	155.145***
Top 0.5 %	144.058***	267.254***	146.158***
Top 0.1 %	139.386***	206.130***	123.104***
Top 0.01 %	164.688***	170.136***	108.308***
1981-2007			
Top 1 %	62.182	59.330	64.386
Top 0.5 %	73.693**	71.982**	67.163*
Top 0.1 %	87.773***	84.523***	67.679*
Top 0.01 %	91.844***	90.603**	66.993*

Note: *, **, *** denote significance at the 10%, 5%, 1% levels.

Appendix B

Correlation matrix

	Tax top 1 %	Tax top 0.5%	Tax top 0.1%	Tax top 0.01%	Neighbour tax top 1 %	Neighbour tax top 0.5 %	Neighbour tax top 0.1 %	Neighbour tax top 0.01 %	Apartment construction	Unemployment rate	Sector	Population	Crime	Foreigner	Religion	Population density	Social Democrats	Expenditure	Transfers	WW I	WW II	AHV	Tax Harmonization	Direct federal tax	Companies	Communities	
Tax top 1 %	1																										
Tax top 0.5%	0.98*	1																									
Tax top 0.1%	0.96*	0.98*	1																								
Tax top 0.01%	0.94*	0.97*	0.99*	1																							
Neighbour tax top 1 %	0.75*	0.74*	0.71*	0.70*	1																						
Neighbour tax top 0.5 %	0.74*	0.74*	0.72*	0.71*	0.99*	1																					
Neighbour tax top 0.1 %	0.73*	0.73*	0.71*	0.71*	0.98*	0.99*	1																				
Neighbour tax top 0.01 %	0.73*	0.73*	0.72*	0.71*	0.97*	0.98*	0.99*	1																			
Apartment construction	0.43*	0.39*	0.33*	0.31*	0.46*	0.43*	0.38*	0.36*	1																		
Unemployment rate	0.13*	0.16*	0.20*	0.21*	0.08*	0.11*	0.16*	0.18*	-0.21*	1																	
Sector	0.61*	0.61*	0.61*	0.60*	0.58*	0.59*	0.61*	0.62*	0.30*	0.50*	1																
Population	0.38*	0.38*	0.37*	0.37*	0.19*	0.21*	0.23*	0.24*	0.16*	0.43*	0.67*	1															
Crime	0.18*	0.18*	0.17*	0.15*	-0.02	-0.03	-0.02	-0.04	0.04	0.12*	0.09*	0.18*	1														
Foreigner	0.59*	0.58*	0.57*	0.57*	0.51*	0.51*	0.53*	0.53*	0.26*	0.43*	0.73*	0.56*	0.03	1													
Religion	0.11*	0.11*	0.10*	0.10*	-0.13*	-0.13*	-0.14*	-0.14*	-0.07*	0.00	-0.09*	0.36*	0.26*	0.04	1												
Population density	0.22*	0.19*	0.19*	0.17*	0.09*	0.08*	0.10*	0.09*	0.03	0.14*	0.34*	0.41*	0.35*	0.29*	0.13*	1											
Social Democrats	0.31*	0.32*	0.33*	0.33*	0.11*	0.11*	0.13*	0.12*	0.08*	0.21*	0.20*	0.47*	0.39*	0.26*	0.44*	0.24*	1										
Expenditure	0.50*	0.51*	0.52*	0.51*	0.59*	0.60*	0.63*	0.64*	0.06*	0.56*	0.81*	0.41*	0.04	0.63*	-0.20*	0.29*	0.14*	1									
Transfers	0.25*	0.25*	0.26*	0.26*	0.40*	0.41*	0.42*	0.42*	0.09*	0.31*	0.47*	0.17*	-0.15*	0.18*	-0.30*	-0.08*	-0.08*	0.65*	1								
WW I	-0.26*	-0.25*	-0.24*	-0.24*	-0.28*	-0.28*	-0.27*	-0.27*	-0.22*	-0.08*	-0.17*	-0.16*	-0.03	-0.03	0.04	-0.02	-0.20*	-0.18	-0.10*	1							
WW II	-0.24*	-0.22*	-0.22*	-0.22*	-0.29*	-0.27*	-0.27*	-0.28*	-0.28*	-0.14*	-0.21*	0.04	-0.03	-0.26*	0.07*	-0.02	-0.01	-0.22*	-0.17*	-0.04	1						
AHV	0.67*	0.65*	0.61*	0.59*	0.77*	0.76*	0.73*	0.72*	0.56*	-0.05	0.47*	0.10*	-0.01	0.38*	-0.14*	0.05	0.06	0.44*	0.34*	-0.28*	-0.50*	0.32*	1				
Tax Harmonization	0.28*	0.29*	0.31*	0.32*	0.36*	0.38*	0.41*	0.42*	-0.01	0.64*	0.67*	0.40*	-0.09*	0.45*	-0.18*	0.03	0.07*	0.78*	0.63*	-0.09*	-0.16*	0.32*	0.32*	1			
Direct federal tax	0.64*	0.62*	0.57*	0.56*	0.72*	0.71*	0.68*	0.67*	0.48*	-0.18*	0.41*	0.13*	0.02	0.26*	-0.11*	0.05	0.09*	0.36*	-0.28*	-0.35*	-0.13*	0.80*	0.26*	0.26*	1		
Companies	0.48*	0.47*	0.49*	0.48*	0.39*	0.40*	0.39*	0.40*	0.22*	0.39*	0.75*	0.52*	0.11*	0.63*	0.03	0.15*	0.17*	0.51*	0.13*	-0.10*	-0.15*	0.30*	0.41*	0.25*	0.25*	1	
Communities	0.20*	0.23*	0.25*	0.26*	0.00	0.01	0.01	0.01	0.07*	0.02	0.09*	0.11*	0.16*	0.02	0.31*	-0.21*	0.28*	-0.09*	-0.09*	0.01	0.01	-0.02	-0.04	-0.02	0.28*	0.28*	1

* Indicate that the correlations are statistically significant at 5 %.

Appendix C

Variable	Obs	Mean	Std. Dev.	Min	Max
Income share Top 1%	1094	9.214433	2.807944	3.89	27.13
Income share Top 0.5%	1094	6.583346	2.360868	2.41	22.56
Income share Top 0.1%	1094	3.033208	1.625642	0.84	17.25
Income share Top 0.01%	1094	1.011782	0.9005498	0.15	12.05
Average tax rate Top 1%	1092	16.70449	5.496009	0	30
Average tax rate Top 0.5%	1092	17.70183	5.76466	0	30
Average tax rate Top 0.1%	1092	18.70559	6.15611	0	35.3
Average tax rate Top 0.01%	1092	19.00027	6.341971	0	37.5
Neighbour tax rate Top 1%	1094	16.56665	4.825419	4.5	30.04
Neighbour tax rate Top 0.5%	1094	17.59679	5.011139	5.2	30.04
Neighbour tax rate Top 0.1%	1094	18.6438	5.251507	5.2	35.33
Neighbour tax rate Top 0.01%	1094	18.94782	5.386502	5.2	35.33
Apartment construction	1092	0.5178895	0.3531676	0	2.273
Unemployment rate	1093	0.9777402	1.290734	0	5.97
Sector (in % of Population)	1091	44.27204	14.98438	15.28	83.97
Population share (20-64 age)	1094	58.52659	3.945268	48.58	69.35
Crime (in % of Population)	1092	0.3152015	0.1323913	0.02	0.97
Foreigner (in % of Population)	1094	12.32121	7.286106	1.6	38
Religion (in % of Population)	1094	36.28033	25.93239	1.88	88.15
Expenditure per capita	1092	3276.514	3861.104	18	28034
Transfers per capita	1092	693.1822	1057.302	3	7677
Population density	1094	414.8976	1022.033	17	6324
Share of Social Democrats voters	1094	17.98327	13.73555	0	85.7
WW I	1094	0.0228519	0.1494996	0	1
WW II	1094	0.0685558	0.2528128	0	1
Federal old age and survivors	1094	0.7714808	0.4200708	0	1
Federal Tax Harmonization	1094	0.261426	0.4396124	0	1
Direct federal tax	1094	0.8400366	0.3667398	0	1
Number of communities	1092	119.2317	121.8109	3	508
Number of companies	1092	3219.181	4719.026	5	29421

Appendix D

Cantonal income concentration, lagged dependent variable and robustness check, 1917-2007

	Top 1%	Top 0.5 %	Top 0.1 %	Top 0.01%	Top 1%	Top 0.5 %	Top 0.1 %	Top 0.01%
Top 1 % (t-1)	0.725*** (33.37)							
Tax top 1 %	-0.0178 (-0.99)				-0.0796*** (-3.21)			
Top 0.5 % (t-1)		0.694*** (30.81)						
Tax top 0.5 %		-0.0319** (-2.09)				-0.102*** (-5.01)		
Top 0.1 % (t-1)			0.635*** (26.40)					
Tax top 0.1 %			-0.0324*** (-2.90)				-0.0785*** (-5.75)	
Top 0.01 % (t-1)				0.592*** (23.44)				
Tax top 0.01 %				-0.0191*** (-2.73)				-0.0389*** (-4.77)
Unemployment rate	-0.238*** (-3.20)	-0.188*** (-2.84)	-0.121** (-2.22)	-0.0428 (-1.19)	-0.486*** (-4.56)	-0.338*** (-3.67)	-0.224*** (-3.18)	-0.0941** (-2.14)
Sector	0.00759 (0.43)	0.00148 (0.09)	-0.00297 (-0.23)	-0.00699 (-0.81)	0.00450 (0.17)	-0.00382 (-0.16)	-0.00591 (-0.33)	-0.0174 (-1.57)
Population (20-64 age)	0.00368 (0.10)	-0.00413 (-0.12)	-0.0172 (-0.62)	-0.0109 (-0.60)	0.0487 (0.91)	0.0359 (0.78)	-0.00692 (-0.20)	-0.00638 (-0.29)
Crime	0.584 (1.18)	0.569 (1.29)	0.311 (0.86)	-0.0428 (-0.18)	0.275 (0.40)	0.678 (1.13)	0.326 (0.71)	-0.0232 (-0.08)
Foreigner	0.0487* (1.92)	0.0559** (2.47)	0.0434** (2.35)	0.0259** (2.13)	0.178*** (5.26)	0.159*** (5.43)	0.0970*** (4.33)	0.0491*** (3.52)
Religion	0.0124 (1.26)	0.0174** (1.97)	0.0186** (2.53)	0.0138*** (2.84)	0.0292** (2.15)	0.0442*** (3.77)	0.0441*** (4.88)	0.0305*** (5.41)
Population density	0.000575** (1.96)	0.000436* (1.67)	0.000276 (1.29)	0.000167 (1.18)	0.00144*** (3.43)	0.00102*** (2.83)	0.000614** (2.21)	0.000357** (2.06)
Social Democrats	-0.00745 (-1.47)	-0.00584 (-1.29)	-0.00336 (-0.90)	-0.00109 (-0.45)	-0.0250*** (-3.48)	-0.0208*** (-3.36)	-0.0122*** (-2.58)	-0.00506* (-1.71)
Expenditure	0.0000358 (0.94)	0.0000310 (0.91)	0.0000279 (0.99)	0.0000209 (1.13)	0.0000874 (1.61)	0.0000977** (2.09)	0.0000887** (2.47)	0.0000535** (2.40)
Transfers	-0.0000281 (-0.03)	0.0000306 (0.41)	0.0000613 (1.01)	0.0000765* (1.92)	0.0000400 (0.34)	0.0000660 (0.65)	0.0000798 (1.02)	0.0000685 (1.41)
WW I					-4.988*** (-6.34)	-4.413*** (-6.49)	-2.762*** (-5.30)	-1.257*** (-3.86)
WW II	-1.120*** (-3.20)	-0.984*** (-3.14)	-0.491* (-1.90)	-0.226 (-1.33)	-1.054** (-2.10)	-0.802* (-1.85)	-0.442 (-1.33)	-0.204 (-0.98)
Federal old age and survivors insurance	-1.443** (-2.43)	-0.830 (-1.57)	-0.0837 (-0.19)	0.256 (0.90)	-3.601*** (-4.30)	-2.130*** (-2.95)	-0.509 (-0.92)	0.447 (1.30)
Federal Tax Harmonization	-0.0906 (-0.21)	-0.190 (-0.48)	-0.272 (-0.84)	-0.307 (-1.43)	0.0607 (0.10)	-0.0939 (-0.17)	-0.135 (-0.32)	-0.0820 (-0.31)
Direct federal tax	-0.108 (-0.30)	-0.563* (-1.76)	-0.522** (-1.99)	-0.289* (-1.68)	-0.599 (-1.17)	-0.579 (-1.31)	-0.470 (-1.39)	-0.160 (-0.76)
Communities					0.0125*** (3.03)	0.0100*** (2.83)	0.00684** (2.51)	0.00421** (2.48)
Companies					0.0000766*** (2.76)	0.0000312 (1.29)	-0.00000942 (-0.05)	-0.00000974 (-0.85)
N	1066	1066	1066	1066	1091	1091	1091	1091
R²	0.566	0.532	0.464	0.413	0.353	0.316	0.218	0.163

Notes: t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01.

Figure 3: Average tax rate for the top income shares, 26 Swiss cantons, 1917-2007

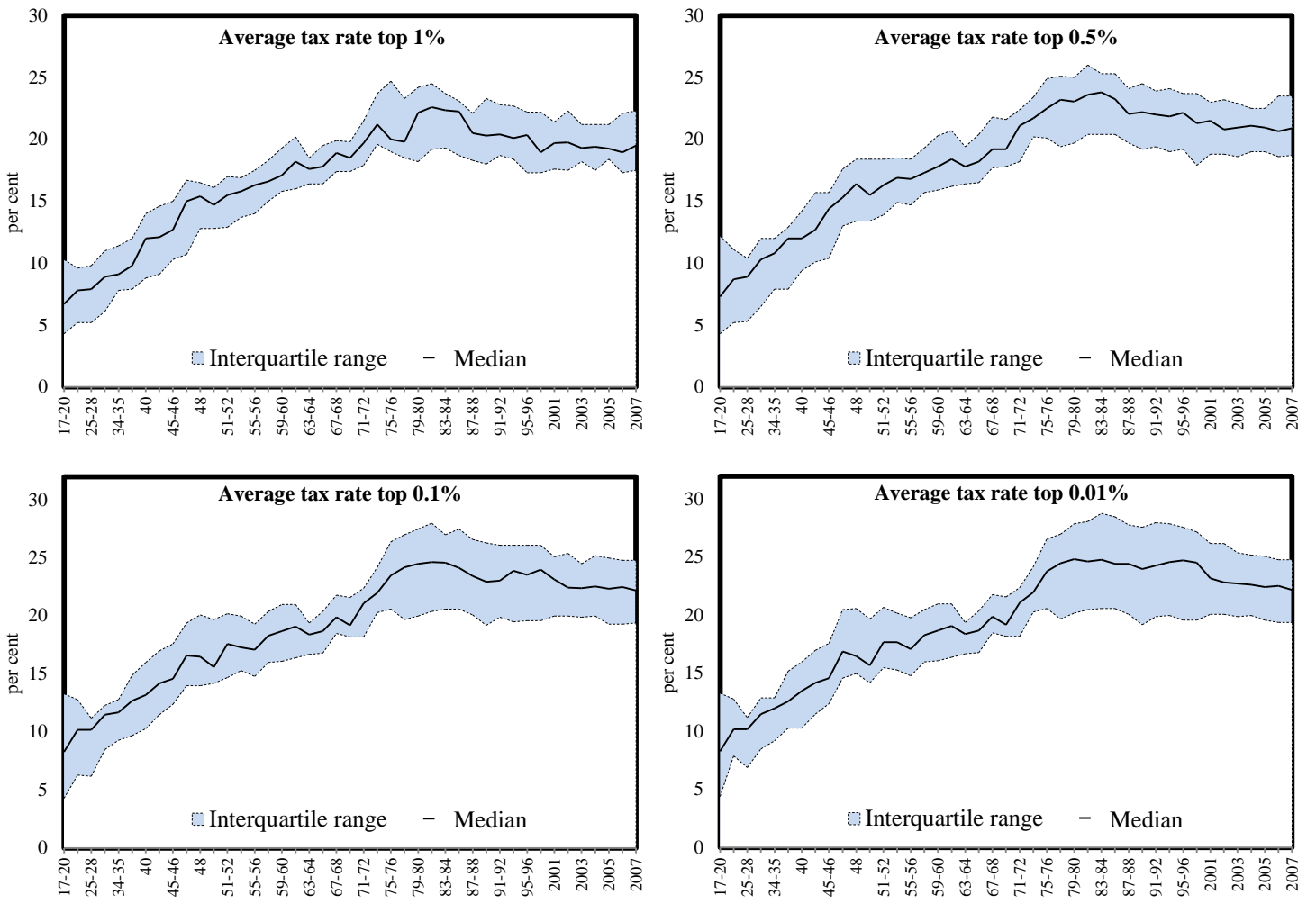


Figure 4: Tax rates of neighbouring cantons and tax rate for the top 1% and 0.1% income shares, 1917-2007

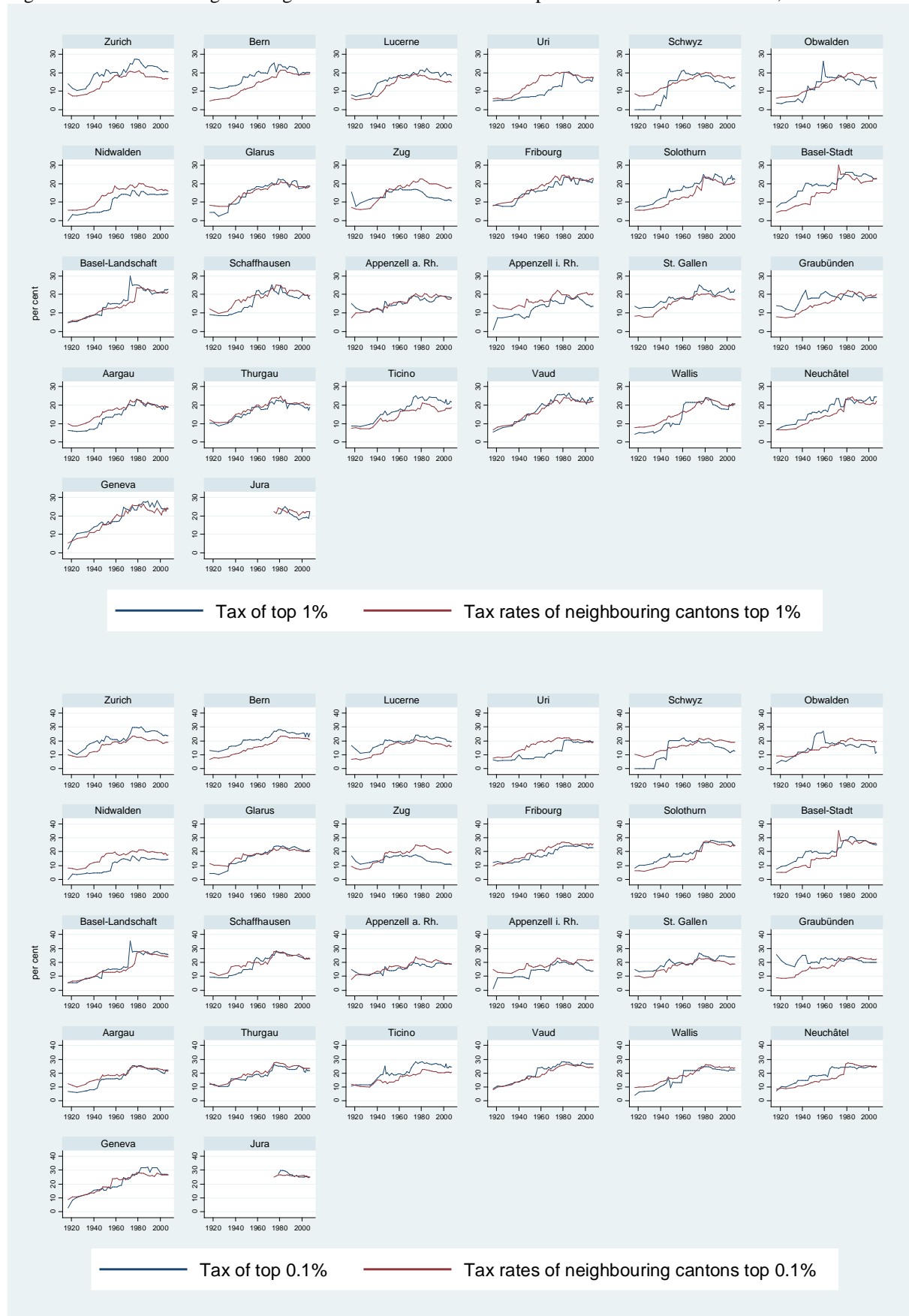


Figure 5: Scatter plot for the top 0.1 % income shares and the average tax , 1917-2007

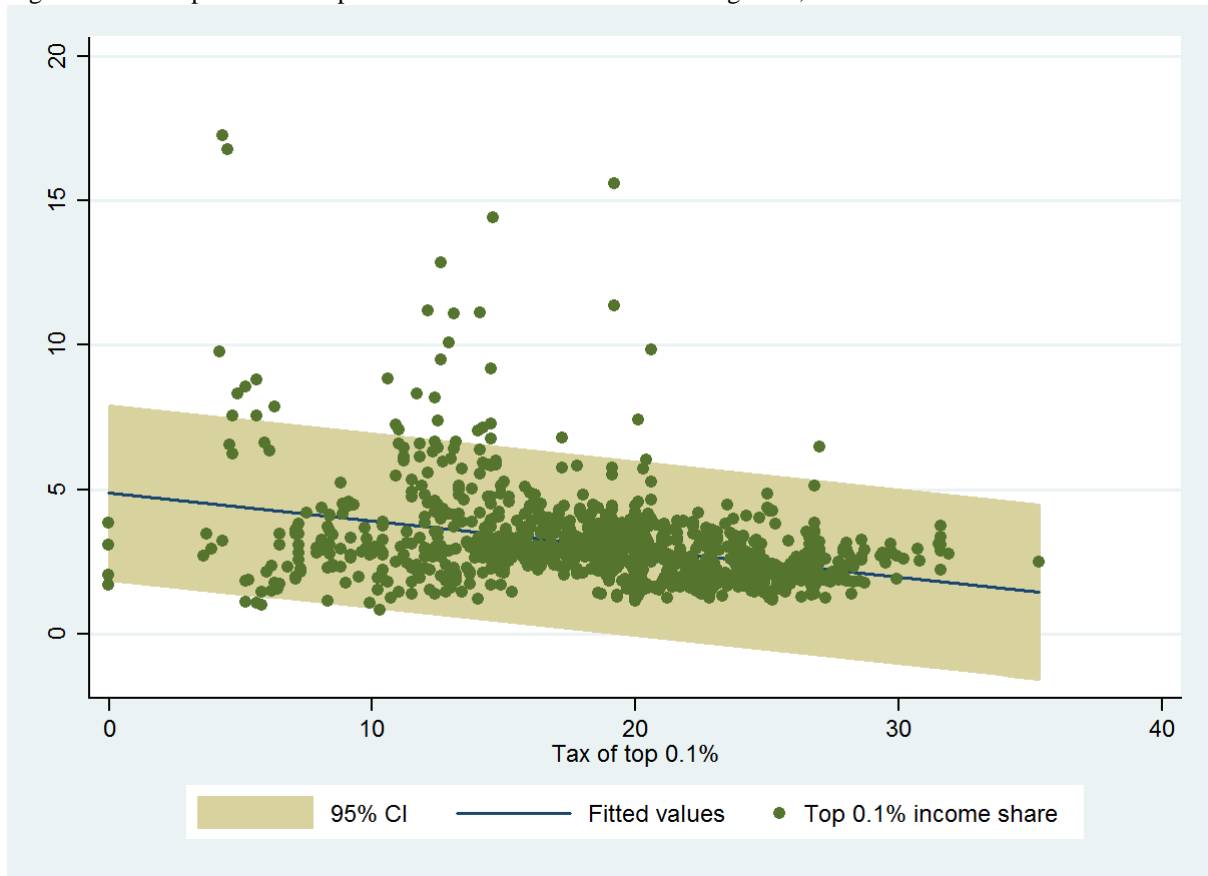


Figure 6: Apartment construction (multiplied by 10) and tax of top 0.1%

