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Beggar-Thy-Neighbour Tax Cuts: Mobility after a Local Income and Wealth Tax Reform in Switzerland

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Abstract

This paper analyzes mobility responses to a large, regressive local income tax cut benefiting the top 1% in the Swiss Canton of Obwalden in 2006. DiD estimations comparing Obwalden with neighboring cantons confirm that the reform was successful in increasing the share of rich taxpayers in the canton (+20-30%). Using individual tax data, I find a large elasticity of the inflow of rich taxpayers with respect to the average net-of-tax rate ranging from 3.2 to 6.5. DiD estimates of cantonal revenue, however, show that the tax cuts did not lead to an increase in cantonal tax revenue per capita. This is in line with a theoretical analysis suggesting Obwalden was not on the wrong side of the Laffer curve before the reform.

JEL-Classification: H24, H31, H71, H73, R23
Key Words: Mobility; Personal income tax; Local taxes; Tax competition; Regressive income tax

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1 Introduction

In the presence of tax competition, governments are concerned about the drain of their tax base. Lately, the focus has shifted from capital taxation to top income earners evading taxes by relocating to tax havens. This raises the question how responsive top earners' location decisions are to taxation when taxes differ across regions. And how much do especially small regions gain in terms of increased tax base and revenue from entering tax competition?

There is still relatively little empirical evidence on the spatial mobility of rich taxpayers in response to taxation. Existing estimates differ across countries and institutional settings. The work by Kleven *et al.* (2013, 2014) (Kleven et al., 2014,0) (Agrawal and Foremny, 2016) (Young et al., 2014) (Young and Varner, 2011) I add to this literature by analyzing a regressive income tax reform in central Switzerland, which explicitly aimed at attracting rich taxpayers from surrounding large urban areas, including Zurich. I use individual income tax data and an instrumental variable approach to estimate the elasticity of rich taxpayers moving to the low-tax canton (state). I find an elasticity of 3.3–6.5, suggesting that location responses of the top 1% are larger than what most previous studies have found. The (initially small) share of rich taxpayers living in the canton increased by 20-30%.

These results imply that tax competition may lead to considerable drain of the tax base, especially in settings where income taxation is residence-based (as opposed to source-based). Cost of labor mobility can be expected to fall further in the future thanks to improved transportation and communication technologies, as well as to institutional developments, such as European Integration and positive-selection immigration policies, reducing migration costs even across countries. Especially those in the top 1% who are not superstars but CEO,Äôs, self-employed and high-earning professionals (Denk, 2015) will continue benefitting from these developments, such that the pressure from tax competition on the tax base is likely to increase.

In 2006, the canton (state) of Obwalden in central Switzerland changed its tax code and introduced falling marginal tax rates for incomes beyond 300,Äô000 CHF. This corresponds roughly to the income threshold to belong to the top 1% of Swiss taxpayers. The regressive scheme implied that for the richest taxpayers, effective average tax rates fell from 30% to 26%, while for the upper middle class the effective average tax rate remained at 25%. Since

in Switzerland personal income taxation is residence based, it was sufficient for taxpayers living in other regions to move to Obwalden to take advantage of the low tax rates. I exploit the variation in time, across cantons and across different groups of taxpayers to identify the pull effect of this pro-rich tax policy in Obwalden. The Swiss setting is particularly interesting, as it comes close to Tiebout's (1956) model world where taxpayers can freely relocate and vote with their feet. The income tax applies to all forms of income in a global manner, not distinguishing between labor and capital incomes. Employees, self-employed and rentiers can therefore all take advantage of local income tax differences by relocating.

The analysis of the reform proceeds in three steps. Using federal income tax data, aggregated at the municipality level, I first analyze (i) the share of rich taxpayers before and after the reform, and (ii) net income per taxpayer in Obwalden in comparison to its neighbors, Lucerne and Nidwalden, in a difference-in-differences (DiD) setting. The results indicate that the reform had the intended effect, increasing the share of rich taxpayers by attracting and retaining them in the canton. Compared to its neighbors, the share of rich taxpayers in Obwalden grew by 24–30%. This is also reflected by an estimated average increase in net income per taxpayer of 15% as a result of the reform. Income growth, however, is concentrated among rich taxpayers: the reform had no effect on average net incomes of the "bottom 99%,Äô,Äô of taxpayers, those below the regressive threshold.

Based on individual cantonal income tax data from Obwalden for the period 2001–2010[1], I estimate the elasticity of rich taxpayers in the canton with respect to the average net-of-tax rate using a instrumental variable approach. I find a large elasticity of in-migration of up to 6.5 in the short-run and 4.6 in the five years after the reform. Moving responses were immediate and flattened out somewhat over time.

Finally, DiD estimates of the change in cantonal tax revenue show that the reform was at best revenue neutral. Comparing the effective top marginal tax rate with the revenue-maximizing rate shows that Obwalden already was on the left side of the Laffer curve prior to the reform, which explains the adverse revenue effects despite the large inflows.

This paper contributes to the literature on tax-induced mobility and local

[1]Data made available by courtesy of the tax administration of the Canton of Obwalden.

public finance studying a tax reform meant to attract new taxpayers from within the country as well as from abroad, in an institutional setting where no restrictions on citizenship or income source apply for eligibility of the tax scheme. First, the results show that in absence of institutional restrictions location responses of high earners are large—even when not focusing on especially mobile groups like football players (Kleven et al., 2013) or star scientists (Akcigit et al., 2016). The institutional setting in the U.S. may explain why Young and Varner (2011) and Young et al. (2014) find only small moving responses in the US context. Only some states have reciprocal agreements, allowing to tax individuals in their place of residency. In many instances, labor income taxation is source-based, reducing the possibilities for tax planning through relocation for individuals. Second, the results indicate that within-country elasticities are larger than in the international context studied by Kleven *et al.* (2013, 2014) and Akcigit et al. (2016). This is supported by a recent study by Agrawal and Foremny (2016) who find even larger elasticities within Spain. Third, the magnitude of the elasticity has to be understood in the context of the size of the migration flows prior to a tax reform. Starting from a situation with low spatial mobility, a small increase in the number of in-movers corresponds to a large relative change. In turn, a large elasticity may not be sufficient to offset revenue losses from tax cuts on the rich.

Switzerland has proven to be an ideal laboratory to study effects of local tax differences due to its strong federal character (Kirchgässner and Pommerehne, 1996; Feld and Kirchgässner, 2001; Schmidheiny, 2006; Roller and Schmidheiny, 2016). To my knowledge, however, this is the first paper to also address revenue implications of tax competition within Switzerland.

The implications of my findings go beyond Switzerland and apply generally in contexts of fiscal federalism. This includes the U.S., allowing for tax competition at the state or metropolitan area level where residence-based taxation is applied, Canada, Spain, or Sweden, to name just a few countries where local income tax competition is at play. The European Union is another example of how economic integration and relaxed migration policies put pressure on the fiscal power of autonomous nation states. Even though within the European context mobility costs are higher than within Switzerland, these considerations still matter for households living in border regions, and, more generally, for high income earners who are known to be more mobile—a fact this study confirms.

2 Location Choice as a Response to Taxation

Income segregation of high-income taxpayers is a well documented phenomenon in Switzerland (Kirchgässner and Pommerehne, 1996; Feld and Kirchgässner, 2001; Schaltegger et al., 2011). Roller and Schmidheiny (2016) show that in Switzerland this segregation leads to a de-facto regressive tax scheme, where taxpayers with incomes above 1 million CHF face falling average tax rates due to strategic choice of their location.

Despite this compelling evidence, only few studies have studied migratory responses to taxation in the Swiss context. Schmidheiny (2006) develops an extensive location choice model and shows that for relocating households in the area of Basel in 1997, low tax levels attract high income individuals. Liebig et al. (2007) use the 2000 census and find that migratory responses are small and concentrated among Swiss college graduates. A drawback of their study is that incomes are not available in the census data and have therefore to be estimated, allowing only for estimates of labor incomes and excluding capital incomes. For the presumably more mobile high-income earners, however, the latter are an important income source.

I fill this gap by exploiting the regressive income tax reform introduced in Obwalden in 2006 using federal and cantonal income tax data. Incomes and wealth are captured in high detail and in the individual income tax data of the canton of Obwalden the exact moving date is reported. The present paper therefore adds to other recent work relying on large tax changes to estimate the mobility of rich taxpayers (see for example Young and Varner, 2011, Young et al., 2014, and Moretti and Wilson (2017) for the U.S.; Agrawal and Foremny, 2016, for Spain; Kleven et al., 2014, for Denmark).

In contrast to some of the studies estimating the migration elasticity with respect to taxes, the focus here is not limited to high-income foreigners (Kleven et al. 2014; Schmidheiny and Slotwinski, 2015) or highly mobile international professionals such as star scientists (Akcigit et al., 2016) or football players (Kleven et al., 2013). These papers all report relatively large mobility elasticities of one or more with respect to the average net-of-tax rate. Due to the highly mobile nature of these types of workers, Kleven et al. (2013) argue their estimates should be seen as upper bounds. My results show that this is not necessarily true and that within-country mobility elasticities may well be larger (as Moretti and Wilson, 2017, show for star scientists *within* the

U.S.), even for regular high-income taxpayers (as Agrawal and Foremny, 2016, show for Spain). Elasticities are larger (i) in settings which come close to a Tiebout (1956) model world without restrictions with respect to profession, income source, nationality or origin to take advantage of lower taxes in an other jurisdiction; (ii) in jurisdictions starting from low levels of migration.

3 Income and Wealth Tax Reform in Obwalden

In 2006, the canton of Obwalden introduced a regressive tax schedule with marginal rates declining at taxable incomes above 300,000 CHF, and at taxable wealth of 5 million CHF. Like in a Tiebout (1956) model, income and wealth taxation in Switzerland is residence based, and cantons compete especially over rich taxpayers.[2] Hence Obwalden's aim explicitly was to attract high-income and wealthy individuals and to keep up with the competitive tax rates of the neighboring cantons (especially Zug, Nidwalden and Schwyz). These have long been known for their low tax rates on high incomes and wealth (Figure C1 in the Appendix shows average tax rates across Swiss cantons and municipalities), while Obwalden had been continuously ranked as the canton with the highest taxes on income and wealth since 2002.

To lower the overall tax load, the cantonal parliament had suggested a two-step tax strategy. First, Obwalden was to strengthen its position by actively engaging in inter-cantonal tax competition for high-income taxpayers and firms.[3] In a second step in the near future, the overall tax load was to be lowered.[4] Due to its geographic location at the heart of Switzerland and the small size of the country, mobility costs are low and commuting times to urban centers like Lucerne, Zug and Zurich lie within a reasonable range of one hour or less (Figure C2 in the Appendix shows commuting distances and population densities in urban agglomerations across Switzerland). It was deemed feasible to attract high-income taxpayers even if their workplace was outside Obwladen. The tax strategy further included lower rates for imputed

[2]For an overview over the Swiss tax system, see Appendix A.

[3]The tax on corporate earnings, formerly in the range of 9-11%, was reduced to a unique cantonal rate of 6.6% to become the lowest in the country. The corporate capital tax was reduced from 0.32% to 0.2% (in Sarnen). Special conditions for holding and domicile companies had already been in place for more than 10 years.

[4]This line of reasoning was shared with the voters in the official information material for the popular referendum on the new tax law: "Abstimmungsbotschaft Kantonale Volksabstimmung vom 11. Dezember 2005", Kanton Obwalden.

rents to increase the attractiveness of real estate in Obwalden.

Initial losses in tax revenue were to be financed through exceptional payouts each canton had received from large gold sales by the Swiss National Bank in 2005. Most cantons have used this money by large to reduce their debts, sometimes combined with (future) tax reductions. Obwalden was no exception to this, the only difference being the dramatic size in tax cuts for the rich. Out of the 134.5 million CHF Obwalden had received, 23.5 million were allocated to financing initial losses in municipalities tax revenue over the first five years. This sum corresponded to almost 50% of cantonal tax revenue totaling approximately 50 million p.a. at that time.

The introduction of the regressive tax scheme had been decided by the cantonal parliament in October 2005 with 39 against 4 votes, and confirmed by 86% of the voters in the mandatory popular referendum held on December 11 2005. The scheme immediately became effective as of January 1 2006. However, to take advantage of the low taxes it was sufficient to officially reside in Obwalden as of December 31 2006, since in Switzerland this is the reference date defining the location of the tax liability. Hence, individuals from other cantons had roughly 12 months to relocate to Obwalden and benefit from the low tax in the first year already. Note that the law and many cantonal and federal court rulings attempt to inhibit fake moves for tax avoidance. Taxpayers who wish to have a second residence will undergo an interview with the authorities, where the municipality will try to establish the tax liability based on where the taxpayer's center of life is.

Starting in October 2005, the proposal and the introduction had gained large media attention in the whole country and this attention grew considerably once the introduction had been decided upon at the ballot.[5] Left-wing politicians across the country protested heavily against this new tax law and brought the case to the Federal Court. According to the plaintiffs, the law violated the principle of proportional taxation according to one's ability to pay and the principle that taxes should be general and equal in nature. The canonical view in the media and academia, however, was that the Federal Court had no say in this and was not going to rule, due to the large set of

[5]In the large liberal newspaper *Neue Zürcher Zeitung NZZ* for example, there were 12 articles on taxes in Obwalden between January 1 2000 and October 15 2005, but 49 articles on regressive taxation in Obwalden between December 1 2005 and July 31 2007.

rights the constitution guarantees to cantons in taxation matters.[6] Furthermore, in a similar case in the canton of Schaffhausen in 2004 (which had gone by surprisingly unnoticed) the same court had rejected the appeal.[7] It therefore came as a surprise for many observers including the President of the Cantonal Conference of Financial Directors[8] when on June 1 2007 the court essentially ruled in favor of the plaintiffs[9], obliging Obwalden to change its tax schedule. To guarantee legal certainty, however, the regressive schedule remained valid for the tax periods 2006 and 2007. Keeping the promise of lowering taxes for everyone and offering attractive conditions for high-income households, the canton was the first to introduce a flat rate tax, with a general social exemption of 10,000 CHF, effective January 1 2008.To respond to this change, it was sufficient for individuals to move by December 31 2008.

Panel a) of Figure 1 depicts the changes in marginal tax rates over time exemplarily for the municipality of Sarnen.[10] Income earners with incomes above 300,000 CHF taxable income benefited substantially from the tax cut in 2006 (red line), while those with incomes below that threshold faced similar or slightly lower marginal tax rates than before the change. As Panel b) of Figure 1 shows, average tax rates were reduced for all taxpayers in 2006. With the introduction of the flat rate tax in 2008, taxable incomes below 340,000 CHF saw a decrease in marginal rates, while incomes exceeding this threshold were now again taxed at a higher rate than during the regressive period—yet not as high as before the 2006 reform. This cut in marginal rates translated into lower average tax rates also for top earners. Only incomes above 555,100–658,600 CHF were taxed at a slightly higher average rate (depending on the municipality).

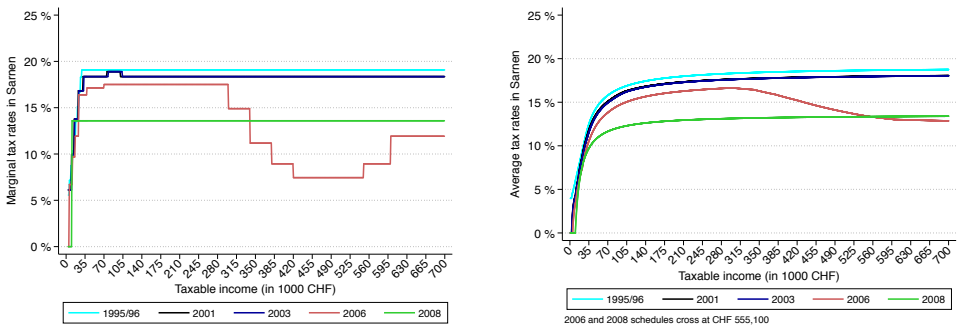
[6]See for example comments from Prof. Silvio Borner (University of Basel) and Charles Blankart (Humboldt University Berlin) in *NZZ* 24./25.12.2005, Georg Rich (honorary professor University of Bern and former chief economist Swiss National Bank) in *NZZ* 22.8.2006, and Prof. Pascal Hinny (University of Fribourg) in *NZZ* 22.1.2007

[7]BGE 1.P.668/2003

[8]Eveline Widmer-Schlumpf, *NZZ* 2./3.6.2007.

[9]BGE 133|206. One of the judges in fact argued that the introduction of a regressive income tax was "alarming but acceptable" given its intended temporary nature on the way to lower overall taxes in the near future (*NZZ* 2./3.6.2007).

[10]Taxes vary across municipalities within a canton: the cantonal tax is multiplied by a municipality-specific tax multiplier; see Appendix A for details. Figures A2 and A3 show the evolution of tax rates by municipality in Obwalden.



(a) Effective marginal tax rates (b) Effective average tax rates

Figure 1: Average and marginal tax rates after different cantonal tax reforms

Note: Marginal and average tax rates for gross income of a single taxpayer, multiplied by the cantonal and the local tax multipliers. See Figure A3 in Appendix A for an overview of tax rates in all municipalities of the canton.

4 Theoretical Model

Cutting local taxes affects the income distribution and the potential for raising revenue through two channels. First, individuals may decide to move to the area if the average tax is lower than in their current place of residence. Second, residents affected by the tax cut may adjust their taxable income as a reaction of lower marginal tax rates. This implies two different elasticities with respect to taxation, a mobility elasticity and an elasticity of taxable income (ETI)). In the following, both behavioral responses are presented in turn, and then they are combined to describe the overall effect the tax change has on the canton's tax base.

4.1 The Elasticity of Reported Income

Tax Scheme. Assume a progressive, piece-wise linear tax scheme with a marginal tax rate τ_b, which is constant within each income bracket $b = 1, \ldots, B$ but differs across brackets. Integrating the area under the tax curve $f(z)$ gives the amount of taxes due in a given canton j, $T_j(z)$. The average tax rate with respect to gross income y is defined as: $\bar{\tau} = T_j(z)/y$.

Utility Maximization. In each period t, individuals i living in canton j maximize a utility function

$$U^i_{jt}(c_t, z_t, \mu^i_{jt}) = c_t - h_i(z_t) + \mu^i_{jt}, \tag{1}$$

where c_t is consumption in period t, z_t is the individual's reported income, and $h_i(z_t)$ denotes the labor supply cost of earning z. This cost function $h_i(z_t)$ is increasing and convex, so that $h_i'(z_t) > 0$ and $h_i''(z) > 0$. There are $j = 1, \ldots, J$ cantons to choose to move to (while still keeping a given job), and individuals have preference parameters $\mu_{jt}^i = \mu_{1t}^i, \ldots, \mu_{Jt}^i$ for each canton. This is analogous to the location-choice framework in Kleven et al. (2013).[11] The unobservable components of this decision, μ_{jt}^i, are assumed to increase the moving costs for the household.[12]

The budget constraint takes on the form

$$c_t = z_t - T_j(z_t) = z_t(1 - \tau_{jt}) + R_{jt}, \tag{2}$$

where $R_{jt} = (z_t\tau_{jt} - T_j(z_t))$ denotes virtual income from the non-linear tax schedule, arising from the fact that incomes below the tax bracket the individual is in are taxed at a different (usually lower) rate (for an illustration of the virtual income concept, see Gruber and Saez, 2002).

The Elasticity of Reported Income. Abstracting from income effects, the resulting "reported income supply function" reads as $z_{it}(1 - \tau_{jt})$.[13] This is the crucial function to determine the elasticity of reported income with respect to the marginal net-of-tax rate, defined as

$$e = \frac{(1 - \tau_{jt})}{z_{it}} \cdot \frac{\partial z_{it}}{\partial(1 - \tau_{jt})}. \tag{3}$$

[11] An alternative interpretation of μ_{jt}^i would be that of the stochastic part in a random utility model (RUM), where individuals decide about moving, nested in the utility function (1).

[12] If μ_{jt}^i was zero so that the moving decision would be fully explained by the tax difference and the distance to the new location, this would imply unrealistically high tax-induced mobility. There are only very few unobserved factors presumably reducing mobility costs, e.g., the location of the workplace and duration of the commute. If however, commuting is not expensive, and given that commuting expenses can be deducted from taxable income, commuting reduces taxable income ceteris paribus.

[13] With the exception of Gruber and Saez (2002), the ETI literature usually abstracts from income effects, which considerably simplifies the presentation especially of efficiency effects. The reason is that empirical estimates suggest that income effects are small, especially in the case of reported income (see for example the estimates in Kleven and Schultz, 2014). Note that R is only a virtual income component arising from the tax scheme and therefore entering the individual's budget constraint, but it is not part of taxable income. For a discussion of the relevance of income effects in the estimation of the ETI the reader is referred to Gruber and Saez (2002) and (Saez et al., 2012, especially pp.5–6); for an overview on income effects in labor supply models see Blundell and MaCurdy (1999).

4.2 The Mobility Elasticity

Migration Decision. From the reported income supply function, it is possible to determine the individually optimal reported income $z^\star_{it}$ for each location j. U^i_{jt} is the utility a tax unit i would enjoy in canton j. The household chooses the canton that yields the highest utility, so that moving to j is optimal if

$$U^i_{jt}(z^\star_i(1-\tau_{jt}))+\mu^i_{jt} > \max\left\{U^i_{j't}(z^\star_{it}(1-\tau_{j't}))+\mu^i_{j't}\right\}, \qquad \forall j' \neq j. \tag{4}$$

While for the moving decision alone what matters is the average tax rate, this solution takes into account that individuals can not only choose a location, but adjust to the prevailing marginal tax rates.

The Mobility Elasticity. The presented utility framework can be interpreted as a random utility model (RUM), where utility is decomposed into a deterministic and an unobservable part: $U^i_{jt}(c,z) = V^i_{jt}(c,z) + \mu^i_{jt}$ (for an overview of RUMs, see Train, 2009). Assuming that the individual-specific unobserved term μ^i_{jt} follows some extreme value distribution, it is possible to determine the probability of moving, P^i_{jt}. The elasticity of moving with respect to the net-of-tax rate is then given by:

$$\varepsilon^i_{jt} = \frac{\mathrm{d}\log P^i_{jt}}{\mathrm{d}\log(1-\tau_{jt})}. \tag{5}$$

Location choice models become increasingly complex when the choice set is large. In the present context, where tax rates also vary between municipalities within cantons, individuals theoretically have more than 2000 municipalities to choose from when deciding where to relocate. Therefore, and because no panel data is available on the universe of Swiss taxpayers, I rely on a combined two-stage least squares (2SLS) and DiD approach to estimate the mobility elasticity in Section 7.

4.3 The Total Elasticity of the Canton's Tax Base

Here I show how the individual responses add up to the total elasticity of a canton's tax base with respect to its tax rate. Rather than an individual's taxable income, let now z_t denote a canton's total tax base. x_t denotes the sum of incomes that moved to the canton (potentially from a higher-tax canton) during period t, such that $z_t = z_{t-1} + \Delta z_{t-1} + x_t$. The term Δz_{t-1} accounts

for changes in residents' taxable income and for losses in the tax base due to taxpayers leaving the canton or dying.

Now assume there is one canton, l, which lowers its income tax. Taking all other cantons' taxes as given, there will be a fraction of taxpayers residing in the surrounding cantons for whom $\tau_{jt} > \tau_{lt}$. Individuals maximize utility along the lines set out above and some of them may now find it optimal to move to canton l. Aggregating over all taxpayers after moving decisions and adjustments in taxable income have been made, one obtains the overall elasticity of reported income in canton l:

$$e = \frac{(1-\tau_{lt})}{z_t} \cdot \frac{dz_t}{d(1-\tau_{lt})}. \tag{6}$$

This elasticity can be thought of as consisting of two components: the elasticity e_1 of reported income of former residents of canton l, and the elasticity of attractable income, e_2. The former residents of canton l have an elasticity of reported income of

$$e_1 = \frac{(1-\tau_{lt})}{z_{t-1}} \frac{dz_{t-1}}{d(1-\tau_{lt})}. \tag{7}$$

The part of taxable income attracted from other cantons due to the tax cut, $x_t = x_t(\tau_{jt} - \tau_{lt})$, is increasing in the tax rate difference $\tau_{jt} - \tau_{lt}$. $x(0) = 0$, as there is no reason to move away for tax reasons if tax rates are identical. Hence, $z_{lt} = z_{lt}(1-\tau_{lt}, \tau_{jt}) = z_{l,t-1}(1-\tau_{lt}) - x_t(\tau_{jt} - \tau_{lt})$ is increasing in the net-of-tax rate $(1-\tau_{lt})$ and the other cantons' marginal tax rates τ_{jt}.

Following the lines of Piketty et al. (2014), the moving elasticity of the tax base with respect to taxation can be defined as $e_2 = s \cdot e$. s denotes the fraction of the behavioral response of z_t to $\mathrm{d}\tau_{lt}$ due to individuals moving to the low-tax canton l for tax reasons.

$$s = \frac{dx/d(\tau_{jt} - \tau_{lt})}{dz_t/d(1-\tau_{lt}) + dx_t/d(\tau_{jt} - \tau_{lt})} = \frac{dx_t/d(\tau_{jt} - \tau_{lt})}{\partial z_t/\partial(1-\tau_{lt})},$$

and

$$e_2 = s \cdot e = \frac{(1-\tau_{lt})}{z_t} \frac{dx}{d(\tau_{jt} - \tau_{lt})}. \tag{8}$$

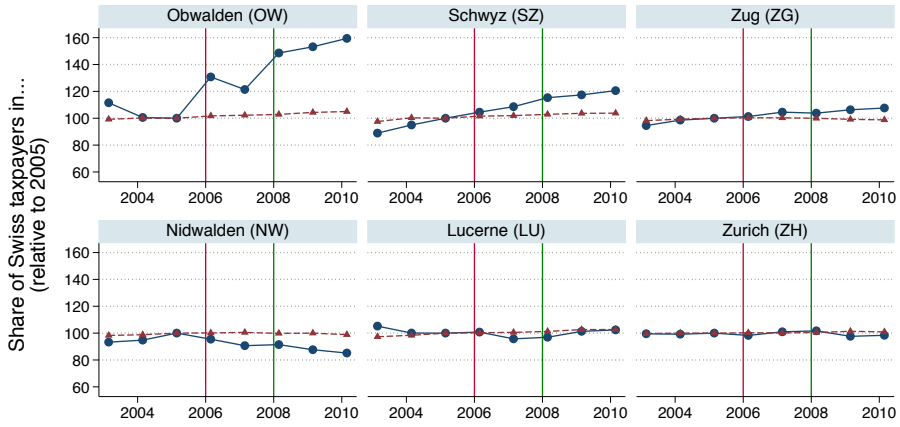
5 Data

5.1 Federal Income Tax Data

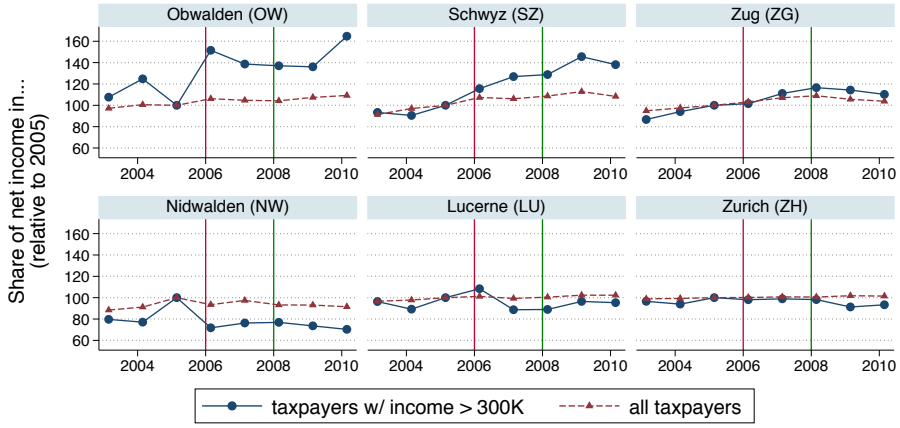
The first approach to assess the effect of the reform is based on a cross-cantonal comparison of the share of rich taxpayers and their incomes using federal income tax data. The federal income tax data have the advantage that they allow comparing incomes across cantons and over time, since the definition of taxable income is identical across cantons and has remained remarkably stable. Prior to 2001, Switzerland had a biennial praenumerando tax system, hence data is available only bi-annually. The praenumerando system also implies that incomes were realized in the period preceding the tax period: tax period 1989/90 refers to incomes realized in 1987/88, averaged over two years.[14] Due to minor changes in the data structure and quality prior to the tax period 1989 and after 2011, the analysis is based on years 1987–2010, allowing to control for pre-reform trends.

While the federal tax data is encompassing in time and space, it is limited in scope. The available income variables are taxable and so-called net income (*Revenu net* or *Reineinkommen*), both including all income sources from labor and capital. Net income is net of itemized deductions, not net of social deductions nor taxes. Realized capital gains remain untaxed at the individual level in Switzerland and are therefore not part of the income definition. Wealth is taxed at the cantonal and municipal level only, hence the federal tax statistics do not contain information on wealth. Available individual characteristics are marital status, number of children, employment status (employee, self-employed, non-working), and municipality of residence. Because individual identifiers are set at the cantonal level, it is not possible to track individuals over time once they leave their canton of residence. Note, finally, that married couples have to file jointly and a taxpayer may therefore be an individual or a married couple.

[14] For details on the praenumrando tax system and the change to the postnumerando system in the late 1990s, see Föllmi and Martínez (2016).



(a) Evolution of taxpayers



(b) Income evolution

Figure 2: Cantonal shares in taxpayers and net income

Note: The graph shows the cantonal share of (a) the total number of taxpayers and (b) total net income in Switzerland overall (dashed red line) and for taxpayers with net income of 300,000 CHF and more (solid blue line), relative to 2005. Net income refers to *Revenu net* as defined by the federal income tax: income net of itemized deductions, but not net of social deductions and taxes. *Source*: Federal income tax statistics, 2003–2010, ESTV.

5.1.1 Descriptive statistics

An inspection of the number of taxpayers and the income arising from those with net income of 300,000 and more shows that Obwalden (OW) experienced a large increase in rich taxpayers after 2005 (Figure 2.a)): within one year, the share of rich taxpayers in living in Obwalden increased by almost 30% , accompanied by an increase in Obwalden's share in net income from that

bracket of more than 50% (Figure 2.b). The only other canton which experienced a similar growth in income from rich taxpayers is the low-tax canton Schwyz (SZ). There, however, the increase was of a gradual nature over several years. Other low-tax neighbors likeZug (ZG) and Nidwalden (NW), the largest canton, Zurich (ZH), with its strong financial center, and other small to medium sized cantons in central Switzerland like Lucerne (LU), in contrast, experienced only a modest increases in their tax base at the top after 2006. The steep rise observed in Obwalden after 2005 is therefore a unique phenomenon and it is unlikely due to spurious correlation, caused for example by a positive income shock in 2006 affecting the top 1% in the whole country.

5.2 Obwalden Cantonal Income and Wealth Tax Data

To overcome some of the limitations of the federal income tax data, I use individual income tax data from the Canton of Obwalden for the period 2001–2010.[15] These register data are of very high quality and detail. The panel data contain the full information collected in the annual income tax returns such as all sources of income and all deductions applied as well as some basic information about each tax unit, namely age, nationality, marital status, number of dependents, self-declared occupation, and an industry code. What makes the data unique is that the records contain the exact date when a taxpayer registered with the municipality, along with their municipality of origin–or the country of origin if they moved-in from abroad. This allows to shed light on the moving behavior of taxpayers.

In turn the data are limited to taxpayers with a tax liability in the canton of Obwalden during the period 2001–2010. Because individuals have a cantonal rather than a national tax id, it is not possible to link individual tax data from different cantons. I therefore lack information on wealth and incomes earned before moving to Obwalden or after leaving the canton. Similarly, it is not possible to identify the intentionally treated non-movers living in other cantons.

Obwalden being a small canton, the number of observations is relatively small. The total population is roughly 35,000 individuals in 2010 (0.5% of the Swiss population), corresponding to 18,000–22,000 taxpayers each year. All

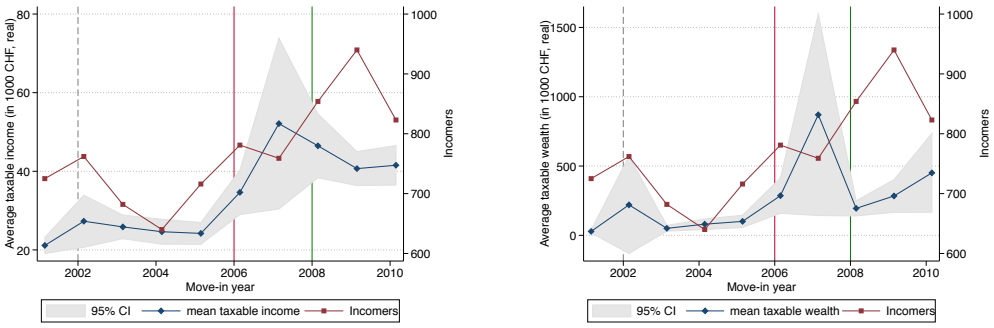
[15]These data have been kindly provided by the Tax Administration of the Canton of Obwalden for this research project.

Swiss cantons engaging successfully in tax competition are small in terms of population and geographical area. This is in line with theory and makes sense intuitively: a small, open economy can expect large relative gains in its tax base from cutting taxes, but faces relatively small losses in foregone revenue (for theory on asymmetric tax competition where countries differ in size, see Bucovetsky (1991); Wilson (1999), for empirical evidence see Winner (2005); Buettner (2003)). In line with the small size of tax havens for off-shore wealth, Obwalden can be seen as representative in the case of competing over income and capital taxes.

5.2.1 Descriptive statistics

Figure 3 depicts average taxable income and wealth of in-movers (left scale) along with their number in each year (right scale). Their number started to increase in 2005 already. Looking at their average taxable income and wealth, however, suggests that there has been a change in the type of in-movers right after the 2006 tax cut: both income and wealth of in-movers increased sharply right after the tax cut. In the following years, this increase was reverted somewhat but average income and wealth of in-movers stayed above pre-reform levels. Median income and wealth follow similar patterns, suggesting that the findings are not driven by outliers. Decomposing income into mobile capital incomes and "immobile" income from labor, further shows that those moving to Obwalden after 2005 also had large labor incomes and were not only depending on highly mobile capital incomes (Appendix Figure C3). Although information on the location of the workplace is not available, assuming that the tax cut did not create a substantial number of new, high-paying jobs taken by in-movers, this suggests that the canton of Obwalden has the potential to attract taxpayers relying on labor incomes and not only wealthy rentiers.

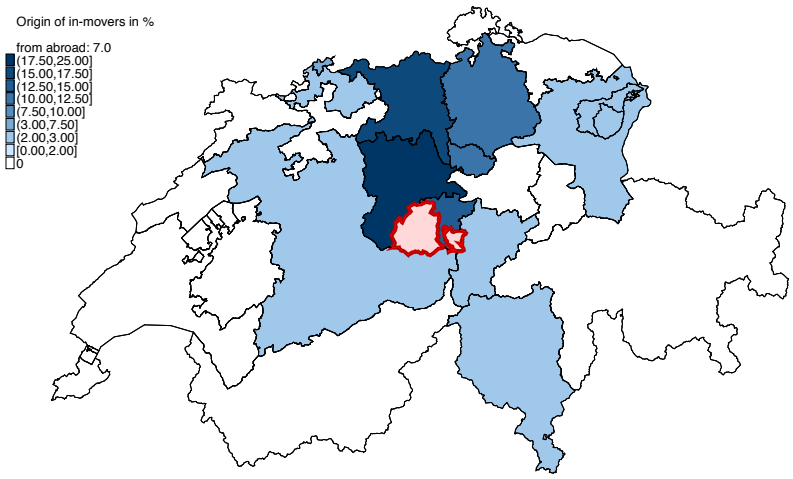
Rich taxpayers moving to Obwalden also come from further away after the reform, as the comparison of Panels a) and b) in Figure 4 shows. A majority still moved-in from Lucerne (19%), the major neighboring canton, followed by large cantons (in terms of total Swiss population) like Zurich (15%) and Aargau (11%). However, after 2006 also taxpayers from more distant cantons—especially the high-tax french-speaking cantons—and from abroad moved to Obwalden (see Appendix Table C3 for a detailed overview.)



(a) Average income (b) Average wealth

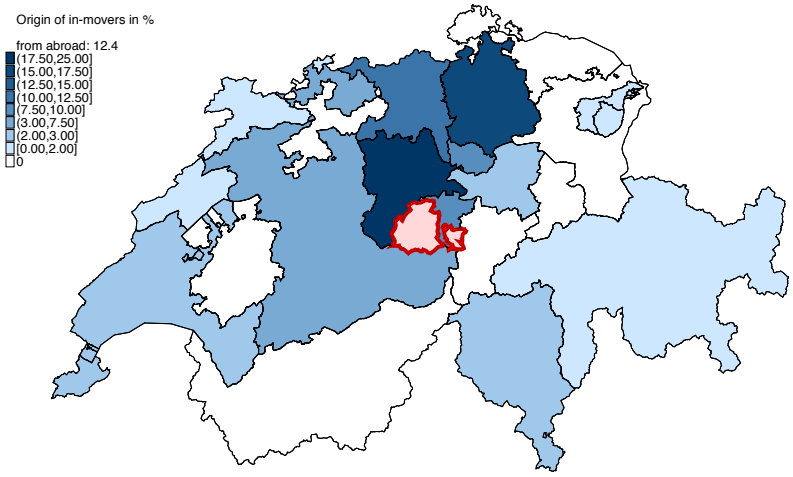
Figure 3: In-movers and their average taxable income and wealth in move-in year

Note: Taxpayers moving to Obwalden in year t pay taxes in Obwalden in that year. The red line 2006 marks the introduction of the regressive schedule, in 2008 (green line) the flat rate tax came into place; the grey dotted line marks the introduction of the AFMP with the EU. *Source*: Personal income and wealth tax data Obwalden, 2001–2010.



(a) Pre-reform (2001-2005)

Figure 4: Origin of rich taxpayers who moved to Obwalden



(b) Post-reform (2006-2010)

Figure 4: Origin of rich taxpayers who moved to Obwalden

Note: The graph shows the origin of rich taxpayers in percent of all rich in-movers, pooled over the pre- and post-reform period, respectively. *Source*: Personal income and wealth tax data Obwalden, 2001–2010.

6 Effect of the Reform on Obwalden's Tax Base

If the reform was successful in attracting rich taxpayers, the share of rich taxpayers and average taxable income should have increased in Obwalden compared to other cantons. I exploit the federal setting in Switzerland using DiD approach to estimate the effect of the reform on Obawlden's tax base. Using the federal income tax data described in Section 5, I compare (i) the share of rich—defined as taxpayers with federal taxable income above 300,000 CHF—in percent of total taxpayers, and (ii) net income per taxpayer. The first outcome is a direct measure of whether the reform was successful in attracting and retaining rich taxpayers, the second one sheds light on how the reform affected the tax base on average.

Table C1 shows some macroeconomic characteristics for Obwalden, low- and high-tax cantons in the region, as well as similar cantons in other regions, the two largest cantons Zurich (ZH) and Bern (BE), and Switzerland as a whole. These measures reveal that in 2005 Obwalden was a comparatively poor canton, with a large first sector in terms of establishments and full-time equivalent employment. Unemployment was substantially below the Swiss average and so was inequality as measured by the Gini index. Note that while Obwalden is small, hosting less than 0.5% of total Swiss population, quite a

few cantons host less than 1% of the Swiss population.

Using a difference-in-differences (DiD) approach, I compare Obwalden to its two direct neighbors, Lucerne (LU) and Nidwalden (NW). Nidwalden is a suitable control since it's geographic characteristics, size, and location are very similar to that of Obwalden, making commuting times to all major cities in the area, namely Lucerne, Zurich (ZH), and Zug (ZG), comparable. The canton of Lucerne is Obwalden's major neighbor and hosts the closest urban center, the city of Lucerne. Obwalden, Nidwalden, and Lucerne all share the same local labor market. Most importantly, both comparison cantons fulfill the parallel trends assumption in the outcomes under consideration (Figures 5 and 6).

A major difference between the cantons is the average tax burden at different income levels. Nidwalden has always had lower taxes than Obwalden, while in Lucerne, especially in the city, taxes were always higher. Nidwalden was one of the cantons Obwalden wanted to challenge with its new tax schedule. This can be seen in Figure C4 in the Appendix, which shows the evolution of tax rates in the two cantons for different gross income levels for comparison. It is apparent that the reform aimed at undercutting the traditional low-tax canton at high incomes only. Even after the flat rate tax was introduced in 2008, the average tax rate has been higher in Obwalden than in Nidwalden for married taxpayers without children with a small gross income of 60,000 CHF. Figure C5 compares the corresponding evolution of tax rates in Lucerne and Obwalden, where tax rates have evolved fairly parallel.[16] Summing up, despite the different tax levels in Nidwalden, Lucerne, and Obwalden, these differences have been stable prior to 2006.

The effect of the reform on both outcomes is estimated using the following DiD model:

$$Y_{g,c,t} = \alpha + \beta \cdot (TR \cdot PR) + \lambda \cdot TR + \gamma \cdot PR + \epsilon_{g,c,t} \quad , \tag{9}$$

The unit of analysis are municipalities within each canton. $Y_{g,c,t}$ denotes the outcome at time t in a municipality g belonging to canton $c = \{0, 1\}$, indicating whether the municipality lies in the treated canton Obwalden or in the comparison canton. $TR = \mathbb{1}[c = 1]$ is the treatment group dummy, $PR =$

[16] In fact, Lucerne adopted major tax cuts in 2008 and 2010, hoping to attract rich taxpayers.

$\mathbb{1}[t \geq 2006]$ is a dummy indicating the post-reform period. The coefficient of interest β is the DiD estimator measuring the effect of the reform on the outcome. This baseline specification is then extended to include time trends and fixed effects.

6.1 Share of Rich Taxpayers

Figure 5 depicts the share of taxpayers in Lucerne, Nidwalden, and Obwalden, respectively, with taxable income above 300,000 CHF.[17] For illustrative purposes, the series are scaled such that Obwalden matches the comparison canton in 2005.[18] The Figure shows how the share of rich taxpayers increased steeply after the reform in Obwalden. Especially in comparison with Lucerne, the increase has been dramatic.

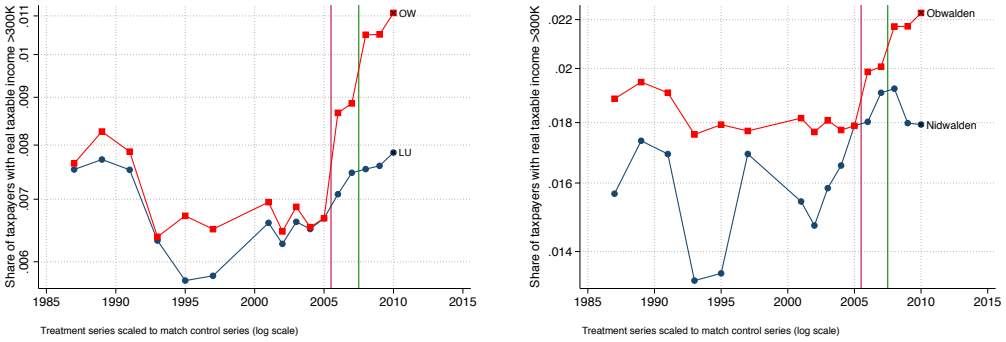
Table 1 shows the corresponding DiD estimates of the log share in rich taxpayers with taxable income above 300,000 CHF in each municipality, estimated according to equation (9) and extensions thereof.[19] Top Panel A and bottom Panel B report estimates from the comparison with Lucerne and Nidwalden, respectively. The estimated baseline increase in the share of rich taxpayers in Obwalden due to the tax reform is $exp(0.215) = 24\%$ when compared to Lucerne, and $exp(0.261) = 30\%$ when compared to Nidwalden. These estimates are robust to the inclusion of year and municipality fixed effects (Columns 3 and 4), although in the case of Nidwalden, they loose statistical significance. Adding a time trend (Column 2) rises the estimates above 35% in both comparison scenarios. Overall, coefficients are comparable when estimated with either Nidwalden or Lucerne as a control group. Given that the comparison with Lucerne satisfies the parallel trends assumption in a more satisfactory way than the comparison with Nidwalden, the somewhat smaller estimates from the comparison with Lucerne are more trustworthy and precise.

A potential threat to identification is movement into treatment. If rich taxpayers moved to Obwalden from Nidwalden and Lucerne because of the

[17] This is federal taxable income, which generally exceeds cantonal taxable income as deductions at the federal level are less generous than at the cantonal level.

[18] Obwalden's share of rich taxpayers before the tax reform was lower than in Nidwalden and Lucerne.

[19] I choose a log specification to better compare changes over time despite the substantial level differences. Estimates tend to be less precise when estimated in levels but are otherwise comparable.



(a) Lucerne vs. Obwalden

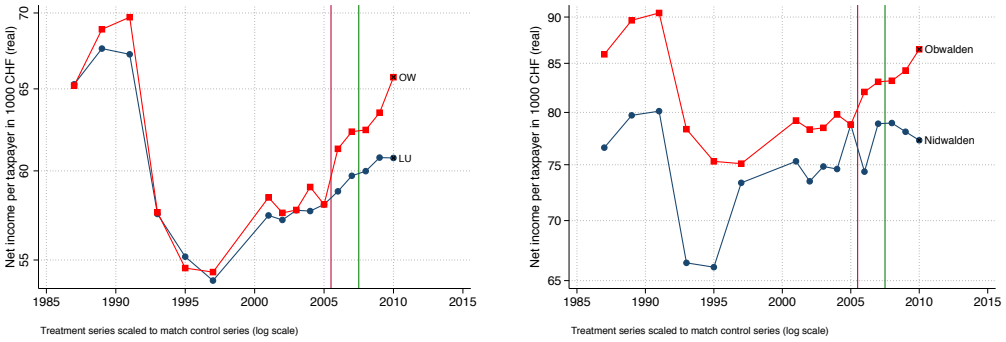
(b) Nidwalden vs. Obwalden

Figure 5: Share of rich taxpayers with federal taxable income $> 300,000$ CHF

Note: Treatment series scaled to match control series in 2005 (log scale).
Source: Individual federal income tax data, ESTV Bern

reform, these control groups were negatively treated. In that case, the coefficients in Table 1 would be upward biased. Estimates would still be informative from a policy perspective in the Swiss context, but they would over-estimate the underlying responses of economic agents to tax changes. Combining the federal income tax data with the cantonal tax data from Obwalden described in Section 5.2, it is possible to correct for the number of taxpayers who presumably responded to the treatment in each of the control cantons and re-estimate the regressions on the share of rich taxpayers. The point estimates remain comparable across both control scenarios and for different specifications (see Appendix Section B.1 for details). The estimated increase in the share of rich taxpayers is therefore not driven by movement into treatment.

In the Appendix I further present placebo estimates, artificially placing the reform in any year between 1991 and 2004 (see Figure B1). The estimates from the comparison with both neighbors show how prior to the actual reform Obwalden would have had a lower share of rich taxpayers. The difference between the true reform estimate and the placebo estimates is substantial and stable over the whole pre-treatment period.



(a) Lucerne vs. Obwalden

(b) Nidwalden vs. Obwalden

Figure 6: Net income per taxpayer

Note: Treatment series scaled to match control series in 2005 (log scale). Net income is *"Reineinkommen"* as defined by the federal income tax, i.e., net of itemized deductions but not net of social deductions nor taxes.
Source: Individual federal income tax data, ESTV Bern.

6.2 Average Income per Taxpayer

The evolution of net income per taxpayer is plotted in Figure 6. Again pre-treatment trends are most similar for Obwalden and Lucerne.[20] While the increase in income per taxpayer after the reform in Obwalden is not as dramatic as the increase in the share of rich, it is still apparent how average income growth in Obwalden was steeper than in its neighboring cantons.

The corresponding regression results are presented in Table 2. Column 1 presents the baseline reduced-form estimates. While the point estimate from the comparison with Lucerne (top Panel A) is small and statistically not significant at conventional levels, the estimate from the comparison with Nidwalden (bottom Panel B) suggests that in the five years after the reform, taxable income per taxpayer increased by roughly 17% more in Obwalden than it would have in absence of the large tax cuts. This finding is robust to the inclusion of a canton-specific time trend (Column 2). Controlling for municipality and time fixed effects, however, the effect vanishes completely (Column 3). To identify effects of the reform on different income groups, I split the sample into taxpayers with taxable incomes smaller than 300,000

[20]The dip in taxable income per taxpayer in the mid 1990s is data driven: the number of taxpayers escalates from 1991 to 1993, thereby increasing the denominator in all cantons. The reason for this is likely related to changes in reporting tax statistics by the Federal Tax Administration and a strong population growth of more than 1% p.a. in the early 1990s.

Table 1: DiD estimates of log share of rich in the canton

	(1) Baseline	(2) Canton trend	(3) Year FE	(4) Municipality FE
	Panel A: Lucerne			
DiD	0.215*	0.302***	0.217*	0.230**
	(0.109)	(0.0801)	(0.109)	(0.109)
Canton-specific trend	No	Yes	No	No
Year FE	No	No	Yes	Yes
Municipality FE	No	No	No	Yes
Observations	1,411	1,411	1,411	1,411
R-squared	0.012	0.013	0.022	0.084
No. of clusters	110	110	110	110
	Panel B: Nidwalden			
DiD	0.261*	0.310*	0.261	0.261
	(0.148)	(0.157)	(0.152)	(0.151)
Canton-specific trend	No	Yes	No	No
Time FE	No	No	Yes	Yes
Municipality FE	No	No	No	Yes
Observations	288	288	288	288
R-squared	0.126	0.128	0.137	0.165
No. of clusters	18	18	18	18

*** p<0.01, ** p<0.05, * p<0.1

Note: In Models (1)–(3), standard errors are clustered at the municipality level, in Model (4) robust standard errors are reported. All regressions include a constant, a post-treatment dummy ($t \geq 2006$), and a treatment group dummy. DiD denotes the interaction of the post-treatment with the treatment group dummy, hence the difference-in-differences estimator. There are 7 municipalites in the treated canton Obwalden, 11 in Nidwalden, and (on average) 83 in Lucerne over the period of analysis. *Source*: Individual federal income tax data, ESTV Bern.

Table 2: DiD regressions of net income per taxpayer

	(1) Baseline	(2) Canton trend	(3) Municip. FE	(4) Sample: $< 300K$	(5) Sample: $> 300K$
	Panel A: Lucerne				
DiD	0.051	0.145***	0.036	-0.005	0.129*
	(0.070)	(0.055)	(0.057)	(0.012)	(0.067)
Canton-specific trend	No	Yes	No	No	No
Time FE	No	No	Yes	Yes	Yes
Municipality FE	No	No	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	1,748	46,001	46,001	7,193	3,644
R-squared	0.025	0.227	0.288	0.868	0.245
No. of clusters	115	115	115	115	110
	Panel B: Nidwalden				
DiD	0.156*	0.153**	0.003	-0.008	0.234**
	(0.081)	(0.060)	(0.065)	(0.014)	(0.088)
Canton-specific trend	No	Yes	No	No	No
Time FE	No	No	Yes	Yes	Yes
Municipality FE	No	No	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	288	10,264	10,264	1,203	1,002
R-squared	0.121	0.166	0.253	0.926	0.303
No. of clusters	18	18	18	18	18

*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors clustered at the municipality level. Observations are municipality-year cells. In Models (2)–(5) cells are further split into different binary characteristics of the taxpayers: married, single parents, married with children (with single taxpayers with no dependents being the reference category), and self-employed, non-working, retiree (with employees being the reference category). By splitting up the municipality-year cells into these categories, the number of observations increases. Models (2)–(5) control for cell size. Detailed results are reported in Tables D2 and D1 in the Appendix. *Source*: Individual federal income tax data, ESTV Bern.

CHF and therefore falling below the regressive threshold, and into those with incomes above the threshold (Columns 4 and 5, respectively). In line with the incentives it imposed, the reform did not have an effect on average income of the "bottom 99%", i.e., taxpayers below the threshold. This suggests that the reform did not trigger economic growth or job creation. Among taxpayers above the threshold, on the other hand, net income per taxpayer rose significantly in Obwalden: the estimates suggest an increase in net income of rich taxpayers in Obwalden compared to rich taxpayers in Lucerne of almost 14%. The estimates from the comparison with Nidwalden are even larger, suggesting a relative increase in average incomes of what should otherwise be comparable taxpayers of 26% in Obwalden.

The reform had a positive effect on net incomes per taxpayers, which concentrated among the rich. Stated differently, not only did the pool of rich taxpayers in Obwalden become larger, but also richer. This can be due to (i) rich taxpayers moving to Obwalden, (ii) residents who would have otherwise moved out to a low-tax canton but chose to remain in Obwalden, and (iii) increases in (reported) income by residents who now face a lower marginal tax rate. The next section will address these responses in turn

7 Individual Responses to the Reform

7.1 Stock and Flow Elasticity of Rich Taxpayers

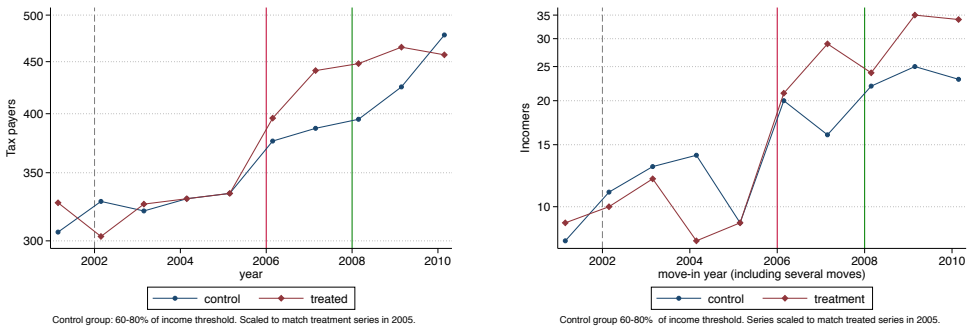
To estimate the elasticity of the in-flow and the stock of rich taxpayers in the canton with respect to the average net-of-tax rate, I use the detail-rich individual cantonal income tax data from Obwalden described in Section 5.2. I follow a common approach used in the literature estimating tax elasticities by comparing income groups affected differently by a tax change (see for example Kleven et al., 2014; Kleven and Schultz, 2014; Sillamaa and Veall, 2001; Auten and Carroll, 1999). As control group I define taxpayers with income just below the regressive threshold of the tax scheme.

The Swiss tax system draws an important distinction between taxable and rate-determining income. Usually, taxable income determines the tax rate. Some taxpayers, especially top earners, however, have income from abroad or real-estate income in other cantons, which is taxed at the source. These incomes do not form part of taxable income in their place of residence to

avoid double taxation. These incomes are, however, part of rate-determining income. Rate-determining income takes all income sources into account as if they were earned in the canton of residence, allowing for all applicable deductions (e.g., maintenance cost of real estate). This income is then used to determine the average tax rate of the taxpayer in the canton of residence. This average tax rate, finally, is applied to the income which is taxable in the canton, i.e., taxable income. Since it is rate-determining income which puts taxpayers either above or below the regressive part of the tax scheme, in what follows the treatment and control groups are defined according to their *rate-determining* income.

Figure 7 shows the evolution in the number of treated taxpayers compared to the control group. The latter is defined as having a rate-determining income in the range of 60–80% of the regressive threshold (180,000–240,000 CHF). Panel a) shows the stock of taxpayers falling into each of the two groups. Pre-treatment trends are parallel and flat, until the number of rich taxpayers increases by 18% in the year of the reform. The total number of rich taxpayers keeps rising until 2007 and then stabilizes. The control group on the other hand increases somewhat in 2006 but remains stable until 2008. It is after the flat rate tax reform that their number increases. This is in line with the economic incentives imposed by the 2008 reform: they were the group who benefited most from the second reform. Panel b) depicts the annual flow of in-movers in each group. Due to the small size of the canton, these series are very noisy. What is most apparent is that in 2006 also more taxpayers from the upper middle class, not benefiting from the regressive tax, moved to Obwalden. These in-movers may have expected to have higher incomes in the future, or their former canton (or country) of residence's income definition resulted in a higher taxable income than the taxable income they had according to Obwalden's tax laws. Including individuals with larger incomes in the control group, indeed potential response to the treatment by the control group increases (Figure C6 in the Appendix). Defining the control group through an income range which is further away from the threshold is a way to ensure the control group did not respond to the treatment due to the reasons mentioned.

The number of in-movers in Figure 7.b) is potentially downward biased because the register data only record the last moving date. Households who had moved within the canton by 2012 (when the data was exported) do therefore not show up as in-movers from outside anymore. In the stock of rich



(a) Residents, 60–80%

(b) Inmovers, 60–80%

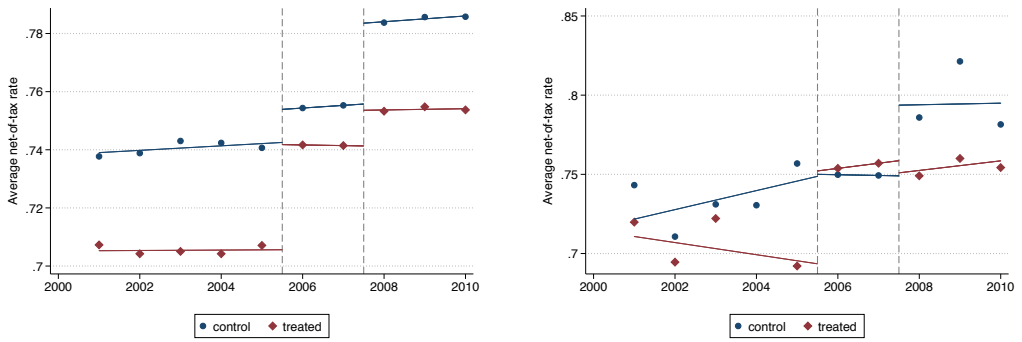
Figure 7: Control vs. treatment groups, 2001–2010

Note: The percentages indicate how the control group is defined in each panel in terms rate-determining income relative to the regressive threshold of 300,000 CHF. 60–80% , for example, means that taxpayers with incomes of 180,000–240,000 CHF fall into the control group. The treatment group is always defined as taxpayers above the threshold of 300,000 CHF.
Source: Personal income and wealth tax data Obwalden, 2001–2010.

taxpayers, however, there are only a handful of observations with a moving date after 2005 and for which the canton of origin is Obwalden, indicating that new arriving taxpayers did not move around substantially within Obwalden.

Table C2 in the Appendix presents descriptive statistics for the treatment and control groups. While they differ from the average taxpayer living in or moving to Obwalden, they are similar to each other in most characteristics. Taxpayers in the treatment group are more likely to be foreigners, and they derive a smaller share of their income from labor than the control group. By aiming at top earners, the treatment group will almost by definition depend more heavily on capital than on labor incomes, since this is common feature at the top of the income distribution across space and time. It is worth noting that only a very small share of taxpayers benefit from some sort of weekly residency elsewhere, and that this share is lowest among the treated (1.6% in the stock, 5.2% in the inflow). This shows that that the rich in Obwalden are not just fake residents for tax purposes with a main residence elsewhere. Although I lack information on taxpayers workplace, self-reported occupations or professions reveal that these rich taxpayers are professionals including doctors, lawyers, and economists. Half of them are employees, and about 15% are self-employed.

Table C3 in the Appendix further shows the distribution of the origin of



(a) Residents (b) In-movers

Figure 8: Average net-of-tax rates in control and treatment groups, 2001–2008

Note: Binned scatter plots with regression discontinuities in 2005.5 and 2007.5. Control group defined as having rate-determining income of 180,000–240,000 CHF, corresponding to 60–80% of the regressive threshold. The treatment group are taxpayers with incomes above the threshold of 300,000 CHF. Average net-of-tax rate including federal, cantonal, and municipal tax.
Source: Personal income and wealth tax data canton Obwalden, 2001–2010.

taxpayers in the control and treatment groups, respectively, before and after the treatment. While in the total population there where no shifts in the origin of taxpayers (last two columns of Table C3), the composition of the treatment and the control groups experienced some changes. In the treatment group the share of taxpayers coming from Zurich, Bern, and from abroad increased in the post-reform years, and rich taxpayers moved to Obwalden from 19 different cantons compared to 12 prior to the reform. In the control group, in-movers came from 15 different cantons after the reform, and from 13 in the years 2001–2005. This suggests that the reform was successful in attracting especially rich taxpayers from further away.

The identifying variation in the average net-of-tax rates, $1 - \bar{\tau}$, created by the 2006 and 2008 tax reforms is shown in Figure 8. The treated residents (Panel a) faced an increase of $\simeq 5.1\%$ in their average net-of-tax tax rate. For in-movers (Panel b) again the graph is more noisy, yet the variation the reforms created is of same qualitative nature: the 2006 reform substantially increased the net-of-tax rate of the treated, the 2008 reform led to largest increases in the net-of-tax rate among the control group. The remaining difference in $(1 - \bar{\tau})$ after introduction of the flat rate tax in 2008 stems from the progressive federal tax.

Estimation and results

Collapsing the data into year t, treatment group $i = \{0, 1\}$ cells gives rise to a simple DiD model of the form:

$$N_{i,t} = \alpha + \beta \cdot (TR \cdot PR) + \lambda \cdot TR + \gamma_t + \epsilon_{i,t} \quad ,$$

where $N_{i,t}$ denotes the number of taxpayers in group i, $TR = \mathbb{1}[i = 1]$ is the treatment group dummy, $PR = \mathbb{1}[t \geq 2006]$ is the post-reform dummy, and γ_t are year fixed effects. The coefficient of interest β is the DiD estimator on the average annual increase in the number of residents or in-movers, respectively, after the introduction of the tax reform in 2006. I exclude years after 2007 and hence the 2008 flat rate tax reform from the estimation, since presumably the control group responded to the second reform. With seven years of observations, five pre- and two post-reform, and two groups, this leads to 14 group-year cells for the regression analysis.

The elasticities of the number of rich taxpayers with respect to the net-of-tax rate are estimated using a 2SLS approach, following Kleven et al. (2014). This approach takes into account that the treatment, i.e., the tax reform, may not have perfectly determined migration decisions (for similar applications see Angrist, 1990; Waldinger, 2010). Again I collapse the data into year-group cells for the period 2001–2007. The second stage takes on the form:

$$\log N_{i,t} = \alpha + \varepsilon \cdot \log(1 - \tau_{i,t}) + \beta \cdot TR + \gamma_t + \epsilon_{i,t} \quad , \tag{10}$$

where $(1-\tau_{i,t})$ is the net-of-tax rate of group i. Depending on the specification, I estimate the elasticity with respect to the marginal net-of-tax rate, denoted ε_τ, or with respect to the average net-of-tax rate, denoted $\varepsilon_{\bar{\tau}}$. In the first stage, I instrument for the respective net-of-tax rate with the treatment interaction dummy $DiD_{2006} = TR \cdot \mathbb{1}[t \geq 2006]$. The first stage therefore takes on the form:

$$\log(1 - \tau_{i,t}) = \beta \cdot DiD_{2006} + \lambda \cdot TR + \gamma_t + u_{i,t}. \tag{11}$$

In a second set of regressions I add an instrument for the 2008 reform to equation (11) to make use of the whole time frame available. The first stage is accordingly modified to:

$$\log(1 - \tau_{i,t}) = \beta_1 \cdot DiD_{2006} + \beta_2 \cdot DiD_{2008} + \lambda \cdot TR + \gamma_t + u_{i,t}. \tag{12}$$

$DiD_{2006} = TR \cdot \mathbb{1}[2006 \leq t < 2008]$ is the original DiD treatment interaction dummy, and $DiD_{2008} = TR \cdot \mathbb{1}[t \geq 2008]$ identifies the second reform.

The results for the stock of rich taxpayers are summarized in Panel A of Table 3.[21] The reduced form estimates (Columns 1 and 2) suggest that in the first two years after the introduction of the regressive tax the number of taxpayers increased by 37, or by 6.1% when estimated in logs. The corresponding short run elasticity with respect to the marginal net-of-tax rate, ε_τ, is 0.65 (Column 3). The elasticity with respect to the average net-of-tax rate, $\varepsilon_{\bar{\tau}}$, is 2 (Column 4) and therefore above the short-run elasticity estimates found in Kleven et al. (2014), which are in the range of 1.3 to 1.8. The medium-run elasticity, based on the estimation instrumenting for both reforms, leads to very similar, somewhat less precise point estimates. Columns 5 and 6 of Table 3 further show how the definition of the control group influences the resulting estimates. In correspondence with Figure C6.a) in the Appendix, the control group is redefined containing taxpayers with rate-determining income of 180,000–285,000 CHF, i.e. 60–95% of the regressive income threshold. The corresponding estimates are all larger than in the baseline estimates. Interestingly, however, the (statistically not significant) reduced form estimate in Column 5 is substantially smaller than the one in Column 1. Overall, the estimates with respect to the marginal net-of-tax rate are all in the upper range or above those of Kleven et al. (2014), who define the control group as having incomes between 80–99% of the qualifying income threshold.

Panel B of Table 3 reports analogous results for the annual inflow of taxpayers moving to Obwalden. The reduced form estimate in Column 1 suggests that roughly 8 rich taxpayers more arrived in each of the two post reform years 2006 and 2007 due to the reform. While this may seem negligible, this corresponds to an increase in the number of rich in-movers of almost 80% compared to pre-reform levels. When estimated in logs (Column 2) results again are not statistically significant. The corresponding elasticities are very large, due to the small number of taxpayers in each year-group cell: one additionally attracted rich taxpayer corresponds to an increase of 10% in 2005. Therefore, and because they are not very precisely estimated, these estimates should be interpreted with care.

Again the use of a different control group affects the size and precision

[21] Detailed regression results are reported in tables D3, D4, and D5 in the Appendix.

of the estimates. As shown in Figure 7.b) in the Appendix, redefining the control group as having income of 55%–75% of the threshold may be more appropriate to avoid using a control group which is potentially contaminated by the treatment. Indeed the estimates become more precise, and they become even larger. The elasticity of in-movers with respect to the average net-of-tax rate in that case lies between 4.6 and 6.5. These estimates are 2–4 times larger than what Kleven et al. (2014) find for Denmark, but still below the elasticity estimates of 10 found in Agrawal and Foremny (2016) across Spanish regions. That medium run estimates are smaller than in the short run suggests moving responses were strongest right after the introduction of the reform. This stands in contrast to the findings in Kleven et al. (2014), where the elasticities build up over time. The explanation for this contrast lies in the different settings: in Denmark, foreigners first had to find a high-paying job in the country to qualify for the tax scheme, while in Obwalden eligibility did not depend on the income source nor the nationality. For taxpayers who considered moving to Obwalden it therefore made sense to do so right away and thereby increase the time horizon of their investment.

All first stage regressions are highly significant with large F statistics, and the DiD interaction term is a strong predictor of the net-of-tax rates. A robustness check using simple OLS, leads to very similar elasticites. Hausman tests for exogeneity (reported in tables D3, D4, and D5 in the Appendix) suggest endogeneity is not an issue here. As a further robustness check I run the the regressions reported in Table 3 with the share (rather than the number) of taxpayers in each year-group cell as a percentage of the total number of taxpayers in the canton. These estimates, reported in Table B2, are again virtually identical to the ones reported in Table 3.

The large elasticities are the result of the small size of the canton with low initial inflows and residence-based taxation (as opposed to taxation at the source). In addition, thanks to the Agreement on Free Movement of Labor with the EU, the pool of potentially treated is large. The estimates serve as a reference point for similar settings with no restrictions on migration, especially for small jurisdictions or metropolitan areas within state border regions. They show that workers willingness to relocate for tax reasons is high.

Table 3: DiD estimates of taxpayers in Obwalden

	(1) Reduced (level)	(2) Reduced (log)	(3) 2SLS (log)	(4) 2SLS (log)	(5) 2SLS (log)	(6) 2SLS (log)
Panel A						
Stock of taxpayers (all residents and in-movers)						
Control group	*60–80%*				*60–95%*	
DiD_{2006}	36.800*	0.061			17.300	0.074
	(15.285)	(0.047)			(16.730)	(0.047)
ε_τ (2006-07)			0.650**		0.787***	
			(0.299)		(0.297)	
$\varepsilon_{\bar{\tau}}$ (2006-07)				2.004**		2.452***
				(0.889)		(0.911)
ε_τ (2006-10)			0.615*		0.586	
			(0.362)		(0.389)	
$\varepsilon_{\bar{\tau}}$ (2006-10)				2.013*		2.317*
				(1.148)		(1.219)
$\Delta\tau_{2006}$ (% pts)	3.599					
Panel B						
Flow of taxpayers (in-movers only)						
Control group	*60–80%*				*55–75%*	
DiD_{2006}	8.400*	0.291			9.600**	0.446*
	(3.764)	(0.298)			(3.021)	(0.212)
ε_τ (2006-07)			3.236		4.861***	
			(1.992)		(1.284)	
$\varepsilon_{\bar{\tau}}$ (2006-07)				3.348		6.452***
				(3.071)		(1.403)
ε_τ (2006-10)			2.110		3.494***	
			(1.695)		(1.270)	
$\varepsilon_{\bar{\tau}}$ (2006-10)				1.635		4.597***
				(1.987)		(1.485)
$\Delta\tau_{2006}$ (% pts)	4.824					

*** p<0.01, ** p<0.05, * p<0.1

Note: All regressions contain year dummies, a treatment dummy, and a constant. Detailed regression results are reported in tables D3, D4, and D5 in the Appendix. Standard errors in parentheses. *Source*: Personal income and wealth tax data Obwalden, 2001–2010.

7.2 The Elasticity of Taxable Income at the Top

Following the panel approach by Gruber and Saez (2002), I estimate the ETI for taxpayers with real incomes above 300,000 CHF, since for these income groups the tax cuts were remarkably large, not only in 2006 but also with the introduction of the flat rate tax in 2008. Abstracting from income effects, (3) leads to the following baseline panel specification:

$$\log(z_{it_2}/z_{it_1}) = e \cdot \log[(1-\tau_{t_2})/(1-\tau_{t_1})] + \upsilon_{it}, \tag{13}$$

where z_{it_1} and z_{it_2} is reported income in year t_1 and t_2, respectively, and e is the ETI. Note that OLS estimates of (13) are biased, as the term capturing the tax rate change is correlated with the error term υ_{it}. If there is a positive shock to income ($\upsilon_{it} > 0$), then, due to the regressive scheme, the marginal tax rate τ decreases mechanically. Gruber and Saez (2002) propose as a natural instrument the predicted net-of-tax rate change if income does not change from year 1 to year 2, i.e., $\log(1-\tau_{t_2}(z_1))$.

Such an instrumental variable (IV) estimation is still susceptible to bias, due to mean reversion (because of transitory incomes) and exogenous changes in the income distribution. Both result in a correlation between z_{it_1} and υ_{it}.[22] The solution proposed by Auten and Carroll (1999) and adopted in Gruber and Saez (2002) is to include a large set of base-year (i.e., t_1) income controls. However, as Weber (2014) shows, base-year income is still correlated with the error in a panel setting. She therefore suggests to use lagged base-year income controls, z_{it_1-s}. Having many years of data, it is possible to add a rich set of such controls. Therefore, in addition to log income in period $t_1 - s$, a 10-piece spline in lagged log base-year income (i.e., a spline for each decile of the gross income distribution in $t_1 - s$) is included to allow for non-linear effects from mean reversion and changes in the income distribution, as in Gruber and Saez (2002). Because the endogeneity of z_{it_1} also affects the tax rate instrument, I use a lag of base-year income to mitigate potential endogeneity bias, following Weber (2014).

I further include a vector of individual controls, $\mathbf{X_{it}}$, containing the age of the main taxpayer and a set of dummies for married, dependents, double-earners (married taxpayers only), retirees and self employed. Time dummies

[22] For an extensive discussion on consistent ETI estimates, circumventing the problems of mean reversion and exogenous income trends, see Weber (2013, 2014).

λ_t control for period effects. Including all these covariates in equation (13), the econometric model reads as follows:

$$\begin{aligned} \log\left(\frac{z_{it_2}}{z_{it_1}}\right) &= \alpha_0 + e \cdot \log\left[\frac{1-\tau_{t_2}(z_1)}{1-\tau_{t_1}(z_1)}\right] + \mathbf{X_{it}}\boldsymbol{\beta} \\ +\alpha_1 \log(z_{it_1-s}) &+ \sum_{k=1}^{10} \alpha_{2k} SPLINE_k(z_{it_1-s}) + \lambda_t + \upsilon_{it} \end{aligned} \tag{14}$$

This identification strategy relies on the assumption that mean reversion or changes in inequality are not correlated with year-specific tax changes, so that the relationship between z_{it_1} and υ_{it} remains constant over time (see Gruber and Saez, 2002, p.12). Since I am interested in the effect of the regressive income tax reform on the reported income, I restrict the sample to taxpayers who had rate-determining income larger than 300,000 CHF at least once in the sample period. Descriptives of the sample used for regression can be found in Table C4 in the Appendix.

Tables 4 and 5 report different specifications to estimate the elasticity of taxable and rate-determining income, respectively. Colmuns 1 and 2 report baseline estimates, followed by estimates including a set of individual controls and base-year income (Columns 3 and 4), and including 10-piece income splines (Columns 5 and 6). Even columns additionally include individual fixed effects. Results in both sets of regressions are similar. For the ETI, reported in Table 4, point estimates are in the lower range of what other studies have found (see Gruber and Saez, 2002; Kleven et al., 2014), and are all not statistically significant. Point estimates for rate-determining income (Table 5) are higher, as one would expect. Taxpayers have an incentive to adjust rate-determining income even more than taxable income. Yet estimates remain statistically insignificant and are sensitive to specification.

The coefficient on lagged base-year income on the other hand is significant in most specifications, implying that there is mean-reversion in the income generating process at the top. The dummy for the top spline (not reported) is statistically significant and positive in models without fixed effects, but becomes insignificant once individual fixed effects are included. The large and statistically significant coefficient on the dummy for double earners in the fixed effects models indicates that adjustments happen mainly for second earners—or through changed marriage behavior. Especially for high income

earners, mandatory joint tax filing of married couples is a disincentive to get married. With regressive tax rates at least high-income couples may benefit from marriage, and the discrimination of marriage vanishes completely with the introduction of the uniform flat rate tax in 2008. That second earners respond strongly to taxation is a channel which has found to be important in the literature on labor supply and taxation (Meghir and Phillips, 2010; Crossley and Jeon, 2007; Eissa and Hoynes, 2004). The adoption of a flat rate tax in 2008 therefore bears potential for positive labor supply effects of second earners, i.e., traditionally women. This interesting aspect of the flat rate tax reform is left for future research.

Adjustment through the second earner seems to be a particularly strong channel, even more than self-employment, which has found to be responsive to taxation in other studies. In addition, self-employed are over-represented in the estimation sample of top earners: around 20% of taxpayers are self-employed, about three times as many as in the whole population of taxpayers. A possible explanation for this is that some of the reaction of self-employment is captured by the double earner-variable, as double earners take up self-employment or the spouse of a self-employed enters the labor market.

All these results have to interpreted with prudence. Despite careful considerations of the specification, the identification strategy has turned out to be very sensitive. That the estimated elasticities remain statistically insignificant may be explained by the small sample size. This limitation, however, lies within the nature of the canton of Obwalden itself. Specifications including large parts of the population delivered statistically significant estimates, yet these were often completely out of range of what one might think of as a reasonable ETI and often carried the wrong sign.

Table 4: ETI: GMM IV regressions of taxable income on net-of-tax rate

	Baseline		Base-year		Splines	
Taxable income	(1)	(2)	(3)	(4)	(5)	(6)
$\ln \Delta(1-\tau)$	1.899	1.477	0.132	0.0174	0.127	0.246
	(2.325)	(2.429)	(1.667)	(1.518)	(1.646)	(1.446)
Log lagged base-year income ($\Delta = 3$)			-0.0588***	-0.172***	-0.268***	-0.251
			(0.0116)	(0.0512)	(0.104)	(0.212)
Married			0.0564	*omitted*	0.0402	*omitted*
			(0.0480)		(0.0489)	
Double earners			0.0755	0.412***	0.0925*	0.422***
			(0.0477)	(0.124)	(0.0481)	(0.124)
HH with children			-0.0239	0.00736	-0.00391	0.0161
			(0.0470)	(0.0983)	(0.0479)	(0.0977)
Self employed			0.0655	0.213	0.0466	0.222
			(0.0448)	(0.227)	(0.0471)	(0.222)
Retiree			-0.0450	-0.0872	-0.0599	-0.116
			(0.0673)	(0.140)	(0.0683)	(0.136)
Age			-0.00110	-0.0458	-0.000531	-0.0424
			(0.00195)	(0.0598)	(0.00192)	(0.0596)
Municipality dummies	N	N	Y	*omitted*	Y	*omitted*
Year dummies	N	N	Y	Y	Y	Y
10-piece income splines	N	N	N	N	Y	Y
Individual fixed effect	N	Y	N	Y	N	Y
Constant	0.00465		0.581***		2.042***	
	(0.0447)		(0.211)		(0.785)	
Observations	2,558	2,488	2,275	2,204	2,275	2,204
R-squared		-0.020	0.028	0.042	0.037	0.048
N_clust	534	464	509	438	509	438
Rank	2	1	21	12	30	21

*** p<0.01, ** p<0.05, * p<0.1

Note: Sample restricted to taxpayers who have an income $> 300,000$ CHF at least once in 2001–2010. Sample descriptives reported in Table C4 in the Appendix. Robust standard errors clustered at the individual level in parentheses.

Source: Personal income and wealth tax data Obwalden, 2001–2010.

Table 5: ETI: GMM IV regressions of rate-determining income on net-of-tax rate

	Baseline		Base-year		Splines	
Rate-determining income	(1)	(2)	(3)	(4)	(5)	(6)
$\ln \Delta(1-\tau)$	3.187	3.776	0.598	0.741	0.492	0.156
	(2.513)	(3.098)	(1.586)	(1.442)	(1.220)	(0.996)
Log lagged base-year			-0.144***	-0.322***	-0.182**	-0.457***
income ($\Delta = 3$)			(0.0256)	(0.0582)	(0.0786)	(0.122)
Married			-0.0543	*omitted*	-0.0425	*omitted*
			(0.0459)		(0.0462)	
Double earners			0.134***	0.404***	0.166***	0.398***
			(0.0434)	(0.0954)	(0.0445)	(0.0942)
HH with children			0.0769**	0.0662	0.0907**	0.0766
			(0.0378)	(0.0712)	(0.0380)	(0.0709)
Self employed			0.0666*	0.154	0.0502	0.154
			(0.0383)	(0.128)	(0.0379)	(0.126)
Retiree			-0.0208	-0.241**	-0.0124	-0.210**
			(0.0574)	(0.0992)	(0.0562)	(0.0987)
Age			0.00123	0.00818	0.00153	-0.000351
			(0.00159)	(0.0483)	(0.00159)	(0.0473)
Municipality dummies	N	N	Y	Y	Y	Y
Year dummies	N	N	Y	Y	Y	Y
10-piece income splines	N	N	N	N	Y	Y
Individual fixed effect	N	Y	N	Y	N	Y
Constant	-0.0955**		1.600***		2.114**	
	(0.0441)		(0.328)		(0.866)	
Observations	3,090	3,024	3,039	2,975	3,039	2,975
R-squared		-0.100	0.059	0.080	0.079	0.099
N_clust	593	527	589	525	589	525
Rank	2	1	21	17	30	26

*** p<0.01, ** p<0.05, * p<0.1

Note: Sample restricted to taxpayers who have an income $> 300,000$ CHF at least once in 2001–2010. Sample descriptives reported in Table C4 in the Appendix. Robust standard errors clustered at the individual level in parentheses.

Source: Personal income and wealth tax data Obwalden, 2001–2010.

8 Revenue Effects of the Reform

Figure 9 shows the evolution of cantonal income and wealth tax revenue in Obwalden in millions of CHF (right scale) and its share in cantonal income and wealth tax revenue collected in all Swiss cantons (left scale). The Figure shows how tax revenue dropped slightly after the reform but picked up again after 2008 and has surpassed pre-reform levels. The share in cantonal tax revenue, however, fell sharply after 2005 and has remained below pre-reform levels. Estimates so far have suggested that rich taxpayers did respond mainly by moving to (and staying in) Obwalden.

To analyze this effect on cantonal tax revenue, I use the cantonal revenue statistics covering the period 1990–2014.[23] I compare tax revenue per capita from personal income taxes and total personal tax revenue from income and wealth taxes across cantons in a simple DiD analysis as described in Equation (9). Rather than limiting the analysis to comparisons with Lucerne and Nidwalden, I here compare the revenue in Obwalden to that in each of the Swiss cantons. A graphical inspection of the parallel trends assumption in tax revenues across cantons shows that for many cantons this assumption is fulfilled over an extended time span. Trends are parallel to those in Obwalden in most of the 25 cantons in the four years prior to the reform, so I run DiD regressions comparing all 25 cantons to Obwalden, over the time frames 2002–2007 and 2002–2014, respectively.

Figure 10 shows DiD estimates of the reform in Obwalden on the change in cantonal income tax revenue (Panel a), and in total personal tax revenue, including wealth tax revenue (Panel b). To capture potential differences in time trends across cantons, I extend the baseline model in (9) to include canton-specific trends. Both graphs show how in comparison with almost every canton, the point estimates indicate a negative effect of the reform. About two thirds of the estimates are statistically significantly smaller than zero.

This analysis indicates that in per capita terms, the 2006 and 2008 tax reforms combined were revenue neutral at best. More likely, tax revenue per capita declined as a result of the reforms. In the presence of economies of scale in providing public goods, e.g., schools and roads, taxpayers in Obwalden

[23] Finanzstatistik der Kantone, available online from the Federal Finance Administration: http://www.efv.admin.ch.

would nevertheless be better off in a new equilibrium with larger population and lower tax payments per capita. Kellermann (2007), however, finds that large cantons (in terms of population) also have larger expenditures per capita, even after controlling for structural factors. She finds an overall population elasticity of 0.14, such that doubling the population increases expenditures by 14%. This speaks against the economies of scale argument.

Table 6 shows the gains due to new taxpayers attracted and revenue losses on residents.[24] This simple accounting exercise shows that losses were mostly suffered from rich taxpayers, and that Obwalden benefited from inflows of middle class households, who helped compensate the losses. This again suggests that Obwalden was not on the wrong side of the Laffer curve. This is in line with a simple estimate of the revenue-maximizing tax rate corresponding to the maximum of the Laffer curve. For the top bracket, Saez et al. (2012) show that the revenue-maximizing top rate can be expressed in terms of the ETI, e, and the alpha parameter from the Pareto distribution, a:

$$\tau^* = \frac{1}{(1 + a \cdot e)} \tag{15}$$

Even in the case of a large ETI around 1 (as suggested by Feldstein, 1999, for the U.S.), plugging $a = 1.74$, (the average value in Switzerland for the period 2000–2010 and the value in Obwalden in 2005, see Föllmi and Martínez, 2016), into (8) yields an estimate for τ^* of 36.5%. Assuming a low ETI of 0.25 the revenue-maximizing top rate would increase to 69.7%. Given that the top rate was around 30% before 2006, revenue losses should be expected. Another reason why Obwalden was not able to significantly increase tax revenue despite attracting rich taxpayers is that many of those with rate-determining income above the regressive threshold had substantially lower taxable income (see Table C2 in the Appendix). Stated differently: the rich who moved there did not necessarily increase the tax base by their total net worth but rather to a smaller amount.

[24] As the cantonal income tax data from Obwalden does not contain tax payments, I calculate the tax burden for each individual based on their rate-determining and taxable income.

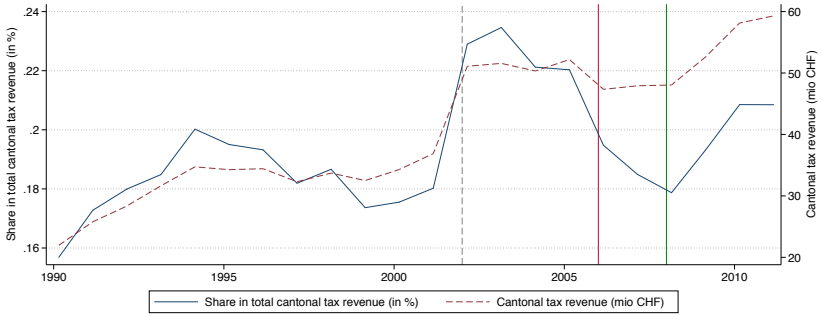
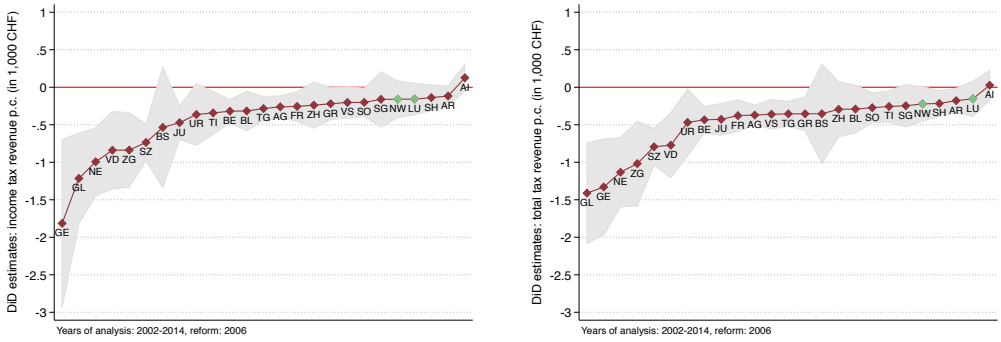


Figure 9: Evolution of personal tax revenue in Obwalden

Note: The graph shows Obwalden's share in total cantonal revenue from individual income and wealth taxes in Switzerland (right scale) and Obwalden's total revenue from personal income and wealth taxes (right scale). Data source: Finanzstatistik der Kantone, EFV.



(a) Personal income tax revenue (b) Total personal tax revenue

Figure 10: DiD estimates of cantonal tax revenue in Obwalden and all other Swiss cantons

Note: Point estimates and 90% confidence intervals from DiD regressions of personal income tax revenue (Panel a) and total personal tax revenue (Panel b) in pairwise comparisons of Obwalden with all other cantons. Data source: Finanzstatistik der Kantone, EFV.

Table 6: Estimated gains and losses from the 2006 and 2008 reforms

	RICH TAXPAYERS			ALL TAXPAYERS		
	Losses	Gains	Net effect	Losses	Gains	Net effect
2006	-6.53	1.00	-5.52	-14.21	2.93	-11.29
2007	-6.96	3.91	-3.05	-14.63	8.59	-6.04
2008	-7.74	3.42	-4.31	-6.48	9.67	3.19
2009	-9.23	4.15	-5.08	-9.43	12.76	3.33
2010	-9.06	4.71	-4.35	-9.69	15.79	6.10
TOTAL	-39.51	17.19	**-22.32**	-54.44	49.73	**-4.71**

Note: Losses are calculated as difference between actual tax revenue from residents and their revenue if all taxes had remained the same as in 2005 (including multipliers). Gains is tax revenue generated by newly arriving taxpayers. Rich taxpayers are those with rate-determining income (wealth) above the regressive income (wealth) tax threshold. Source: individual income and wealth tax data, canton Obwalden, own calculations.

9 Conclusion

This paper shows how responsive migration is to income tax cuts at the top, by exploiting quasi-experimental variation created by a regressive income tax reform in the Swiss Canton of Obwalden. The aim of the reform explicitly was to first attract rich taxpayers, in order to afford an overall lower level of taxation at a later point. The results, based on administrative tax data, show that the share of rich taxpayers living in the canton increased by 25–30% in the first five post-reform years, and average income of the rich rose by 15%. Average incomes of the "bottom 99%" of taxpayers were not affected, suggesting there were no direct spill-over effects from having more rich residents in the canton. Elasticity estimates of the inflow of rich taxpayers range between 3.2 and 6.5.

Three factors explain the comparatively large elasticities. First, within-country elasticities are presumably larger than elasticities across countries, since mobility costs—including potential cultural barriers—are lower than compared to an international setting (like in the Danish case studied in Kleven et al., 2014). Second, the small size of the canton and the small number of inflows prior to the reform reinforces this effect: a small increase in the number of in-movers corresponds to a large relative change. In line with theory on tax competition, small jurisdictions tend to engage more strongly in tax com-

petition, as they can expect large relative gains in their tax base. Third, the paper highlights the role of the institutional setting for mobility responses of taxpayers. The setting studied here comes closest to a Tiebout (1956) model world with a residence-based income tax system where taxpayers are free to relocate to take advantage of low income taxes; especially high-income earners will try to do so to a larger extent than what economists may have believed so far in the absence of restrictions, such as, e.g., source-based taxation.

Despite the large inflows of rich taxpayers, the reform was at best revenue neutral. Comparing the effective top marginal tax rate with the revenue-maximizing rate shows that Obwalden already was on the left side of the Laffer curve prior to the reform, explaining the adverse revenue effects. Efforts for international tax coordination led by the OECD, show that the problem has been recognized yet that compromises can be achieved only very slowly. Due to longstanding traditions of fiscal federalism, this is also true within countries like Switzerland or the U.S.

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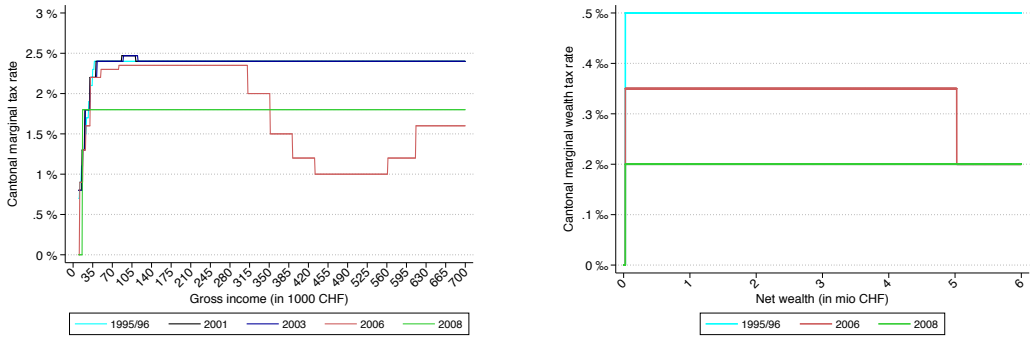
APPENDICES FOR ONLINE PUBLICATION

Appendix A Cantonal and Municipality Income and Wealth Taxation

The Swiss tax system is characterized by a strong degree of decentralization. Income is taxed at three levels: at the federal, the cantonal, and the municipality level. The federal system gives cantons and municipalities large autonomy in taxing residents' income and wealth (the latter is not taxed at the federal level). Each canton has its own tax code, defining itemized and social deductions. These differ widely across cantons and hence so does taxable income. Cantonal taxable income also constitutes the tax base for municipality taxes. Married taxpayers file jointly, additional deductions for married and double-earner couples are in place to reduce their tax burden

Cantonal and municipality income and wealth taxes are determined in two steps. The cantonal law stipulates marginal tax rates which determine the so-called "simple tax". Figure A1 illustrates the marginal rate of the simple tax under the different tax laws in place between 1995 and 2010 in the canton of Obwalden. The effective cantonal and municipality taxes are then obtained by multiplying the simple tax by a cantonal and a municipality multiplier, respectively. This system allows cantons and municipalities regular adjustments of the tax rates according to their revenue needs without need of going through the demanding task of adjusting the tax whole scheme. Multipliers, especially at the municipality level, are adjusted regularly. In many cantons, balanced budget rules are in place, requiring to adjust multipliers in case of a deficit. Figure A2 depicts the changes in the cantonal and municipality multipliers in Obwalden. The effective marginal income tax rates in all seven municipalities of the canton, after applying the cantonal and municipal multipliers, are shown in Figure A3.



(a) Income tax (b) Wealth tax

Figure A1: Simple income and wealth tax rates ("*Einfache Steuer*") in the Canton of Obwalden, 1995–2010

Note: Marginal tax rates for gross income / wealth of a single taxpayer *before* applying the cantonal and municipal multipliers.

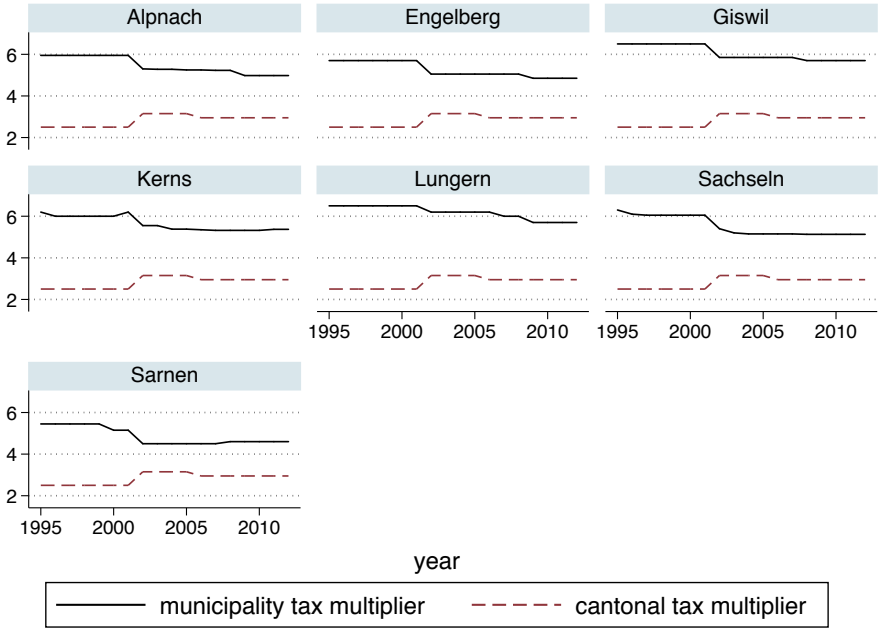
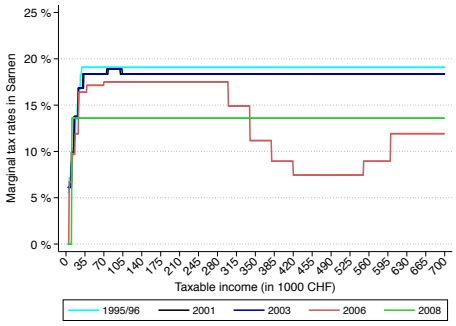
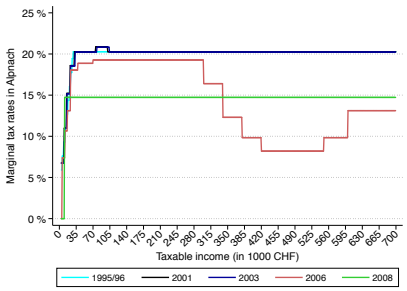


Figure A2: Municipality multipliers and cantonal tax multiplier OW, 1995–2013

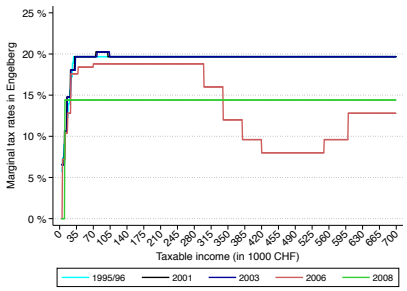
Source: Federal Tax Administration ESTV and Parchet (2012)



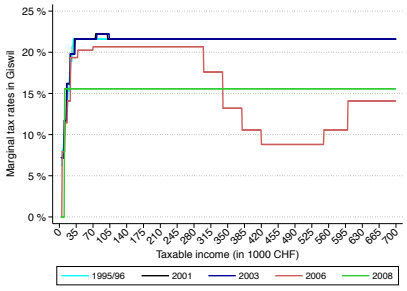
(a) Sarnen



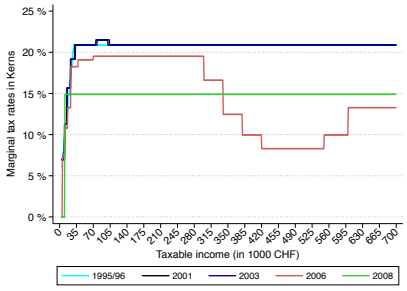
(b) Alpnach



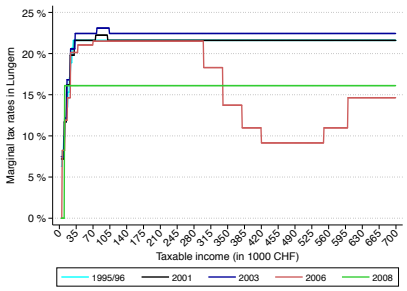
(c) Engelberg



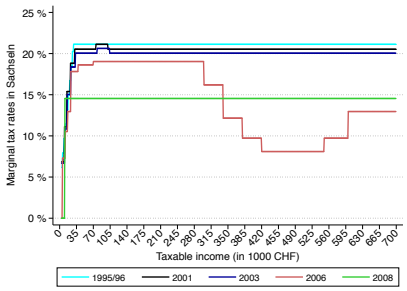
(d) Giswil



(e) Kerns



(f) Lungern



(g) Sachseln

Figure A3: Effective marginal tax rates across municipalities in OW, 1995–2010

Note: Marginal tax rates for taxable income of a single taxpayer, multiplied by the cantonal and the local tax multipliers.

Appendix B Robustness of the Results

B.1 Movement into treatment by cross-cantonal movers

If rich taxpayers moved from Nidwalden and Lucerne, respectively, to Obwalden because of the treatment, these control groups were negatively treated by the reform. In that case, the coefficients presented in Table 1 would be upward biased. Estimates would still be informative from a policy perspective in the Swiss context, but they would over-estimate the underlying responses of economic agents to tax changes.

Combining the federal income tax data with the cantonal tax data from Obwalden, I correct the number of treated taxpayers in each of the control cantons and re-estimate the regressions on the share of rich taxpayers in each canton. Since the cantonal tax data from Obwalden reports the origin of taxpayers who moved there, I correct the number of rich taxpayers in each canton by adding the number of treated taxpayers who moved to Obwalden after 2005 back to their municipality of origin, and subtracting them from their municipality of destination in Obwalden. For the very few cases where only the canton but not the municipality of origin is recorded, I still deduct the taxpayers from the municipalities in Obwalden, but I am not able to assign them to a specific municipality in their canton of origin. This affects 5 observations in Nidwalden and 6 observations in Lucerne. In total, 11 treated taxpayers moved from Nidwalden and 27 from Lucerne to Obwalden after 2005. I calculate the corrected share of rich taxpayers in each canton and re-estimate the regressions of Table 1. The obtained estimates should now represent a lower bound of the effect, because part of the response to the reform is shut down. This is especially true as Lucerne is one of the cantons from which the largest number of taxpayers comes from, both treated and untreated, before and after the reform (see Figure 4).

Table B1 presents the estimates corrected for cross-cantonal movers. Interestingly, the estimated coefficients are larger than without the correction in both comparison groups and across most specifications. In the comparison with Lucerne, they all remain statistically significant. The point estimates, remain comparable between the two control scenarios and across different specifications. I conclude that the estimated increase in the share of rich taxpayers is therefore not driven by movement into treatment.

Net income per taxpayer, can unfortunately not be corrected for cross-cantonal movers in a satisfactory way with the data at hand, because individuals in the federal and cantonal data sets cannot be matched.

Table B1: DiD estimates log share of rich in the canton, corrected for movers

	(1) Baseline	(2) Canton trend	(3) Year FE	(4) Municipality FE
	Panel A: Lucerne			
DiD	0.333*	0.413***	0.332*	0.208*
	(0.169)	(0.137)	(0.168)	(0.107)
Canton-specific trend	No	Yes	No	No
Year FE	No	No	Yes	Yes
Municipality FE	No	No	No	Yes
Observations	1,419	1,419	1,419	1,419
R-squared	0.017	0.018	0.027	0.085
No. of clusters	110	110	110	110
	Panel B: Nidwalden			
DiD	0.295	0.321*	0.289	0.261
	(0.181)	(0.170)	(0.178)	(0.165)
Canton-specific trend	No	Yes	No	No
Year FE	No	No	Yes	Yes
Municipality FE	No	No	No	Yes
Observations	291	291	291	291
R-squared	0.123	0.125	0.136	0.174
No. of clusters	18	18	18	18
F	4.849	9.342	.	9.619

*** p<0.01, ** p<0.05, * p<0.1

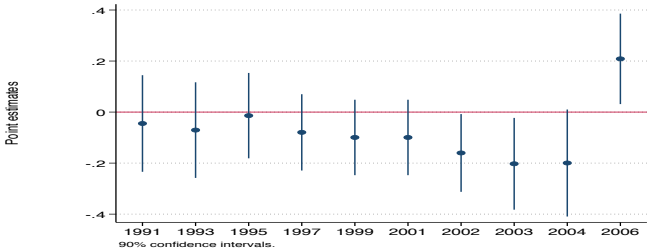
Note: In Models (1)–(3), standard errors are clustered at the municipality level, in Model (4) robust standard errors are reported. Shares of rich taxpayers are corrected by the number of taxpayers moving from Nidwalden, or Lucerne, respectively, to Obwalden after 2005. The number of taxpayers who moved to Obwlden after 2005, as identified in the personal income and wealth tax data from the Cantonal Tax Administration of Obwladen, was subtracted from the municipality of destination in Obwalden and added back to the municipality of origin. All regressions include a constant, a post-treatment dummy ($t > 2005$), and a treatment group dummy. *Source*: Individual federal income tax data, ESTV Bern.

B.2 Placebo estimates

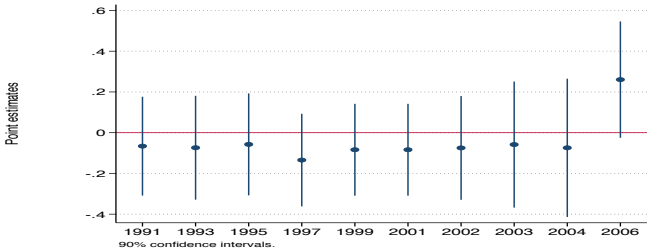
Under the hypothesis that the DiD estimates presented in Tables 1 and 2 capture the true effect of the reform, the same estimates placing the reform in any year before 2006 (and excluding all periods after 2005), should not be statistically significant.

The placebo estimates for the log share of rich taxpayers in Obwalden compared to its neighbors are depicted in Figure B1. The estimates from the comparison with both neighbors show how prior to the actual reform Obwalden would have had a lower share of rich taxpayers. Note further that estimates for 2006 in Figure B1 are based on the sample corrected for cross-cantonal movers as described above. The graphs show that while in the case of Nidwalden (Panel b) the point estimate becomes statistically insignificant when correcting for cross-cantonal movers, this is only marginally true. The difference between the true reform estimate and the placebo estimates is substantial and stable over the whole pre-treatment period.

Similarly, the estimates of the change in real net income per taxpayer (Figure B2) are all close to zero or even negative in the comparison with Lucerne (Panel a) in the pre-treatment period. In the comparison with Nidwalden (Panel b) the results confirm that prior to the true reform in 2006 there was no substantial difference in in net income per taxpayer between the two cantons and that average income has risen in Obwalden as a result of the reform. I find the same patterns in placebo estimates for a large range of different specifications, from baseline estimates to the inclusion of time trends and canton-specific time fixed effects. This confirms that the reform substantially increased income per taxpayer, presumably through inflows of rich taxpayers as well as adjustments in reported income.



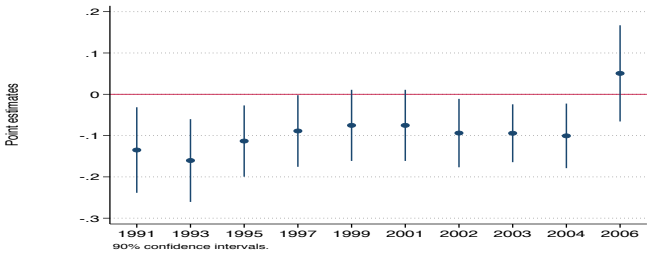
(a) Lucerne vs. Obwalden



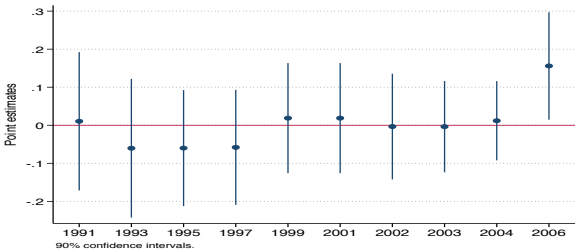
(b) Nidwalden vs. Obwalden

Figure B1: Placebo DiD estimates of the log share of rich taxpayers

Note: The plots depict the DiD estimates of the log share of rich taxpayers in a municipality, corrected for cross-cantonal movers, including municipality and year fixed effects, analogous to Column 4 in Table B1.



(a) Lucerne vs. Obwalden



(b) Nidwalden vs. Obwalden

Figure B2: Placebo DiD estimates of net income per taxpayer

Note: The plots depict the simple reduced form DiD estimates of the log net income per taxpayer in a municipality, analogous to Column 1 in Table 2.

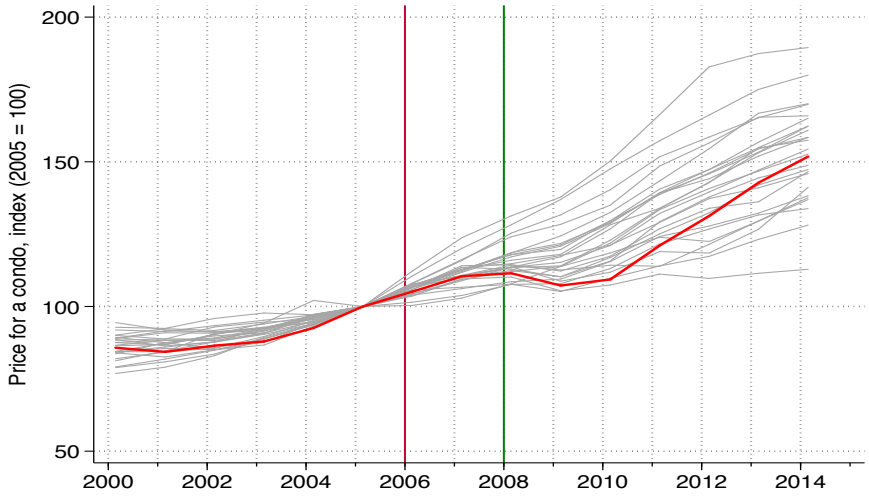
B.3 Capitalization into housing prices

Fiscal policy may capitalize in property prices, as suggested in the seminal paper by Oates (1969). In that case, the tax gains from moving to Obwalden would be neutralized by higher housing expenditures. Empirical studies find that capitalization of lower tax rates into property prices is imperfect in Switzerland (Kirchgässner and Pommerehne, 1996; Schmidheiny, 2006; Schaltegger et al., 2011). This is in line with the theoretical model by Stadelmann and Billon (2012), which predicts that full capitalization is only possible if the elasticity of supply in the housing market is zero. Given that the housing supply is elastic to some degree, moving to a low tax municipality pays off despite higher property prices—especially for rich households with high incomes. In a recent study based on Swiss data, Morger (2013) further shows that capitalization differs for different types of apartments and household groups, so that there is no "one true capitalization rate" (Morger, 2013, p.35). He finds that capitalization is moderate in most cases, except for low-quality apartments (demanded by low-income households) in nearby municipalities. This suggests that low tax rates may crowd out poor households through higher rental prices.

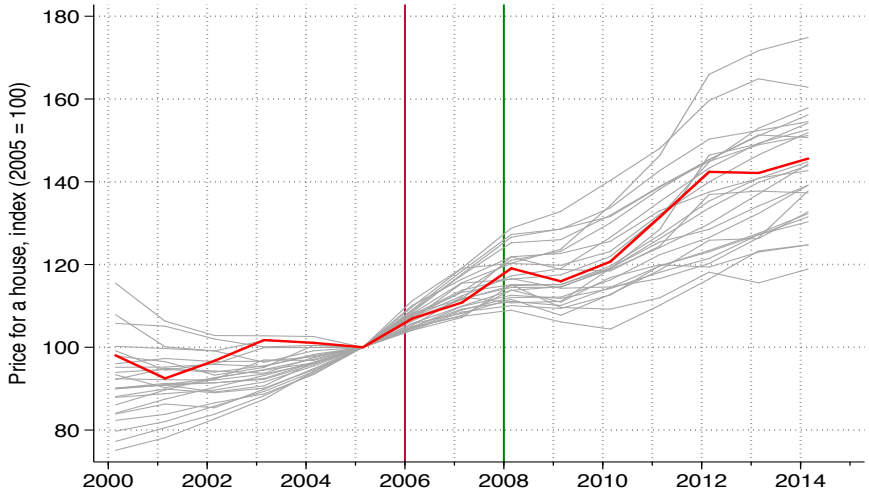
Figure B3 shows how, after the reform, prices for condominiums and houses in Obwalden increased only moderately, following common trends found in surrounding commuting zones. The price increase for condos was even below average compared to other regions. The same is not true for rental apartments (Figure B4a). In this category (prices are available only at cantonal level), prices increased substantially in 2006 and after 2008, when the flat rate tax was introduced. An explanation could be that some in-movers decided to rent an apartment in Obwalden before they decided to buy real estate, driving up prices in this segment.

A caveat is that these price indexes are based on a hedonic price model, which among other things takes into account the tax level. True rental offer prices show that the price change was not as dramatic as suggested and that the level of rents per square meter in Obwalden has remained well below than in Zurich, Zug, or Nidwalden (Figure B4b)

Under the assumption that low-income households rely more heavily on rental apartments, these findings imply that the reform could have affected low-income households negatively through housing prices. For high-income households, the evolution of real estate prices in Obwalden was moderate enough that these households would still benefit from low taxes.



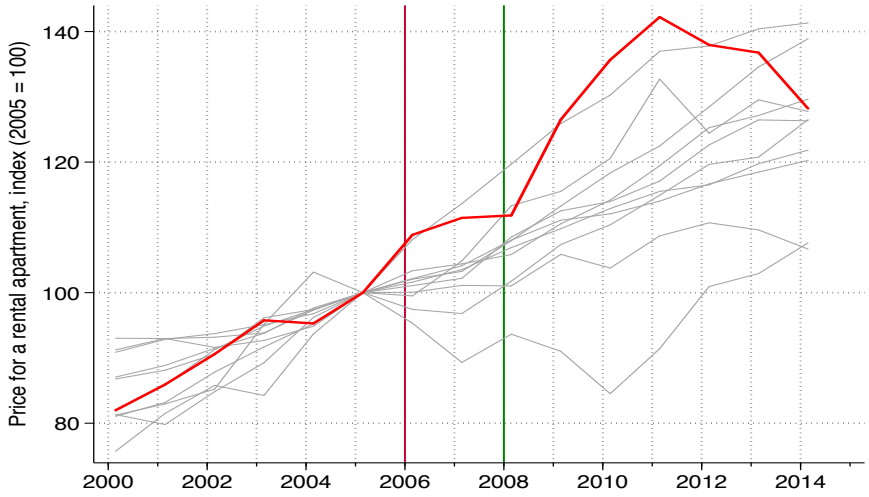
(a) Condominiums



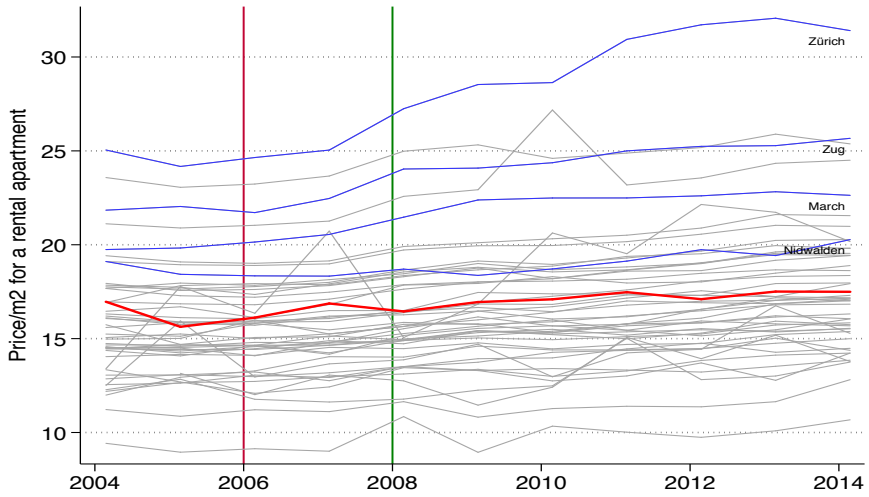
(b) Houses

Figure B3: Price index for apartments and houses in Obwalden and surrounding areas

Note: Panels a) and b) depict the hedonistic transaction price index for apartments and houses, respectively in 26 labor market regions. *Source*: Wuest und Partner AG, Zurich.



(a) Price index



(b) Offer price

Figure B4: Rental prices in Obwalden and surrounding areas

Note: Panel a) shows the hedonistic offer price index for rental flats in 11 cantons. Panel b) shows average offer prices per square meter across relevant commuting zones in nominal values. *Source*: a) Wuest und Partner AG, Zurich. b) Jayson Danton, University of Lausanne

B.4 Elasticity Estimates in Shares

Table B2: DiD estimates in shares of taxpayers

	Panel A					
	Stock of taxpayers (all residents and in-movers)					
Control group	*60-80%*				*60-95%*	
DiD	0.146**	0.061			0.082	0.074
	(0.066)	(0.047)			(0.072)	(0.047)
ε_τ(2006-07)			0.650**		0.787***	
			(0.299)		(0.297)	
$\varepsilon_{\bar{\tau}}$ (2006-07)				2.004**		2.452***
				(0.889)		(0.911)
Observations	14	14	14	14	14	14
R-squared	0.97	0.97	0.97	0.97	0.96	0.96
F	20.37	19.43				
χ^2			432.59	464.59	357.89	370.69
	Panel B					
	Flow of taxpayers (in-movers only)					
Control group	*60-80%*				*55-75%*	
DiD	0.040**	0.290			0.046***	0.445**
	(0.018)	(0.298)			(0.015)	(0.212)
ε_τ (2006-07)			3.232		4.847***	
			(1.989)		(1.282)	
$\varepsilon_{\bar{\tau}}$ (2006-07)				3.348		6.435***
				(3.072)		(1.402)
Observations	14	14	14	13	14	13
R-squared	0.902	0.882	0.881	0.931	0.931	0.964
F	5.73	4.67				
χ^2			103.7	177.2	185.4	336.3

*** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.
Note: The dependent variable is the share of taxpayers (Panel A) or in-movers (Panel B) in the treatment and control group, respectively, as fraction of total population in the canton in a given year. All regressions include a constant, a treatment dummy, and year dummies.
Source: Personal income and wealth tax data Obwalden, 2001–2010.

Appendix C Additional Tables and Figures

Table C1: Macroeconomic conditions in Obwalden and selected Swiss cantons, 2005 (I/II)

		Central Switzerland						Western Switzerland		
		low tax			*average tax*			*high tax*		
	OW	NW	ZG	SZ	LU	GL	UR	FR	VS	JU
Macroeconomic performance										
GDP p.c.	39,646	73,286	93,753	50,170	43,910	73,236	45,712	39,559	38,385	38,070
AAG GDP p.c. (2001-2005)	2.15	3.68	4.86	0.23	1.53	5.20	0.67	1.80	2.04	0.79
AAG GDP (2001-2005)	2.15	3.68	4.86	0.23	1.53	5.20	0.67	1.80	2.04	0.79
Unemployment rate	1.61	1.96	3.15	2.31	3.07	2.50	1.31	3.09	3.96	4.22
Firms										
in % of total Switzerland	0.54	0.63	2.19	2.14	4.86	0.56	0.49	3.28	4.39	1.05
Share of small firms (in %)	90.16	89.47	88.08	89.94	88.04	89.10	89.37	88.76	89.21	89.77
Share of large firms (in %)	0.17	0.11	0.09	0.08	0.17	0.20	0.23	0.14	0.10	0.15
Share of firms in:										
1st sector (in %)	33.01	20.20	6.70	19.75	25.63	19.48	34.71	24.70	23.41	25.17
2nd sector (in %)	17.76	17.23	12.38	19.46	16.95	21.07	14.90	16.70	15.94	20.97
3rd sector (in %)	49.22	62.58	80.92	60.79	57.42	59.46	50.39	58.60	60.64	53.86
Jobs										
in % of total Switzerland	0.41	0.49	1.84	1.52	4.75	0.46	0.40	2.85	3.41	0.87
Share of jobs in :										
1st sector (in %)	12.21	7.75	2.65	8.15	8.46	6.82	11.40	9.65	9.27	10.10
2nd sector (in %)	35.81	30.22	26.13	29.73	26.09	41.56	32.28	27.67	26.15	39.34
3rd sector (in %)	51.98	62.03	71.22	62.12	65.45	51.62	56.32	62.68	64.59	50.56
Population										
in % of total Switzerland	0.45	0.53	1.43	1.84	4.78	0.51	0.47	3.40	3.91	0.93
Inequality										
Gini	.433	.505	.531	.533	.417	.378	.364	.393	.511	.413
Relative Gini, CH=1	.947	1.105	1.162	1.166	.912	.827	.796	.86	1.118	.904

Table C1: Macroeconomic conditions in Obwalden and selected Swiss Cantons, 2005 (II/II)

	Switzerland	Largest cantons		Eastern Switzerland			
	CH	ZH	BE	SG	TG	AR	AI
Macroeconomic performance							
GDP p.c.	54,031	68,804	45,644	44,866	44,918	44,215	45,936
AAG GDP p.c. (2001-2005)	2.31	2.54	2.17	0.95	1.26	-1.22	-1.58
AAG GDP (2001-2005)	2.31	2.54	2.17	0.95	1.26	-1.22	-1.58
Unemployment rate	3.76	4.02	2.83	2.97	3.07	2.19	1.47
Firms							
in % of total Switzerland	100	16.46	13.21	6.37	3.36	0.84	0.32
Share of small firms (in %)	87.43	86.22	87.81	87.48	89.53	92.05	92.61
Share of large firms (in %)	0.23	0.32	0.23	0.22	0.18	0.11	0.00
Share of firms in:							
1st sector (in %)	14.84	6.14	22.70	18.10	21.89	23.57	42.57
2nd sector (in %)	17.19	15.49	17.64	19.75	20.61	18.63	15.65
3rd sector (in %)	67.97	78.37	59.67	62.15	57.49	57.80	41.78
Jobs							
in % of total Switzerland	100	19.13	13.33	6.13	2.72	0.56	0.17
Share of jobs in :							
1st sector (in %)	4.83	1.82	7.58	5.44	8.68	8.97	19.08
2nd sector (in %)	25.18	18.35	23.75	33.94	35.11	33.33	29.93
3rd sector (in %)	69.99	79.82	68.68	60.62	56.21	57.70	50.99
Population							
in % of total Switzerland	100	17.06	12.83	6.17	3.14	0.70	0.20
Inequality							
Gini	.457	.462	.444	.417	.397	.436	.444
Relative Gini, Switzerland=1	1	1.011	.972	.912	.869	.954	.972

Note: All figures refer to 2005. AAG denotes average annual growth over the years 2001–2005. Jobs refer to full-time equivalent employment. Population is measured as permanent resident population as of December 31. Gini index is based on net income as reported in federal income tax statistics. *Sources*: GDP, GDP p.c., firm, employment, and population statistics: Federal Statistical Office BFS. Gini: Federal Tax Administration (ESTV).

Table C2: Characteristics of treatment and control groups, 2001–2010 (I/II)

	All taxpayers			New in-coming taxpayers			
	Treated	Control 60-80%	Non-treated	Treated	Control 55-75%	Control 60-80%	Non-treated
Tax burden							
Avg. NTR ($t < 2006$) in %	70.54	74.08	87.29	70.57	74.86	73.91	87.43
	(1.64)	(1.29)	(5.26)	(1.27)	(1.3)	(1.89)	(4.96)
Avg. NTR ($t \geq 2006^*$) in %	74.15	75.48	88.23	74.19	75.22	75.06	87.59
	(1.21)	(1.18)	(5.21)	(1.37)	(1.07)	(.91)	(5.38)
Avg. wealth tax ($t < 2006$) in %	0.413	0.413	0.416	0.415	0.414	0.415	0.414
	(0.023)	(0.020)	(0.036)	(0.016)	(0.015)	(0.016)	(0.037)
Avg. wealth tax ($t \geq 2006^*$) in %	0.282	0.293	0.285	0.278	0.287	0.299	0.287
	(0.059)	(0.038)	(0.020)	(0.055)	(0.032)	(0.056)	(0.024)
Household characteristics							
Age	59.67	57.03	48.25	52.08	49.46	49.47	42.97
	(12.6)	(12.62)	(19.87)	(10.86)	(11.08)	(11.16)	(15.96)
Married	0.773	0.769	0.460	0.767	0.745	0.756	0.432
	(0.419)	(0.422)	(0.498)	(0.424)	(0.437)	(0.431)	(0.495)
Double earners	0.422	0.483	0.209	0.430	0.476	0.458	0.151
	(0.494)	(0.50)	(0.407)	(0.496)	(0.501)	(0.50)	(0.358)
Nr. dependents	0.694	0.736	0.412	0.834	0.952	1.000	0.325
	(1.067)	(1.077)	(0.886)	(1.096)	(1.132)	(1.150)	(0.769)
Swiss citizen	0.865	0.919	0.930	0.696	0.705	0.678	0.857
	(0.342)	(0.273)	(0.256)	(0.462)	(0.458)	(0.470)	(0.350)
Moved-in from abroad	0.130	0.089	0.064	0.115	0.080	0.120	0.135
	(0.337)	(0.285)	(0.245)	(0.320)	(0.273)	(0.326)	(0.341)
Weekend residents	0.006	0.007	0.017	0.021	0.021	0.031	0.029
	(0.077)	(0.081)	(0.128)	(0.143)	(0.143)	(0.173)	(0.169)
Employment and income source							
Employee	0.517	0.550	0.607	0.637	0.772	0.740	0.785
	(0.50)	(0.498)	(0.488)	(0.482)	(0.421)	(0.440)	(0.411)
Self employed	0.153	0.148	0.058	0.067	0.041	0.061	0.059
	(0.360)	(0.355)	(0.233)	(0.251)	(0.20)	(0.240)	(0.235)
Retiree	0.131	0.139	0.218	0.052	0.062	0.069	0.098
	(0.337)	(0.346)	(0.413)	(0.222)	(0.242)	(0.254)	(0.297)
Share of income from:							
employment	0.317	0.440	0.584	0.455	0.613	0.590	0.689
	(0.349)	(0.378)	(0.688)	(0.394)	(0.362)	(0.369)	(0.982)
self-employment	0.185	0.144	0.035	0.131	0.118	0.130	-1.785
	(0.327)	(0.291)	(24.490)	(0.290)	(0.264)	(0.284)	(133.20)
capital	0.484	0.347	0.133	0.440	0.246	0.262	1.405
	(0.389)	(0.315)	(19.690)	(0.441)	(0.292)	(0.30)	(93.370)
Observations	3,827	3,150	232,913	193	145	131	7,489

Note: Sample means, standard deviations in parentheses. NTR: average net-of-tax rate, i.e. $(1 - \bar{\tau})$.
*: 2006–2007; afterwards, income and wealth tax rates are virtually identical for everyone. *Source*: Personal income and wealth tax data canton Obwalden, 2001–2010.

Table C2: Characteristics of treatment and control groups, 2001–2010 (II/II)

	All taxpayers			New in-coming taxpayers			
	Treated	Control 60-80%	Non-treated	Treated	Control 55-75%	Control 60-80%	Non-treated
Rate-determining vs. taxable income and wealth							
Rate-determining income	849	206	45	966	194	205	50
(real, in 1,000 CHF)	(1732)	(18)	(43)	(2660)	(17)	(17)	(51)
Taxable income	241	79	36	218	61	61	29
(real, in 1,000 CHF)	(1159)	(93)	(33)	(536)	(79)	(81)	(34)
Rate-determining wealth	1619	226	29	1103	133	134	31
(real, in 10,000 CHF)	(6273)	(351)	(129)	(2811)	(248)	(245)	(168)
Taxable wealth	348	74	15	418	54	51	14
(real, in 10,000 CHF)	(1583)	(210)	(70)	(1774)	(212)	(214)	(148)
Tax savings from moving (real, in 1,000 CHF)							
Total				2591	-76	-108	-160
				(8946)	(553)	(540)	(195)
Avg. annual savings				1661	-35	-49	-154
				(3364)	(522)	(511)	(326)
Driving distance to former residence							
In km				84.21	65.01	65.77	61.90
				(59.3)	(46.4)	(44.44)	(50.13)
In minutes				67.62	54.03	54.75	53.71
				(39.61)	(32.08)	(31.17)	(37.1)
Observations	3,827	3,150	232,913	193	145	131	7,489

Note: Sample means, standard deviations in parentheses. NTR: average net-of-tax rate, i.e. $(1 - \bar{\tau})$.
*: 2006–2007; afterwards, income and wealth tax rates are virtually identical for everyone. *Source*: Personal income and wealth tax data canton Obwalden, 2001–2010.

Table C3: Origin of in-movers before and after the 2006 reform (in %)

Origin	Treatment		Control		Total	
	before 2006 %	after 2006 %	before 2006 %	after 2006 %	before 2006 %	after 2006 %
ZH	11.63	15.17	21.62	10.99	8.33	9.35
BE	2.33	4.83	2.70	4.40	5.55	5.81
LU	23.26	19.31	18.92	27.47	25.93	24.99
UR	2.33				1.78	1.35
SZ		2.07		1.10	3.14	3.16
NW	13.95	7.59	8.11	10.99	13.64	14.92
GL					0.12	0.17
ZG	11.63	7.59	5.41	5.49	4.35	4.12
FR				1.10	0.42	0.27
SO			5.41	3.30	2.05	1.64
BS	4.65	1.38	5.41	3.30	1.51	1.33
BL	2.33	4.83	5.41	6.59	3.08	2.77
SH					0.30	0.36
AR		0.69			0.18	0.24
AI		0.69			0.03	0.17
SG	2.33		2.70		1.99	1.69
GR		0.69		2.20	1.42	1.47
AG	16.28	11.03	8.11	6.59	6.55	6.80
TG					0.81	0.80
TI	2.33	2.07	2.70	1.10	0.66	0.92
VD		2.76			0.30	0.77
VS					0.97	0.67
NE		0.69			0.09	0.27
GE		2.07	2.70		0.24	0.31
JU		0.69			0.03	0.10
Abroad	6.98	12.41	10.81	12.09	14.13	13.62
Unknown		3.45		3.30	2.35	1.95
Total	100.00	100.00	100.00	100.00	100.00	100.00

Note: Treatment group: taxpayers with rate-determining income > CHF 300,000. Control group defined as those having rate-determining income of 180,000–240,000 CHF, i.e, 60–80% of the regressive threshold.
Source: Personal income and wealth tax data Obwalden, 2001–2010.

Table C4: ETI estimation sample descriptives

Variable	Mean	SD
Log change in NTR (lagged)	0.015	0.060
Rate-determining income (in 1,000 CHF)	498	1,418
Taxable income (in 1,000 CHF)	197	974
Rate-determining wealth (in 1,000 CHF)	3,120	13,897
Taxable wealth (in 1,000 CHF)	8,092	25,877
Log change in taxable income	0.066	0.953
Log of lagged taxable base-year income ($\Delta = 3$)	10.630	2.118
Log change in rate-determining income	-0.035	0.895
Log of lagged rate-determining base-year income ($\Delta = 3$)	12.490	1.061
Married	0.709	0.454
Double earners	0.409	0.492
Children (dummy)	0.388	0.487
Self employed	0.204	0.403
Retiree	0.104	0.306
Age	57.00	12.66
Engelberg	0.428	0.495
Giswil	0.036	0.185
Kerns	0.076	0.264
Lungern	0.031	0.172
Sachseln	0.086	0.280
Sarnen	0.264	0.441
Observations	5,381	

Source: Personal income and wealth tax data Obwalden, 2001–2010.

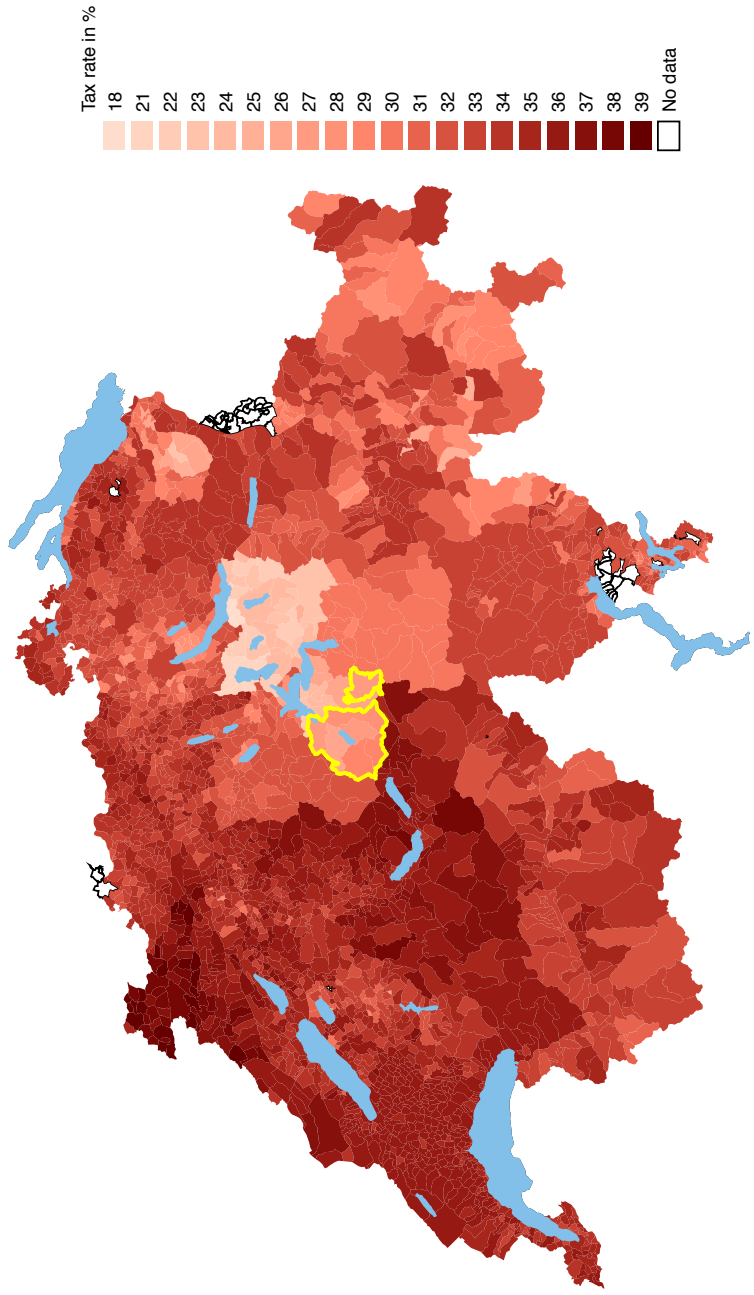


Figure C1: Average income tax for single taxpayer with gross income of 500,000 CHF

Note: Gross labor income net of social security contributions. Average tax load from federal, cantonal, municipality and church taxes. Obwalden is the yellow-rimmed canton (consisting of two areas) in the center of Switzerland.
Source: Tax rates courtesy of Raphaël Parchet (2012); geo-data provided by the Federal Statistical Office, Neuchâtel.

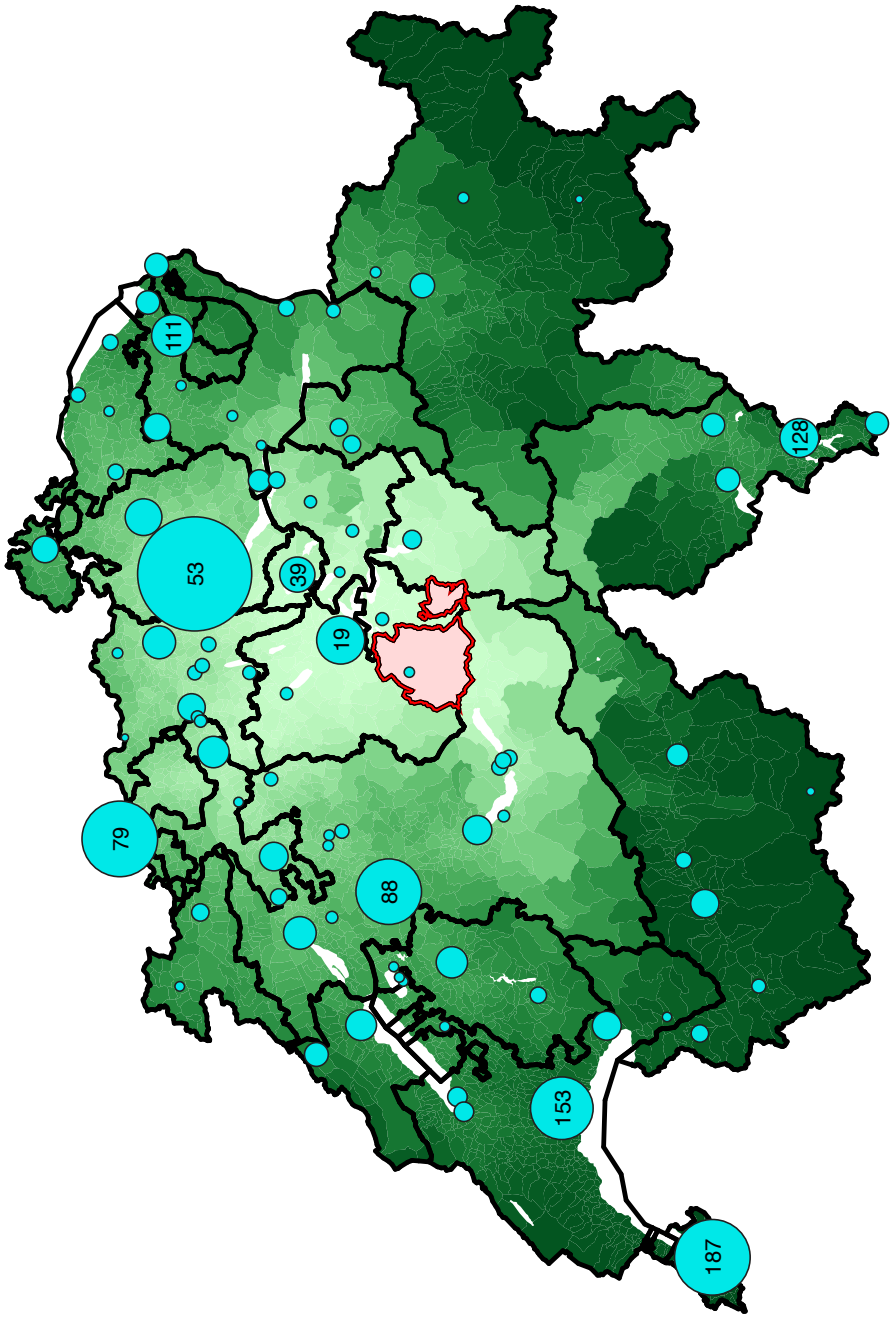


Figure C2: Commuting distances from Sarnen (OW) to urban agglomerations

Note: Numbers in circles denote average driving times from Sarnen in minutes. Circles are drawn in proportion to the population in each agglomeration.

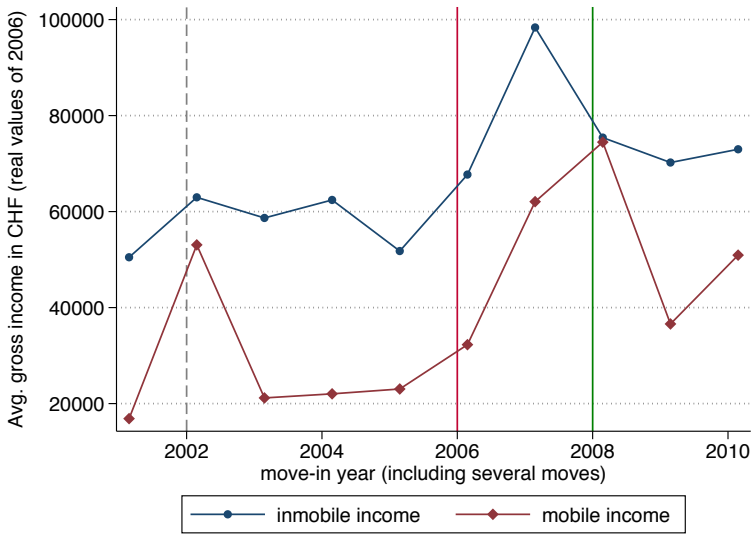


Figure C3: In-movers' average gross mobile and immobile income, 2001–2010

Note: All location-independent income sources are defined as mobile income, including all kinds of capital incomes such as interest income on bank accounts, dividends, returns on shares etc., as well as transfer incomes, such as unemployment benefits, alimony payments from ex-spouses etc. Labor income from employment and self-employment is classified as immobile income. Gross values before deductions.
The red line 2006 marks the introduction of the regressive schedule, in 2008 (green line) the flat rate tax came into place; the grey dotted line marks the introduction of the AFMP with the EU.
Source: Personal income and wealth tax data Obwalden, 2001–2010.

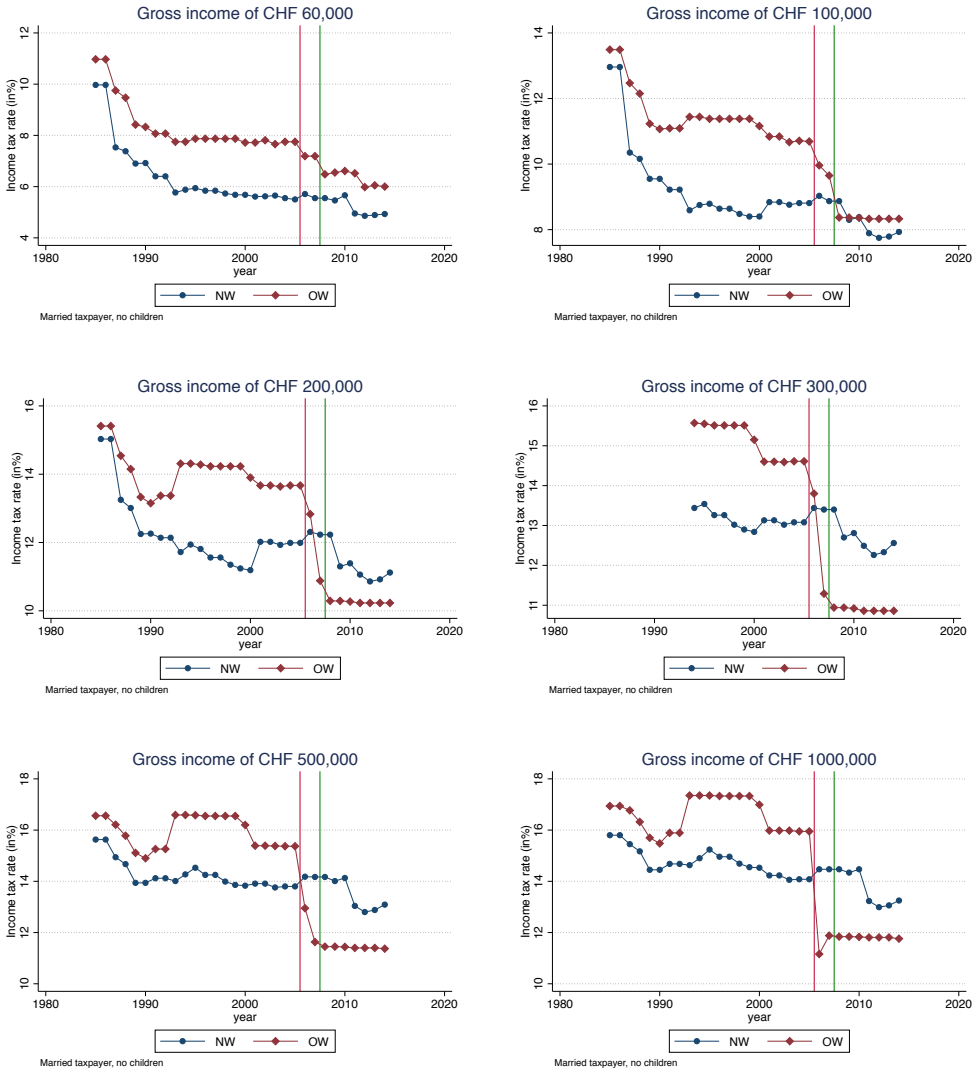


Figure C4: Average income tax rates at gross income levels in Obwalden and Nidwalden

Note: Average tax rates on gross income for a married couple with no children as published by the Federal Tax Administration ESTV, Bern. Tax rates refer to the the average cantonal and municipality tax in the main city of each canton, i.e. Sarnen in Obwalden and Stans in Nidwalden.

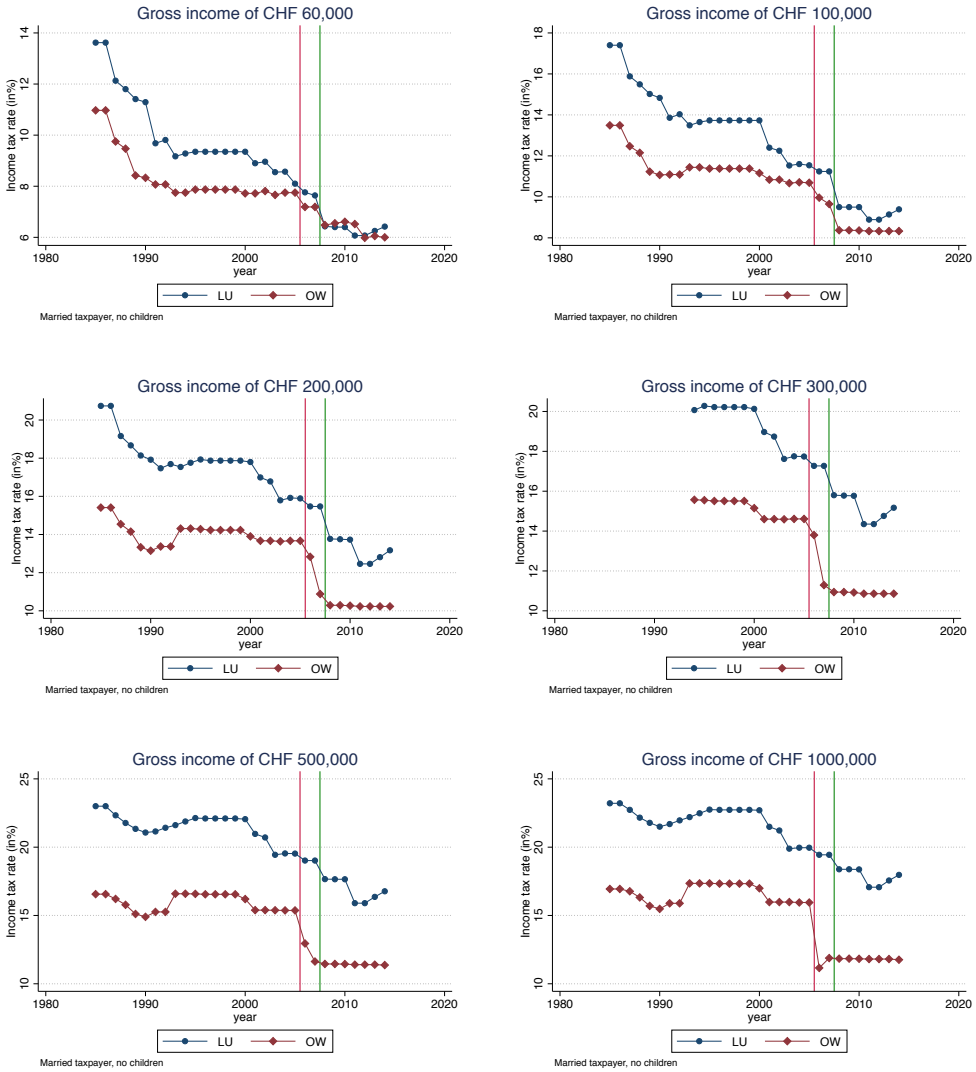
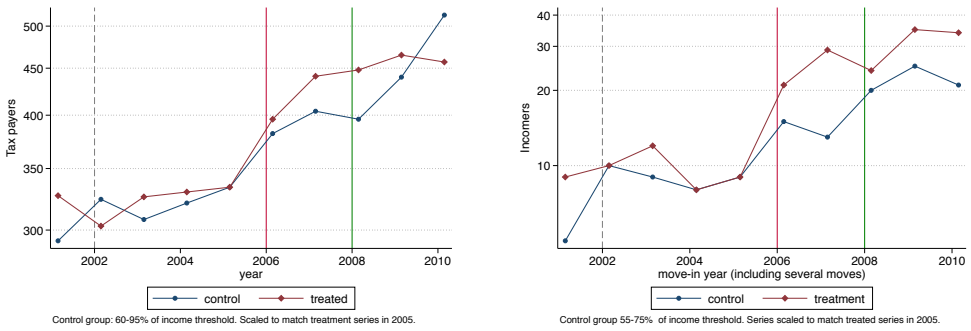


Figure C5: Average income tax rates at gross income levels in Obwalden and Lucerne

Note: Average tax rates on gross income for a married couple with no children as published by the Federal Tax Administration ESTV, Bern. Tax rates refer to the the average cantonal and municipality tax in the main city of each canton, i.e. Sarnen in Obwalden and Lucerne in Lucerne.



(a) Residents, 60–95%

(b) Inmovers, 55–75%

Figure C6: Alternative control groups, 2001–2010

Note: The percentages indicate how the control group is defined in each panel in terms rate-determining income relative to the regressive threshold of 300,000 CHF. 60–95%, for example, means that taxpayers with incomes of 180,000–285,000 CHF fall into the control group. The treatment group is always defined as taxpayers above the threshold of 300,000 CHF.
Source: Personal income and wealth tax data Obwalden, 2001–2010.

Appendix D Detailed Regression Results

Table D1: DiD regressions of net income per taxpayer, Lucerne

	(1) Baseline	(2) Canton trend	(3) Municip. FE	(4) Sample: <300K	(5) Sample: >300K
DiD	0.051	0.145***	0.036	-0.005	0.129*
	(0.070)	(0.055)	(0.057)	(0.012)	(0.067)
Treated	0.054	21.366***	0.377***	0.216***	0.583***
	(0.062)	(3.745)	(0.017)	(0.004)	(0.057)
Period $t > 2005$	0.079***	0.081***	0.131***	-0.020**	0.007
	(0.013)	(0.011)	(0.021)	(0.010)	(0.044)
Non-working		-0.600***	-0.000***	0.051***	0.036
		(0.034)	(0.000)	(0.007)	(0.039)
Retiree		-0.277***	-0.677***	-0.009	0.063
		(0.018)	(0.029)	(0.009)	(0.041)
Self-employed		0.075***	-0.303***	-0.006	0.027
		(0.012)	(0.015)	(0.010)	(0.026)
Married		0.594***	0.052***	0.670***	0.066
		(0.012)	(0.011)	(0.013)	(0.043)
Single parents		0.430***	0.585***	0.446***	-0.040
		(0.015)	(0.012)	(0.015)	(0.097)
Married with children		0.759***	0.395***	0.835***	-0.033
		(0.011)	(0.018)	(0.010)	(0.049)
# taxpayers in cell		0.000***	0.754***	0.000***	-0.000
		(0.000)	(0.011)	(0.000)	(0.001)
Constant	4.140***	3.628***	3.427***	3.467***	6.055***
	(0.021)	(0.020)	(0.017)	(0.012)	(0.057)
Canton-specific trend	No	Yes	No	No	No
Time FE	No	No	Yes	Yes	Yes
Municipality FE	No	No	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	1,748	46,001	46,001	7,193	3,644
R-squared	0.025	0.227	0.288	0.868	0.245
No. of clusters	115	115	115	115	110

*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors clustered at the municipality level. Observations are municipality-year cells. In Columns 2–5 cells are further split into different binary characteristics of the taxpayers, namely: married, single parents, married with children (with single taxpayers with no dependents being the reference category), and self-employed, non-working, retiree (with employees being the reference category). By splitting up the municipality-year cells into these categories, the number of observations increases. Models (2)–(5) further control for cell size. *Source*: Individual federal income tax data, ESTV Bern.

Table D2: DiD regressions of net income per taxpayer, Nidwalden

	(1) Baseline	(2) Canton trend	(3) Municip. FE	(4) Sample: <300K	(5) Sample: >300K
DiD	0.156*	0.153**	0.003	-0.008	0.234**
	(0.081)	(0.060)	(0.065)	(0.014)	(0.088)
Treated	-0.316**	28.011***	0.172***	0.115***	0.170***
	(0.125)	(8.440)	(0.019)	(0.009)	(0.043)
Period $t > 2005$	-0.026	0.069***	0.132**	-0.015	-0.032
	(0.039)	(0.023)	(0.052)	(0.015)	(0.099)
Non-working		-0.652***	-0.000***	0.077***	0.034
		(0.087)	(0.000)	(0.012)	(0.131)
Retiree		-0.164***	-0.716***	-0.021	0.092
		(0.027)	(0.080)	(0.015)	(0.090)
Self-employed		-0.073*	-0.212***	0.034	0.020
		(0.042)	(0.027)	(0.021)	(0.050)
Married		0.524***	-0.110**	0.621***	-0.068
		(0.040)	(0.043)	(0.035)	(0.107)
Single parents		0.293***	0.512***	0.337***	-0.193
		(0.057)	(0.040)	(0.025)	(0.202)
Married with children		0.588***	0.260***	0.718***	-0.231
		(0.040)	(0.060)	(0.019)	(0.139)
# taxpayers in cell		-0.000	0.572***	-0.000	-0.006
		(0.000)	(0.040)	(0.000)	(0.004)
Constant	4.510***	-4.743	3.601***	3.609***	6.035***
	(0.109)	(7.406)	(0.036)	(0.029)	(0.154)
Canton-specific trend	No	Yes	No	No	No
Time FE	No	No	Yes	Yes	Yes
Municipality FE	No	No	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes
Observations	288	10,264	10,264	1,203	1,002
R-squared	0.121	0.166	0.253	0.926	0.303
No. of clusters	18	18	18	18	18

*** p<0.01, ** p<0.05, * p<0.1

Note: Standard errors clustered at the municipality level. Observations are municipality-year cells. In Columns 2–5 cells are further split into different binary characteristics of the taxpayers, namely: married, single parents, married with children (with single taxpayers with no dependents being the reference category), and self-employed, non-working, retiree (with employees being the reference category). By splitting up the municipality-year cells into these categories, the number of observations increases. Models (2)–(5) further control for cell size. *Source*: Individual federal income tax data, ESTV Bern.

Table D3: Estimates of stock of taxpayers in OW, control group 60–80%

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2001–2007						2001–2010	
	Reduced (level)	Reduced (log)	2SLS (log)	2SLS (log)	OLS (log)	OLS (log)	2SLS (log)	2SLS (log)
DiD	36.800*	0.061						
	(15.285)	(0.047)						
ε_{τ}			0.650**		0.643		0.615*	
			(0.299)		(0.500)		(0.362)	
$\varepsilon_{\bar{\tau}}$				2.004**		2.123		2.013*
				(0.889)		(1.444)		(1.148)
Treatment	53.200***	0.179***	0.177***	0.276***	0.177***	0.281***	0.180***	0.275***
	(8.170)	(0.025)	(0.016)	(0.037)	(0.026)	(0.061)	(0.016)	(0.048)
t = 2002	-1.000	0.004	0.004	0.006	0.004	0.007	0.004	0.006
	(12.918)	(0.040)	(0.024)	(0.023)	(0.040)	(0.039)	(0.031)	(0.030)
t = 2003	7.000	0.027	0.030	0.023	0.030	0.023	0.030	0.023
	(12.918)	(0.040)	(0.024)	(0.023)	(0.040)	(0.039)	(0.031)	(0.030)
t = 2004	13.500	0.050	0.049**	0.048**	0.049	0.048	0.049	0.048
	(12.918)	(0.040)	(0.024)	(0.023)	(0.040)	(0.039)	(0.031)	(0.030)
t = 2005	17.500	0.063	0.062***	0.059**	0.062	0.059	0.062**	0.059**
	(12.918)	(0.040)	(0.024)	(0.023)	(0.040)	(0.039)	(0.031)	(0.030)
t = 2006	51.100**	0.187***	0.178***	0.148***	0.178**	0.144*	0.180***	0.148***
	(15.010)	(0.046)	(0.030)	(0.039)	(0.050)	(0.063)	(0.038)	(0.050)
t = 2007	79.100***	0.258***	0.249***	0.218***	0.250***	0.213**	0.251***	0.217***
	(15.010)	(0.046)	(0.030)	(0.039)	(0.050)	(0.064)	(0.037)	(0.050)
t = 2008							0.262***	0.184**
							(0.041)	(0.077)
t = 2009							0.321***	0.240***
							(0.042)	(0.079)
t = 2010							0.378***	0.299***
							(0.042)	(0.079)
Constant	263.400***	5.572***	5.821***	6.175***	5.819***	6.212***	5.806***	6.179***
	(10.006)	(0.031)	(0.120)	(0.272)	(0.201)	(0.442)	(0.144)	(0.351)
Obs.	14	14	14	14	14	14	20	20
R-squared	0.975	0.974	0.974	0.975	0.974	0.975	0.973	0.975
$\Delta\tau_{2006}$, % pts	3.599							
$\Delta\tau_{2008}$, % pts	1.237							
F	24.74	23.17			23.03	24.81		
χ^2			515.8	554.0			727.3	767.9
Hausman[1]			0.000	-0.011			0.000	-0.021
P-value			1	1			1	1

*** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.
[1]Test statistic of a Hausman exogeneity test comparing OLS and 2SLS models.
Source: Personal income and wealth tax data Obwalden, 2001–2010.

Table D4: Estimates of inflow of taxpayers to OW, control group 60–80%

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2001–2007						2001–2010	
	Reduced (level)	Reduced (log)	2SLS (log)	2SLS (log)	OLS (log)	OLS (log)	2SLS (log)	2SLS (log)
DiD	8.400*	0.291						
	(3.764)	(0.298)						
ε_τ			3.236		3.120		2.110	
			(1.992)		(3.283)		(1.695)	
$\varepsilon_{\bar{\tau}}$				3.348		0.560		1.635
				(3.071)		(3.447)		(1.987)
Treatment	1.600	0.216	0.218**	0.481***	0.221	0.415**	0.307***	0.468***
	(2.012)	(0.159)	(0.095)	(0.099)	(0.158)	(0.139)	(0.068)	(0.081)
t = 2002	2.000	0.288	0.254*	0.422**	0.255	0.310	0.266*	0.353***
	(3.181)	(0.252)	(0.153)	(0.171)	(0.255)	(0.241)	(0.140)	(0.126)
t = 2003	4.000	0.490	0.475***	0.513***	0.476	0.494*	0.480***	0.501***
	(3.181)	(0.252)	(0.152)	(0.119)	(0.254)	(0.198)	(0.140)	(0.098)
t = 2004	2.500	0.335	0.302**	0.739***	0.304	0.703**	0.314**	0.731***
	(3.181)	(0.252)	(0.153)	(0.153)	(0.255)	(0.251)	(0.140)	(0.126)
t = 2005	0.500	0.091	0.054	0.126	0.055	0.097	0.067	0.108
	(3.181)	(0.252)	(0.153)	(0.122)	(0.256)	(0.200)	(0.141)	(0.099)
t = 2006	7.800*	0.890**	0.849***	0.944***	0.855**	1.020***	0.914***	0.991***
	(3.696)	(0.293)	(0.190)	(0.145)	(0.316)	(0.218)	(0.170)	(0.111)
t = 2007	9.800**	0.917**	0.845***	0.965***	0.853*	1.046***	0.921***	1.015***
	(3.696)	(0.293)	(0.202)	(0.148)	(0.336)	(0.221)	(0.180)	(0.113)
t = 2008							1.041***	1.120***
							(0.188)	(0.136)
t = 2009							1.252***	1.294***
							(0.194)	(0.181)
t = 2010							1.182***	1.278***
							(0.198)	(0.137)
Constant	6.200*	1.795***	3.046***	2.710***	3.000*	1.871	2.566***	2.181***
	(2.464)	(0.195)	(0.803)	(0.929)	(1.324)	(1.048)	(0.677)	(0.593)
Obs.	14	14	14	13	14	13	20	19
R-squared	0.906	0.889	0.888	0.935	0.888	0.944	0.938	0.970
$\Delta\tau_{2006}$, % pts	4.824							
$\Delta\tau_{2008}$, % pts	0.0933							
F	6.045	5.012			4.968	8.460		
chi2			111.4	190.1			303.7	616.6
Hausman[1]			-0.00195	-3.174			-0.0642	-6.013
P-value			1	1			1	1

*** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.
[1]Test statistic of a Hausman exogeneity test comparing OLS and 2SLS models. *Source*: Personal income and wealth tax data Obwalden, 2001–2010.

Table D5: Estimates of inflow of taxpayers to OW, control group 55–75%

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2001–2007						2001–2010	
	Reduced (level)	Reduced (log)	2SLS (log)	2SLS (log)	OLS (log)	OLS (log)	2SLS (log)	2SLS (log)
DiD	9.600**	0.446*						
	(3.021)	(0.212)						
ε_{τ}			4.861***		5.133*		3.494***	
			(1.284)		(2.107)		(1.270)	
$\varepsilon_{\bar{\tau}}$				6.452***		6.738**		4.597***
				(1.403)		(2.020)		(1.485)
Treatment	0.400	0.054	0.076	0.434***	0.070	0.443**	0.179***	0.441***
	(1.615)	(0.113)	(0.060)	(0.060)	(0.100)	(0.098)	(0.050)	(0.071)
t = 2002	3.000	0.356	0.350***	0.478***	0.349*	0.484**	0.351***	0.443***
	(2.553)	(0.179)	(0.100)	(0.076)	(0.166)	(0.134)	(0.107)	(0.089)
t = 2003	3.500	0.399*	0.396***	0.410***	0.396*	0.410**	0.397***	0.407***
	(2.553)	(0.179)	(0.100)	(0.072)	(0.166)	(0.129)	(0.107)	(0.084)
t = 2004	1.000	0.144	0.099	0.216**	0.096	0.211	0.112	0.278***
	(2.553)	(0.179)	(0.100)	(0.093)	(0.168)	(0.165)	(0.108)	(0.106)
t = 2005	2.000	0.255	0.184*	0.323***	0.180	0.326*	0.204*	0.304***
	(2.553)	(0.179)	(0.101)	(0.073)	(0.169)	(0.130)	(0.109)	(0.086)
t = 2006	6.200*	0.691**	0.648***	0.737***	0.633**	0.729***	0.723***	0.788***
	(2.967)	(0.208)	(0.122)	(0.081)	(0.202)	(0.140)	(0.128)	(0.093)
t = 2007	9.200**	0.786**	0.697***	0.836***	0.680**	0.828***	0.785***	0.885***
	(2.967)	(0.208)	(0.129)	(0.081)	(0.214)	(0.140)	(0.134)	(0.093)
t = 2008							0.877***	0.926***
							(0.148)	(0.112)
t = 2009							1.155***	1.059***
							(0.142)	(0.142)
t = 2010							1.041***	1.085***
							(0.146)	(0.112)
Constant	7.300**	1.968***	3.817***	3.795***	3.924***	3.880***	3.242***	3.212***
	(1.978)	(0.139)	(0.511)	(0.420)	(0.839)	(0.608)	(0.500)	(0.440)
Obs.	14	14	14	13	14	13	20	19
R-squared	0.932	0.926	0.936	0.967	0.936	0.967	0.958	0.973
$\Delta\tau_{2006}$, % pts	4.824							
$\Delta\tau_{2008}$, % pts	0.0933							
F	8.566	7.788			9.135	14.79		
χ^2			201.7	367.7			455.6	687.4
Hausman[1]			-0.0264	-0.0387			-0.00290	-0.100
P-value			1	1			1	1

*** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.
[1]Test statistic of a Hausman exogeneity test comparing OLS and 2SLS models. *Source*: Personal income and wealth tax data Obwalden, 2001–2010.

Appendix E Abbreviations

The 26 Swiss Cantons

ZH Zurich
BE Bern
LU Lucerne
UR Uri
SZ Schwyz
OW Obwalden
NW Nidwalden
GL Glarus
ZG Zug
FR Fribourg
SO Solothurn
BS Basel-Stadt
BL Basel-Landschaft
SH Schaffhausen
AR Appenzell Ausserrhoden
AI Appenzell Innerrhoden
SG St. Gallen
GR Grisons
AG Aargau
TG Thurgau
TI Ticino
VD Vaud
VS Valais
NE Neuchâtel
GE Geneva
JU Jura

Acronyms

2SLS two-stage least squares
IV instrumental variable
DiD difference-in-differences
ETI elasticity of taxable income

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