The Corporate Elasticity of Taxable Income: Event Study Evidence from Switzerland*

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Abstract

We estimate the corporate elasticity of taxable income. Our analysis draws on panel variation in the decentralized system of corporate taxation in Switzerland. We find that an increase in a jurisdiction's corporate net-of-tax rate by 1% results in an increase in aggregate corporate income by around 3.5% over a time span of four years. Although substantial in magnitude, this elasticity is not sufficient for tax cuts to finance themselves. The elasticity is larger in remote, non-central locations. Firm entry, exit, and relocation only account for a small share of the overall elasticity.

Keywords: Corporate Income Tax, Tax Elasticity, Fiscal Federalism
JEL Classification: H21, H25, H32

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1 Introduction

Corporate tax rates in developed countries have been decreasing substantially over recent decades. Between 2000 and 2021, the mean corporate tax rate across OECD countries has steadily fallen from around 32% to 22%.[1] Some countries have also provided low-tax regimes for firms in specific, presumably mobile sectors. International organizations have taken action to address these developments, which they consider harmful. The OECD Base Erosion and Profit Shifting (BEPS) Project provides guidelines for countries' tax codes to mitigate loopholes and profit shifting. Continued reductions in corporate tax rates during the BEPS implementation period, for example through the "Tax Cuts and Jobs Act" of 2017 in the U.S., have, however, led to concerns that tax code harmonization may as well intensify tax competition.[2] As a result, following a mandate from the G20, the OECD is currently working on BEPS 2.0 to address tax challenges arising from digitalization. Pillar One of the project seeks to expand taxing rights to market jurisdictions. Pillar Two would introduce a global minimum effective taxation.

A key parameter to evaluate the economic effects of corporate tax reforms is the corporate elasticity of taxable income (in the following, "elasticity" always refers to the corporate elasticity of taxable income). A greater responsiveness of the tax base of corporate taxable income (in the following, "tax base" always refers to the tax base of corporate taxable income) to changes in corporate tax rates will more likely induce different jurisdictions to undercut each other's tax rates to attract corporate income. Yet, the magnitude of the elasticity is still an open question.

In this paper, we use Swiss administrative data aggregated at the canton and municipality level to analyze the effects of corporate tax reforms. Switzerland grants far-reaching tax autonomy to sub-federal jurisdictions, which compete against each other. This institutional setting with 26 cantons and some 2,200 municipalities ensures significantly more variation in tax rates across jurisdictions and over time than the empirical settings used in the previous literature.[3]

While there is rich variation in tax *rates* in our setting, tax *bases* are harmonized across all jurisdictions. In 1990, the Swiss parliament approved the Federal Tax Harmonization Act (FTHA), which obliges cantons and municipalities to harmonize their corporate and personal tax bases.[4] The FTHA ensures that corporate and personal income are comparable across

[1] OECD, Tax database, Table II.1. Statutory corporate income tax rate, unweighted mean.

[2] A similar argument has already been put forward by Keen (2001).

[3] Schmidheiny (2017) provides an overview of a growing literature that has used Switzerland's decentralized structure to answer a variety of questions. Brülhart and Jametti (2019), for example, examine the effectiveness of tax competition to contain the size of government. Feld *et al.* (2010) and Feld *et al.* (2011), examine the impact of fiscal decentralization and direct voting rights on the size and type of government revenue and debt. Parchet (2019) examines strategic interactions among municipalities in personal income tax rate setting. Eugster and Parchet (2019) analyze the spatial reach of inter-jurisdictional tax competition. Roller and Schmidheiny (2016) quantify effective progressivity in personal income taxes in a fiscally decentralized country.

[4] After it went into effect in 1993, cantons were granted a seven years transition period to adjust there cantonal laws accordingly (cantonal laws also apply to municipalities). The FTHA can be found on the Swiss confederation's official website (in German). The regulations discussed in this section are in Chapter 2 (corporate income tax) and Chapter 3 (tax on corporate equity capital).

jurisdictions during our sample period, which allows us to address an important concern raised against existing cross-country studies. Kawano and Slemrod (2016) document that decreases in corporate tax rates tend to be accompanied by simultaneous tax base broadening provisions, which potentially biases elasticity estimates away from zero. In Switzerland, thanks to the FTHA, the only parameter that policy makers can dispose of to change the corporate tax burden is basically the tax schedule.[5]

There already is a sizeable literature that uses the Swiss setting as a laboratory to analyze the responsiveness of individual income to tax changes. What is missing so far, is an analysis of the responsiveness of *corporate* income to changes in tax rates.[6]

We will first show graphical evidence on large tax reforms in two cantons, Lucerne and Appenzell Ausserrhoden, which reduced their corporate tax rates by 29% and 37%, respectively. A narrative examination (see Romer and Romer, 2010) of official booklets provided to voters prior to the referenda on these reforms doesn't substantiate endogeneity concerns. The booklets show no evidence that policy makers reduced taxes in response to prior increases in corporate income or because they anticipated increasing corporate income. We use Abadie *et al.*'s (2010) synthetic control method to estimate the counterfactual evolution of corporate income in these two cantons without tax rate reductions. Our results suggest sizable elasticities.

We subsequently apply a distributed-lag approach to provide an estimate of the elasticity at the municipality level. This approach goes back to Schmidheiny and Siegloch (2020), who generalize the event-study approach to multiple events. The distributed-lag model captures all changes in municipalities' corporate tax rates. It therefore fully exploits the large variation across jurisdictions and over time in Switzerland's decentralized system of corporate taxation.

The distributed-lag approach yields an elasticity estimate of 3.5 using the net-of-tax rate on an average-sized firm. An increase in the corporate net-of-tax rate in a municipality by 1% thus induces an increase in that municipality's aggregate corporate income by around 3.5%. The effect unfolds over time with about half of the effect occurring in the first year after the reform. Our estimate is fairly robust to alternative specifications.

We find evidence for agglomeration economies. In urban centers the elasticity is not significantly different from zero. In more remote municipalities, however, the elasticity assumes a magnitude of up to 5. Focusing on corporate income of a group of super stayer firms that stay in the same municipality throughout our sample period, we find that only around one sixth of the elasticity is related to firm birth, death, and relocation across jurisdictions. Five sixth of the effect is attributable to firms increasing or decreasing reported corporate income

[5]The cantons have a certain amount of leeway in determining the depreciation rules. As of 2020, the Swiss corporate tax reform (Tax proposal and AHV financing, TRAF) enables cantons to allow for super deductions for R&D expenditures and privileged tax treatment for revenue from patents. Those tax relief measures were meant to partly offset the loss of previously existing preferential regimes that were no longer recognized internationally (BEPS).

[6]Schmidheiny and Slotwinski (2018) find causal evidence for strategic income bunching around tax notches exploiting a special tax regime for high-income foreigners. Brülhart *et al.* (2019) find substantial responses of individuals to wealth taxes and Brülhart and Parchet (2014) find very little response of individuals to bequest tax reforms. See Staubli (2018) for a preliminary assessment of the corporate elasticity of taxable income that relies on municipality and firm-level data. Our paper further develops this line of research.

while staying in the same municipality. This part of the effect can be due to real investment responses, shifting between personal and corporate income in manager-owner firms, and movements of corporate income across subsidiary firms within a corporate group. Our data do not allow us to conclusively disentangle these margins. Nevertheless, we infer from provisions in the Swiss tax law and from estimated elasticities for firms of different sizes that real responses play a role.

Like the majority of studies of behavioral responses to tax reform, we report estimates of elasticities with respect to changes in net-of-tax rates. This focus on net-of-tax rates is important to study the behavior of firms, whose main objective is to maximize profit. We will, however, also discuss implications for revenue using elasticities with respect to tax rates. Although our results suggest substantial responses of corporate income to changes in corporate tax rates, we find no evidence of sustained Laffer effects. Swiss municipalities are still on the increasing part of the Laffer curve, where a decrease in tax rates translates into a decrease in tax revenue. The large reductions in corporate tax rates in the cantons of Lucerne and Appenzell Ausserrhoden may have increased tax revenue temporarily. These increases, however, lasted only for a very short time.

The remainder of this paper is organized as follows. Section 2 discusses how our study relates to the existing literature, Section 3 outlines the Swiss institutional context, Section 4 describes the data set. In Section 5, we show graphical evidence on the elasticity using a synthetic control model, and in Section 6, we present our baseline causal estimates from a distributed-lags model. Section 7 discusses revenue effects and Section 8 concludes.

2 Literature

While the elasticity is typically thought to lie in the range 0.2-1 and more commonly around 0.5, a careful review of the literature shows that our baseline estimate of 3.5 is not as anomalous as they may look at first sight. Appendix Table A1 provides an overview of the existing estimates. Specifically, our estimates are almost perfectly in line with the early results in Buettner (2003). In this table, we distinguish between estimates for elasticities with respect to the tax rate and with respect to the net-of-tax rate. For the methodologically comparable panel estimation studies, we also display mean corporate tax rates given that the link between the two types of elasticity measures depends on these means. Most panel studies agree that the elasticity with respect to the tax rate is around -0.8.

Our methodology allows us to provide a more accurate picture than most previous studies, which either rely on the IV strategy suggested by Gruber and Saez (2002) or on bunching techniques. Gruber and Rauh (2007) as well as Dwenger and Steiner (2012) apply the Gruber-Saez IV estimation technique to account for the inherent endogeneity of the tax base with respect to tax rates. To address the problem of corporate income being zero for a substantial number of firm-year observations, they work with industry-level aggregates. Devereux *et al.* (2014), on the other hand, rely on a bunching methodology, which does not require them to aggregate their data. Bachas and Soto (2018) and Boonzaaier *et al.*

(2019) apply the bunching technique to settings in emerging countries. These studies find the elasticity with respect to the net-of-tax rate to be in the range 0.15-0.55.

More recent work has identified potential biases in these prior studies and suggested solutions that pose additional demands on the data. The bunching technique in Coles *et al.* (2019) requires exogenous variation in tax rates across firms conditional on corporate income. Similarly, Kumar and Liang (2020) develop an IV strategy that exploits exogenous variation in tax rates conditional on taxable income, but apply it to the personal income tax. Coles *et al.* (2019) conclude that the elasticity of corporate income is around 0.75, which is somewhat higher than previous findings.

Riedl and Rocha-Akis (2012) do a cross-country study using a panel of OECD countries and find an elasticity with respect to the tax rate of about -0.8. This result is within the range of what we find if we also regress the tax base on tax rates rather than net-of-tax rates. They also present evidence for positive spillovers on the corporate tax base from increases in the corporate tax rates in neighboring countries.[7] Similarly, Buettner's (2003) results suggest an elasticity of a similar magnitude as we find. Like Dwenger and Steiner (2012) and Fossen and Steiner (2018), Buettner exploits variation across German municipalities in the local business tax (*Gewerbesteuer*), which is only part of the total tax burden.

There is a related literature which analyzes effects of corporate taxes. Bond and Xing (2015) and Ohrn (2018) find large responses of corporate investment and capital accumulation to corporate taxation. Suárez Serrato and Zidar (2016) and Fuest *et al.* (2018) look at tax incidence and find that employees bear a significant part of the corporate tax burden. Studies using firm-level data can help examine mechanisms of the elasticity. Analyses of tax-induced shifting of corporate income across jurisdictions within multinational firms have identified internal debt financing, strategic transfer pricing, or royalty payments as channels through which corporate income is shifted to low-tax jurisdictions (see Hines Jr. and Rice, 1994; Bartelsman and Beetsma, 2003; Huizinga and Laeven, 2008; Egger, Eggert and Winner, 2010; Dharmapala and Riedel, 2013; Heckemeyer and Overesch, 2017; Tørsløv *et al.*, 2018; Bilicka, 2019).

3 Swiss institutional context

Switzerland is divided into 26 cantons and about 2,200 municipalities. More than half (53%) of total tax revenue is raised by these sub-federal government entities. Sub-federal jurisdictions are free to set tax rates at their discretion. To a large extent, the fiscal autonomy of sub-federal jurisdictions extends to public expenditure as well. Federal and sub-federal jurisdictions both levy a corporate income tax and a personal income tax with a larger share of tax revenue going to sub-federal jurisdictions for both types of taxes.[8]

[7] While one might expect to find less intense tax competition at the large geographical scale of a cross-country panel, Riedl and Rocha-Akis's 2012 estimates may be biased away from zero due to non-harmonized tax bases (seeKawano and Slemrod (2016)).

[8] The main sources of tax revenue at the federal level are the value added tax (36% of federal tax revenue and the sole prerogative of the federal government), personal income taxes (16% of federal tax revenue) and corporate income taxes (14%). All numbers are averaged over the sample period (2003-2017). The source of

Firms face a tax on corporate income and a tax on corporate equity capital (in the following, "capital tax" always refers to the tax on corporate equity capital). Over the time span of our sample, the average firm pays about 70% of its corporate income and capital taxes at sub-federal levels and about 30% at the federal level. By far the largest part of the corporate tax burden falls on the corporate income tax. Total revenue from the corporate income tax is about 13 times higher than total revenue from the capital tax. Other kinds of sub-federal corporate taxes such as real estate taxes play a minor role.

The Federal Tax Harmonization Act (FTHA) grants sub-federal jurisdictions almost full autonomy with respect to their corporate tax rates. The only requirement is that corporate income and capital tax rates must be positive. Despite almost full autonomy in tax rate setting, sub-federal jurisdictions face extensive formal restrictions aimed at simplifying the tax code by increasing transparency and by facilitating cross-jurisdictional comparisons. Most importantly for this study, the FTHA harmonizes tax bases by stipulating how sub-federal jurisdictions determine taxable corporate income and taxable equity capital. According to the FTHA, all corporate income is subject to the corporate income tax. The FTHA also provides a detailed account of what type of expenses are deductible. Similarly, the FTHA stipulates that all corporate equity capital is subject to the capital tax and it specifies how to determine taxable equity capital (in the following, "corporate capital" always refers to "corporate equity capital").

Until 2019, the Swiss tax system offered a preferential regime for so-called status firms that engaged in only limited business activities in Switzerland. Status firms were largely exempt from sub-federal (but not federal) taxes on corporate income and they paid a reduced sub-federal capital tax. The resulting effective corporate tax rate on status firms was around 10%, about half that of firms subject to ordinary taxation. BEPS Action 5 identified this preferential regime as susceptible to profit shifting and therefore as a harmful tax practice. As a result, is was no longer recognized internationally and was abolished as of 2020. Presumably, most profit shifting to and within Switzerland occurred through status firms. We only include firms that are subject to ordinary taxation in our analysis. We drop all status firms from our sample.

4 Data

Our data set comprises all 2,240 Swiss municipalities (as of 2017) in 26 cantons and spans 15 years, from 2003 to 2017. In the following we will discuss our two main variables of interest, corporate tax rates and corporate income.

Our main explanatory variable of interest is the corporate tax rate. Our measure of the corporate rate rate is the consolidated effective tax rate on corporate income (ETR). The ETR includes taxes on corporate income and capital, and consists of federal, cantonal, and municipal components. The federal government levies a tax of 8.5% on corporate income throughout our sample period.

all numbers on Swiss tax revenue in this paper is the financial statistic of the Swiss confederation.

It is a special feature of the Swiss tax law that corporate income and capital taxes are deductible from the tax base. Thus, all components vary across municipalities. For instance, in low-tax sub-federal jurisdictions, the effective federal corporate income tax is higher because less sub-federal taxes are deductible from the tax base. This implies that we cannot only take into account the sub-federal components of the corporate tax or exclude the capital tax from our analysis.

To compute the ETR, we rely on publicly available federal, cantonal, and municipal tax law records. Most cantons define tax schedules, while municipalities determine multipliers that they apply to their canton's schedule. Municipalities can, hence, adjust the tax burden but not the progressivity or relative weights of corporate income and capital taxes. The ETR_{ijt} measures the total burden from corporate income and capital taxes of a firm i in municipality j in year t relative to its corporate income

$$ETR_{ijt}(y_{it}, k_{it}) = \frac{\tau^y_{ijt}(y_{it}, k_{it}) + \tau^k_{ijt}(y_{it}, k_{it})}{y_{it}},$$

where y_{it} and k_{it} are firm i's corporate income and corporate capital in year t, τ^y_{ijt} is firm i's corporate income tax in municipality j in year t, and τ^k_{ijt} is firm i's capital tax in municipality j in year t. The ETR is an average tax rate. It is, however, highly correlated with marginal ETR.[9] Towards the end of the sample period, the majority of cantons are converging to linear corporate income and capital tax schedules with no exemption levels.

Like Devereux and Griffith (2003) and Riedl and Rocha-Akis (2012), we will mainly focus on the ETR at a specific point in the schedule. We use an average-sized hypothetical firm with 2 million Swiss francs (CHF) in corporate capital and CHF 260,000 in corporate income (return on equity 13%). These numbers correspond to the means over our sample period as shown in Table 1.[10] Overall, 8.5% of all corporate income comes from the 92% of firms with corporate income of CHF 260,000 or less. In 50% of all municipality-year observations in our sample, 34% or less of corporate income come from firms with corporate income of CHF 260,000 or less.

In Section 6.3, we will also show elasticities using ETRs at different points in the tax schedule. Firms with corporate income of CHF 130,000 or less generate 5% of all corporate income in our data, and firms with corporate income of CHF 100 million or less generate 71% of all corporate income in our data. These figures, however, vary substantially across cantons, in particular between urban and rural cantons. We argue in Section 6.3 that the tax rate on an average-sized hypothetical firm better captures the variation that allows us to measure the corporate elasticity of taxable income than tax rates on a small or a very large hypothetical firm.

[9]The correlation between the ETR and the marginal ETR depends on the size of the firm. We obtain a Pearson coefficient of correlation of 0.95, 0.90, or 1.00, depending on whether we consider a small (corporate capital CHF 1 million/corporate income CHF 130,000), average-sized (CHF 2 million/CHF 260,000), or a very large firm (CHF 100 million/CHF 13,000,000). The correlation of 1.00 for the very large firm implies that the maximum tax rate is reached in virtually every municipality and year. Tax rates of even larger firms are virtually identical. Note that "CHF" is short for Swiss franc.

[10]During our sample period, one Swiss franc (CHF) fluctuated in the range USD 0.7-1.2.

Table 1: Descriptive statistics: Canton- and municipality-level panel data

	Obs	Mean	Standard deviation			Min	Max
			Overall	Within	Two-way		
Corporate income (cantonal level, million CHF)							
All cantons	390	2,298	3,200	820	706	41	19,883
Cantons with super stayers	389	2,304	3,202	821	706	41	19,883
Super stayers	389	1,348	1,937	613	590	27	15,630
Effective tax rates for different firm sizes (cantonal level)							
capital 1m, income 130k	390	0.191	0.038	0.021	0.014	0.124	0.266
capital 2m, income 260k	390	0.195	0.037	0.021	0.014	0.126	0.266
capital 10m, income 1.3m	390	0.201	0.039	0.022	0.015	0.126	0.291
capital 100m, income 13m	390	0.202	0.041	0.023	0.016	0.126	0.320
Corporate income (municipality level, million CHF)							
All municipalities	33,600	27	251	71	71	0	15,658
M'palities w/ sup. stayers	30,075	29	265	75	74	0.0001	15,658
Super stayers	30,075	17	172	76	76	0.0001	13,691
Effective tax rates for different firm sizes (municipality level)							
capital 1m, income 130k	33,600	0.203	0.031	0.017	0.012	0.116	0.269
capital 2m, income 260k	33,600	0.210	0.028	0.018	0.012	0.116	0.269
capital 10m, income 1.3m	33,600	0.217	0.028	0.018	0.013	0.116	0.291
capital 100m, income 13m	33,600	0.219	0.030	0.020	0.015	0.116	0.320
Firm level statistics (million CHF)							
corporate income	3,469,869	0.258	9.389			0	∼9,000
corporate capital	3,469,869	1.996	120.910			0	∼50,000

Notes: Data for the 26 Swiss cantons and 2,240 Swiss municipalities, 2003-2017. Within standard deviation is the variation after controlling for canton or municipality fixed effects; two-way standard deviation is the variation after controlling for both canton/municipality and year fixed effects. We use the term capital to denote corporate equity capital. In some cases, information on corporate capital is not available and was imputed. We report rounded maxima for firm-level statistics for confidentiality reasons.

The effective corporate tax rate of the hypothetical firm ETR^* in municipality j in year t is defined as

$$ETR^*_{jt} = (\tau^y_{jt}(y^*, k^*) + \tau^k_{jt}(y^*, k^*))/y^*,$$

where y^* and k^* indicate corporate income and corporate capital of the hypothetical firm.

Given that cantonal tax schedules are, in most cases, either proportional or only slightly progressive, as shown in Table 1, ETRs do not vary a lot along the tax schedule. The alpine canton of Grisons used a progressive tax schedule with rates ranging from 21.9% on small firms (corporate capital CHF 1 million/corporate income CHF 130,000) and 23.4% on the average-sized firm to 32% on very large firms (CHF 100 million/CHF 13 million) until 2007 and switched to a flatter schedule with ETRs ranging from 21.7% to 22.2% in 2008. Grisons is the only canton that ever used a progressive schedule with ETRs exceeding 30% during our sample period. The maximum ETR in the remaining cantons during our sample period was 27.6%.

Figures 1 and 2 visualize the variation in the ETR across municipalities and the general downward trend during our sample period. The tax-base-weighted mean ETR across all municipalities decreased from 22.8% in 2003 to 19.5% in 2017. The municipality-specific changes in the ETR between 2003-17 range from a reduction by 10.2%-points to an increase

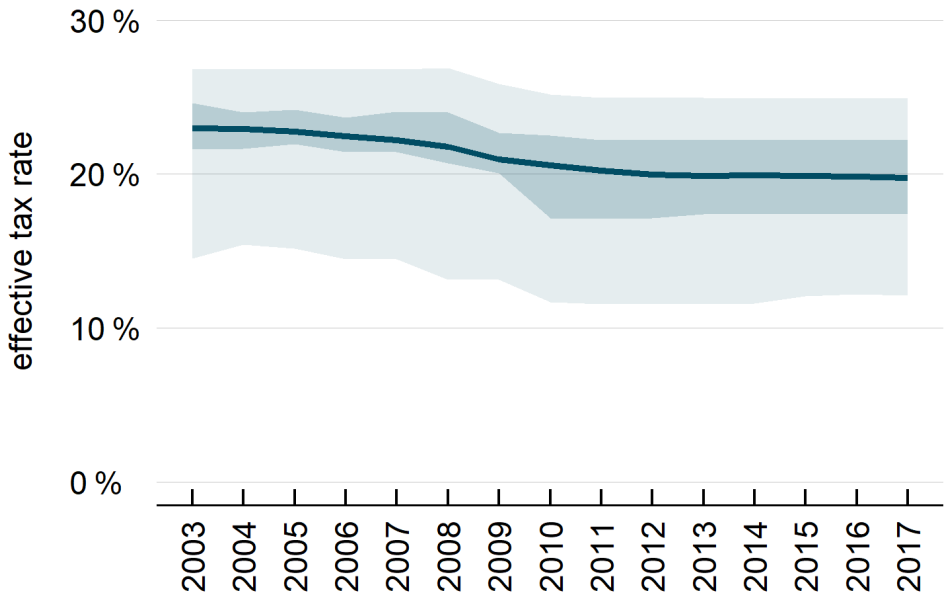

Figure 1: Evolution of the distribution of effective tax rates on corporate income (ETR) over time. Range in light blue; range percentiles 25-75 weighted by corporate income in dark blue; thick line indicates average across all municipalities weighted by corporate income. Source: Portmann and Staubli (2020).

by 1.7%-points. The maps in Figure 2 show that ETRs were reduced in particular in the central and eastern parts of Switzerland.

Figure 1, Figure 2, and Table 1 further show the significant variation in the ETR across municipalities. In 2017 (2003) the range was from 12.1% to 24.9% (14.5% to 26.8%). Most of the variation in corporate tax changes originates at the cantonal level. See Portmann and Staubli (2020) for a detailed discussion of the evolution of corporate tax rates in Switzerland. In the following, "tax rate" always refers to the ETR.

Data on corporate income are provided by the Swiss Federal Tax Administration (FTA).[11] We have access to information on corporate income, corporate capital, and the municipality code of the domicile of every firm subject to the corporate income and capital tax in Switzerland, including stock companies, limited liability companies, and cooperatives that are subject to ordinary taxation. We observe firms at the level of the legal entity which is subject to taxation. If a corporate group has multiple subsidiaries, the legal entity is the individual subsidiary. Since corporate income and capital taxes are deductible from the tax base, using the corporate income *after* taxes as reported in the data would induce inherent endogeneity. We use corporate income *before* taxes, which is not mechanically affected by the tax rate. This required adding the sum of corporate income and capital taxes to corporate income *after* taxes for every firm in the data set.

To perform aggregate-level estimations, we aggregate corporate income of all firms domiciled in municipality j in year t, and denote the result as y_{jt}. In Section 5, we will aggregate at the cantonal level. Mean aggregate corporate income per municipality and year in our data is CHF 26.7 million with a maximum of CHF 15.7 billion. Mean corporate income

[11] ESTV Statistik der direkten Bundessteuer - juristische Personen, 2020, Bern.

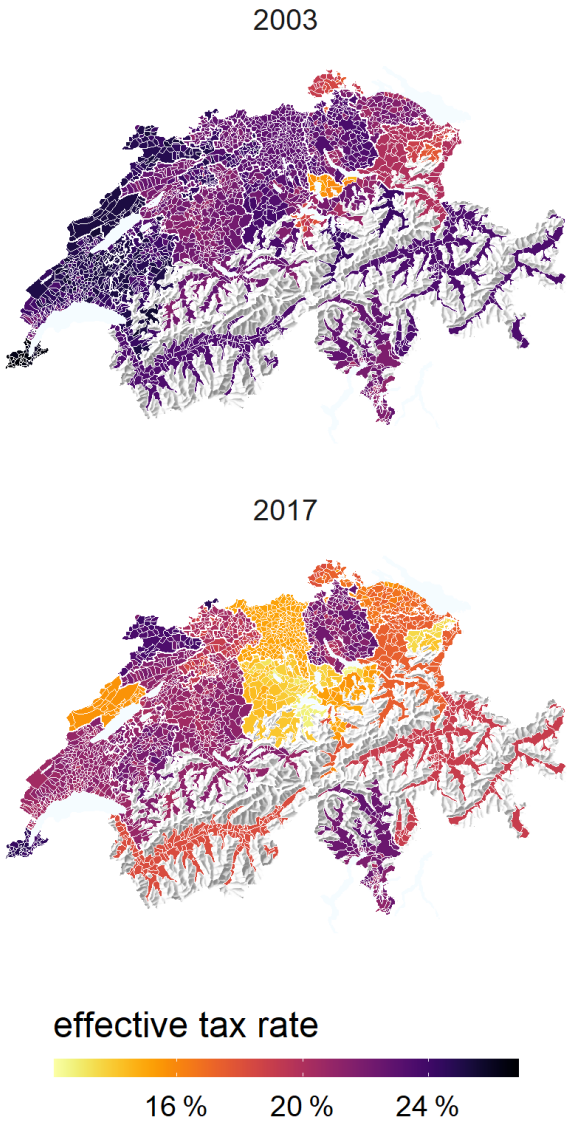

Figure 2: Effective tax rate on corporate income (ETR) in Swiss municipalities, in 2003 and 2017. Lighter (darker) colors indicate lower (higher) effective tax rates. Source: Portmann and Staubli (2020).

of super stayer firms per municipality and year is CHF 16.3 million with a maximum of CHF 13.7 billion. We define super stayers as firms that we observe in all years in the same municipality throughout our sample period.

Note that the data set assigns all corporate income to the municipality in which a firm is registered as a legal entity. Our data do not take into account tax apportionment among permanent establishments (production sites that are not legal entities of their own), which may induce measurement error. In reality, if a legal entity is domiciled in municipality A and has a permanent establishment in municipality B, a share of that firm's corporate income would be apportioned to municipality B. In the data, the firm's corporate income is fully reported in municipality A. There are thus two types of firm responses that we may not observe in our data. First, firms may respond to changes in corporate tax rates by moving

corporate income between production sites without moving the domicile of the legal entity. Second, firms may respond to changes in corporate tax rates by changing the legal entity's location without moving corporate income. Federal-level data on balances of inter-cantonal tax apportionments indicate that inter-jurisdictional tax allocations are of minor quantitative importance.[12]

5 Canton-level evidence

In this section, we show graphical, canton-level evidence for the elasticity. As outlined above, the tax schedule specified at the cantonal level affects corporate tax rates in all municipalities within that canton.

While we will mainly rely on the synthetic control method (SCM), note that it is also possible to observe bunching in the corporate income distribution at kinks in the tax schedule. One canton with a tax schedule that is progressive in corporate income is Valais. From 2006 to 2017 there were two tax brackets, the marginal tax rate was 12.66% in the lower tax bracket and 21.55% in the upper bracket (after application of cantonal and municipal multipliers).[13] The kink in the tax schedule was at CHF 100,000 from 2006 to 2012 and at CHF 150,000 from 2013 onward. Note that these thresholds refer to corporate income after the deduction of taxes. This makes it non-trivial for corporate accountants to target these thresholds. Still, as we document in Figure A1, there is bunching around these kinks.[14]

Using the SCM, we will exploit two canton-level experiments in the cantons of Lucerne and Appenzell Ausserrhoden, which both induced substantial drops in corporate tax rates. Rather than comparing the outcome of interest in the treated unit to another unit, the SCM creates a convex combination of potential counterfactual units that closely tracks the treated unit during the pre-treatment period. We will use this method to create a synthetic Lucerne and a synthetic Appenzell Ausserrhoden to estimate the evolution of the tax bases in the two cantons in the counterfactual case without a tax reduction. The synthetic counterfactuals will be weighted averages of untreated cantons with no substantial changes in tax rates. The SCM was developed in Abadie and Gardeazabal (2003) and Abadie *et al.* (2010) (see Abadie, 2020, for a review). Previous applications in the tax literature mostly rely on cross-country comparisons and include Kleven *et al.* (2013) and Rubolino and Waldenström (2020).

Figure 3 shows corporate tax rates in Lucerne and Appenzell Ausserrhoden, as well as in the comparison groups between 2003 and 2017. Lucerne implemented its reform in two steps in 2010 and 2012, Appenzell Ausserrhoden implemented its reform in 2008. During

[12] According to data provided by the canton of Lucerne, the extra corporate income from production sites of firms domiciled in another canton accounts for around 13% of the corporate tax base. Federal-level data indicate that, in most cantons, the balance of inter-cantonal tax allocations amount to around 3% of the cantonal aggregate corporate income.

[13] The marginal tax rates remained so until 2019 (beyond the time span of our data set).

[14] Assuming 13% return on equity capital as in our baseline, we find that the kink in the tax schedule with regards to the pre-tax corporate income was at CHF 117,520 during 2006-12 and at CHF 177,060 from 2013 onward. Using the formula in Chetty *et al.* (2011), we obtain bunching elasticities of 0.293 for the five-year period 2008-12 and 0.257 for the five-year period 2013-17. These numbers are in the middle of range of the findings in Devereux *et al.* (2014). The bottom panel of Figure A1 shows that the excess mass at CHF 100,000 persists after 2012.

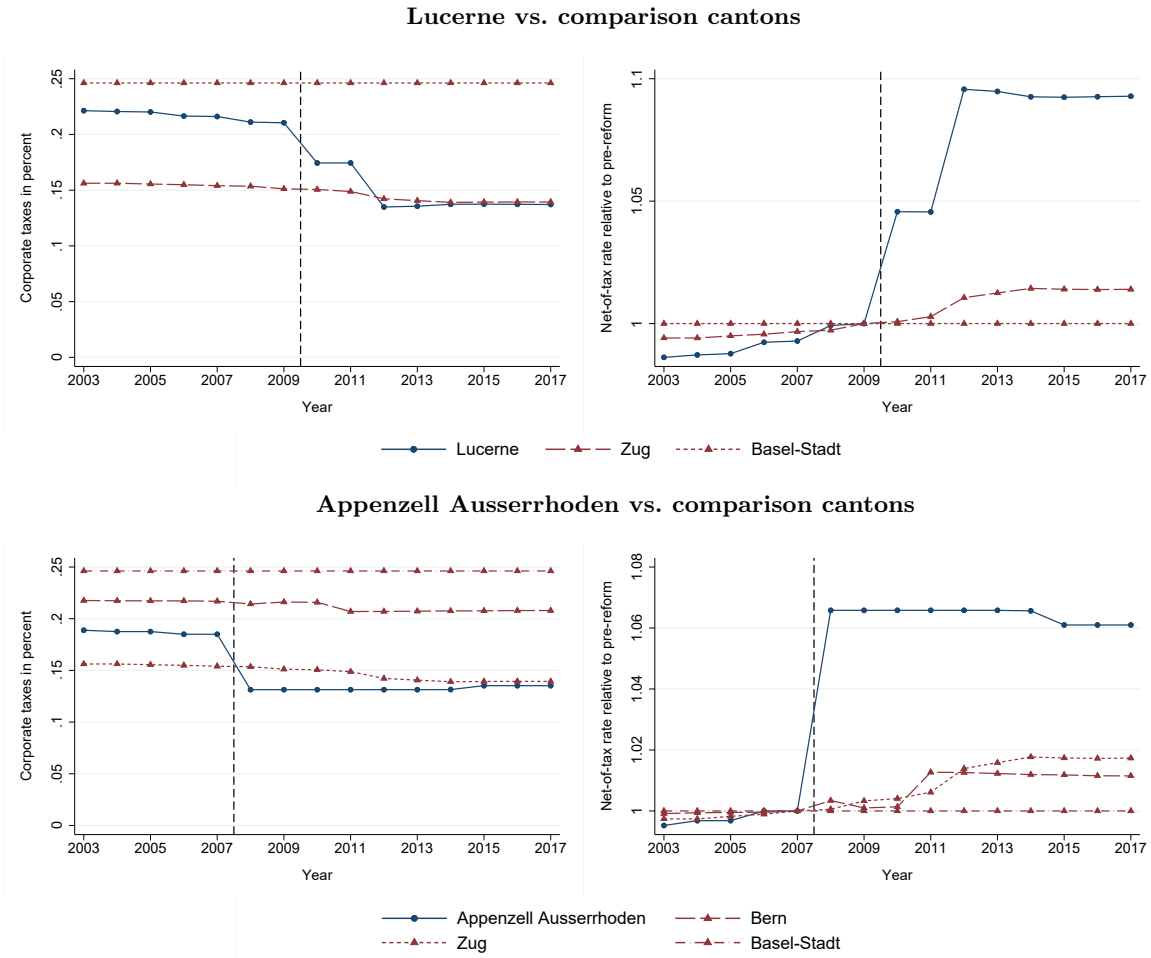

Figure 3: Evolution of corporate tax rates and net-of-tax rates in the treated and comparison cantons used to construct synthetic controls for our two experiments. The upper panels show tax and net-of-tax rates for the Lucerne experiment, the lower panels for the Appenzell Ausserhoden experiment. Synthetic Lucerne consists of the cantons of Zug (75.4%) and Basel-Stadt (24.6%). Synthetic Appenzell Ausserrhoden consists of the cantons of Bern (36.0%), Zug (42.7%) and Basel-Stadt (21.4%). The left-hand panels show tax rates in absolute value. The right-hand panels show the implied net-of-tax rates scaled to their value in the pre-tax reform period.

the pre- and post-reform periods there is little movement in corporate tax rates. Similarly, corporate tax rates did not remain entirely constant in most comparison cantons, in which they display slight and smooth downward trends.

The construction of the comparison group, also referred to as the synthetic control, follows a formalized procedure. First, one needs to specify a pool of donors that did not experience any substantial movement in the corporate tax rate during the period of interest. In our case, we include the cantons of Zurich, Bern, Zug, Basel-Stadt, Ticino, and Jura in this group. Besides corporate income, the construction of the synthetic control group takes corporate and personal tax rates as well as the population and the canton's score attained in the national fiscal transfer scheme into account.[15] In the end, the combination of comparison cantons that best resembles Lucerne in years prior to 2010 consists of the canton of Zug with

[15]The canton's score attained in the national fiscal transfer scheme is a measure of the overall taxable resources in the canton.

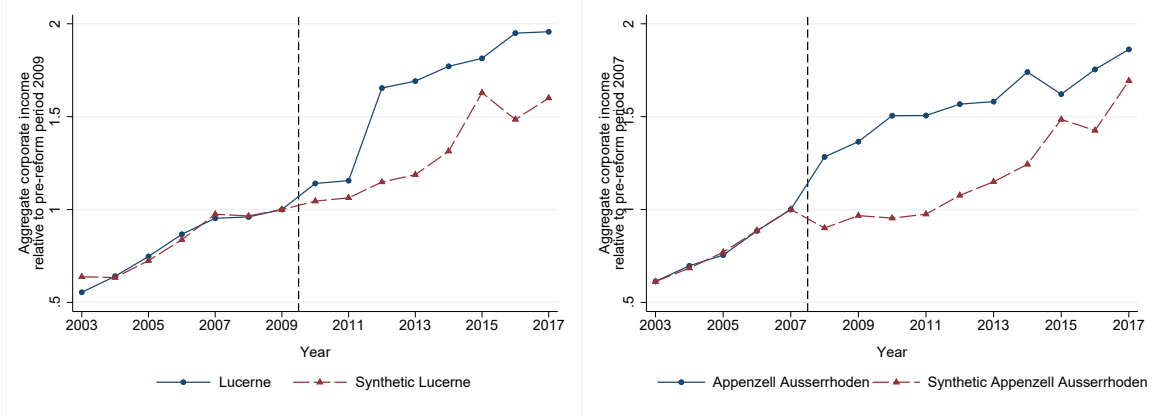

Figure 4: Aggregate corporate income in treated cantons vs. synthetic counterfactuals relative to pre-reform year 2009. The synthetic unit is a weighted average of corporate incomes from a donor pool of cantons with no large tax reform, with weights chosen to match the evolution of aggregate corporate income in pre-reform years.

a share of 75.4% and Basel-Stadt with a share of 24.6%, the combination that best resembles Appenzell Ausserrhoden in years prior to 2008 consists of Bern (36.0%), Zug (42.7%), and Basel-Stadt (21.4%).

Lucerne lowered its corporate tax rate in 2010 from 21.0% to 17.4%, and in 2012 to 13.5%.[16] Both steps were part of a broader tax strategy crafted in 2006 aimed at putting Lucerne among the five most attractive cantons in terms of corporate taxes. Both reforms were subject to a popular referendum. 77% of voters approved of the first step of the tax decrease in March 2007 and 68% approved of the second step in September 2009. As indicated in the upper panel of Figure 3, corporate taxes in Lucerne decreased by nearly 7.6 percentage points over three years, which corresponds to an increase in the net-of-tax rate by 9.6%.

The lower panel of Figure 3 visualizes the reduction in Appenzell Ausserrhoden's corporate tax rate in 2008 from 18.5% to 13.1%, which implied an increase in the net-of-tax rate by 6.6%. 76% of the canton's voters approved the tax reform in a popular referendum in October 2007.

Whether Lucerne's corporate tax reform was a success or not has dominated the canton's political debates for years. On the one hand, aggressively lowering taxes may have deprived the canton of financial means to provide public services.[17] On the other hand, Lucerne's improved attractiveness as a business location may enhance its public finances and other economic outcomes in the long run. In 2016, there was a referendum on whether to undo half of the second tax cut, which was voted down.

The left panel of Figure 4 shows that the reform had an enormous effect on reported corporate income. While the first tax reduction in 2010 induced only a small differential between corporate income in Lucerne and in synthetic Lucerne by around 10 percentage points, this differential jumped to 50 percentage points after the second reduction in 2012. Given an increase in the net-of-tax rate by 9.6%, this implies an elasticity of up to 5.3.

The response in Appenzell Ausserrhoden even exceeds the already sizeable response in

[16] Cantonal effective tax rates are corporate-income weighted averages across municipalities.

[17] In fall 2016, the canton shut down its schools for a week, which appeared to confirm such concerns, see https://www.srf.ch/news/schweiz/luzerner-schueler-muessen-ferien-machen.

Lucerne. The right panel of Figure 4 shows that the differential between the treated and the synthetic unit fluctuated between around 40 and 55 percentage points during seven years following the tax reform and decreased afterwards. Relative to an increase in the net-of-tax rate of 6.6%, this implies an elasticity of up to 8.4. In both, Lucerne and Appenzell Ausserrhoden, we observe fluctuations and a decline in the gap between the treated and the control unit starting at around five years after the reform.

An analysis of official information booklets provided to citizens by the cantonal governments prior to the vote shows no evidence that the governments reduced tax rates in response to prior increases in corporate income or because they anticipated an increase in corporate income which enabled them to lower tax rates. The tax cuts were touted to the voters with the argument of positioning the respective canton as an attractive business location. Based on this narrative examination (see Romer and Romer, 2010), we find no evidence to substantiate endogeneity concerns regarding our SCM analysis.

These canton-level estimates show clear evidence of a "smoking gun". The synthetic control methodology comes with the caveats that there might be direct spillovers from corporate tax reforms to other cantons in our control groups. In the following section, we will corroborate our finding of a sizeable elasticity using the comprehensive set of municipality-level data. We will rely on the distributed-lag model, which, similarly to the synthetic control method, allows to inspect pre-trends to examine causality.

6 Distributed-lag model

6.1 Methodology

In this section, we make use of the sizeable panel variation in corporate tax rates across Swiss municipalities.[18] Rather than focusing on large experiments at the cantonal level as in Section 5, we now exploit all events independently of their size. Our methodology relies on work by Schmidheiny and Siegloch (2020), who demonstrate that a distributed-lag model with binned treatment dummies is a natural generalization of the standard event-study model with multiple events of different magnitudes. We estimate the equation

$$\ln y_{jt} = \sum_{k=-3}^{3} \gamma_k \ln(1 - ETR_{j,t-k}) + \lambda_t + \mu_j + \psi_t \cdot x_j + \varepsilon_{jt}, \tag{1}$$

where y_{jt} is aggregate corporate income and $ETR_{j,t-k}$ is the effective corporate tax rate in municipality j and year $t-k$. We include controls for time fixed effects λ_t and municipality fixed effects μ_j. We further include municipality-specific personal tax rates and corporate tax rates in surrounding municipalities in the initial year in a vector x_j, which we interact with a vector of year fixed effects ψ_t to allow for heterogeneous responses to aggregate shocks.[19] We

[18] Using the data from Staubli (2018), Burgherr (2020) also used a distributed-lag model to estimate the corporate elasticity of taxable income in Switzerland.

[19] We construct the personal and corporate tax rates in surrounding municipalities by taking the population-weighted average of all municipalities within 20 minutes road distance. This is, according to Eugster and Parchet (2019), the spatial reach of tax competition.

allow for the standard errors to be correlated across municipalities within cantons because most variation in tax rates emerges at the cantonal level.

The distributed-lag coefficients give rise to the cumulative effect after k years

$$\beta_k = \begin{cases} -\sum_{m=k+1}^{-1} \gamma_m, & \text{if } -3 \leq k \leq -2 \\ 0 & \text{if } k = -1 \\ \sum_{m=0}^{k} \gamma_m, & \text{if } 0 \leq k \leq 3, \end{cases} \tag{2}$$

where the coefficients β_k capture the cumulative response of corporate income to changes in tax rates relative to the year prior to the change $k = -1$, for which we normalize $\beta_{-1} = 0$. Note that we bin the event-time dummies at $k = -3$ for more than three years prior to and at $k = 3$ for events more than three years after the event of interest, which allows us to also include events outside the event-time window. $\beta_k = -3$ hence picks up the effect for all $j \leq -3$, while $\beta_k = 3$ picks up the effect for all $j \geq 3$. Since we take logs both on the left-hand side and the right-hand side of equation (1), we can interpret our coefficients of interest β as elasticities.

6.2 Main results

The top left-hand panel of Figure 5 displays how the implied tax-base response unfolds over time between three years before and three years after tax reform. In the baseline, we use the tax rate on a firm with CHF 2 million corporate capital and corporate income of CHF 260,000. The flat pre-trends in this figure support our identifying assumption that municipalities do not adjust their tax rates in response to prior shocks to the tax base. We observe a substantial response with an implied elasticity of 3.5 in total. About half of the effect happens in the year of the tax change itself. The full effect takes about two years to accumulate. Whether we include controls for personal tax rates and for corporate tax rates in neighboring municipalities does not affect our results.

Our baseline elasticity estimate comprises the following margins: firm birth, firm death, relocation of firms across jurisdictions, real investment responses, shifting between personal and corporate income in manager-owner firms, and movements of corporate income across legal entities within a corporate group. Such movements of corporate income across legal entities can either reflect pure profit shifting or real reorganization of activities within a corporate group. Further below, to the extent that our data allow us to draw conclusions, we will explore the relative importance of these margins.

In the top right-hand panel of Figure 5, we distinguish between municipalities by proximity to Switzerland's five largest airports. For each municipality in our data, we compute the road travel distance to the closest municipality which hosts an airport with more than 100,000 passengers per year. To capture the effect of agglomeration economies, we interact the log net-of-tax rate with the inverse distance to the nearest airport.[20] This variable not

[20]These airports are located in Kloten near Zurich, Le Grand-Saconnex/Meyrin near Geneva, Hésingue/Saint-Louis in France near Basel, Belp near Bern and in Lugano.

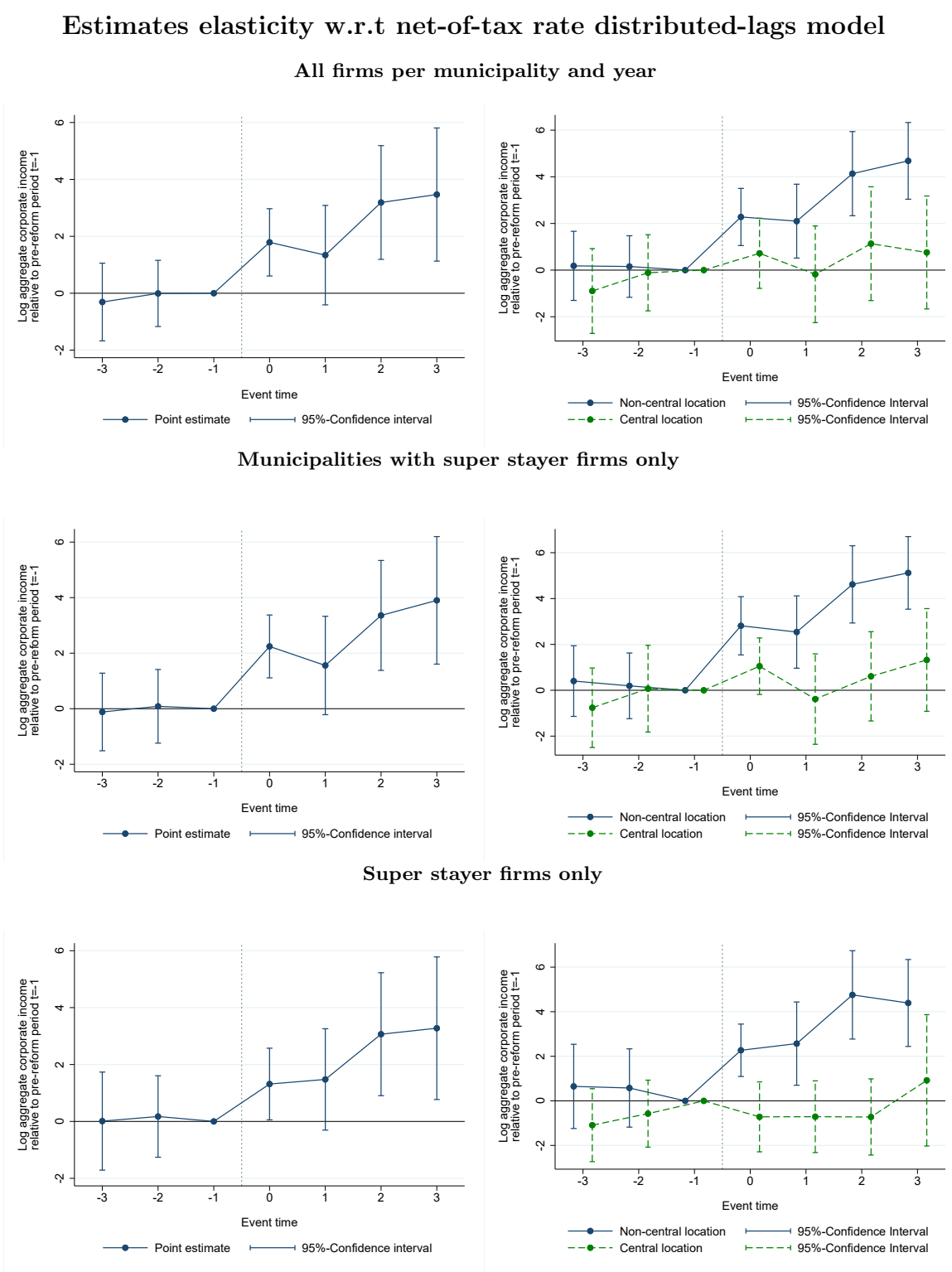

Figure 5: Distributed-lag cumulative effects according to equation (2), estimated through the first-differences empirical model (1) with nonparametric controls for initial personal taxes and corporate taxes in neighboring municipalities for all changes in corporate tax rates. The upper panel uses municipality-year aggregates of corporate income of all firms subject to regular taxation. The lower panels only takes corporate income generated by super stayer firms that we observe in all years of our sample period into account. Effects are the cumulated coefficients after and before the reference year, i.e. one year prior to the event. Standard errors clustered at canton level. The estimated effects correspond to elasticities and can be found in Appendix Table A2.

only picks up transport connection of a municipality, which is itself economically important. It also proxies for proximity to urban centers with their associated agglomeration effects.

We observe that the effect is concentrated among municipalities farther away from airports and urban centers. In the most remote municipalities, the elasticity attains a value of nearly 4.7, whereas in more central locations, the elasticity is not significantly different from zero. This finding is in line with previous research which shows that agglomeration economies mitigate tax competition (Brülhart *et al.*, 2012, 2015). Intuitively, Zurich, Geneva, or Basel, each with large industries specialized in the financial or pharmaceutical sectors, have more room to play with their tax rates without inducing firms to reduce their activity than more remote municipalities.

In the middle and bottom panels of Figure 5, we repeat the above analysis, but in the middle, we only use corporate income in municipalities with super stayer firms, and in the bottom panel we only use corporate income of these super stayers. This allows us to eliminate firm birth, firm death, and relocation of firms as potential margins. In this specification, the effect is arguably driven by the remaining margins: real investment responses, shifting between personal and corporate income in manager-owner firms, and movements of corporate income across legal entities within a corporate group. Comparing the results in the middle and bottom panels, we conclude that around one sixth of the elasticity is related to firm birth, death, and relocation. Around five sixth are due to real investment responses, shifting between personal and corporate income in manager-owner firms, and movements of corporate income across legal entities within a corporate group (pure profit shifting and/or real reorganization of activities across legal entities within a corporate group). Our data do not allow us to conclusively disentangle these remaining margins. Yet, we argue in Section 6.3 that at least part of the effect is due to real responses.

The estimated response to the two major corporate tax reforms is a bit stronger than what is implied by the elasticity estimate from the distributed-lag model. This difference may partly reflect a bias in the synthetic control analysis resulting from treated cantons attracting corporate income from control group cantons. The difference is, however, also in line with previous research on tax sensitivities. First, it is consistent with estimates on behavioral responses to wealth taxes, where larger tax cuts also have a disproportionately strong effect (Brülhart *et al.*, 2019). Second, behavioral responses increase with the salience of taxes (documented by Chetty *et al.*, 2009, for sales taxes). The tax cuts we analyze within the SCM framework were particularly salient. Not only because they were large in magnitude, but also because both Lucerne and Appenzell Ausserrhoden offered the lowest corporate tax rates in Switzerland right after the implementation of their tax reforms.

6.3 Discussion

Spillovers of tax changes in neighboring municipalities

So far, we have exclusively focused on own-tax elasticities, that is, on responses of corporate income in a jurisdiction to tax rate changes in the same jurisdiction. While we have controlled for personal tax rates and corporate tax rates in neighboring municipalities, to rule out

endogeneity, we fixed those at their levels in the first year of our data set (2003) and interacted them with a full set of year dummies. We observe that corporate tax rates in a municipality tend to move closely together with population-weighted corporate tax rates in neighboring municipalities. This suggests that changes in tax rates in neighboring municipalities are likely endogenous and, hence, a bad control.[21] Naturally, the question arises whether controlling for tax rates in neighboring municipalities would affect our estimates and whether tax rates in neighboring municipalities have direct effects, too.

Appendix Figure A2 and the upper panel of Appendix Table A6 display estimated elasticities controlling for tax changes in neighboring municipalities. The estimate decreases from 3.5 in the baseline to slightly below 3. In Appendix Figure A3 and the lower panel of Appendix Table A6, we show the estimates for a model, in which we apply our standard distributed-lags methodology to tax changes in neighboring municipalities with controls for tax changes in municipalities' own tax rates. The resulting elasticities are substantially smaller than own-tax elasticities and, with the exception of super-stayer firms in non-central locations, not significantly different from zero. While spillovers from tax changes in neighboring municipalities may exist, they tend to be small compared to the effects of changes in municipalities' own tax rates.

Robustness to choice of the hypothetical firm

In this section, we explore the robustness of our estimate to the choice of the hypothetical firm to determine municipalities' tax rates. In our baseline analysis, we work with the tax rate on an average-sized hypothetical firm with corporate capital and corporate income of CHF 2 million and CHF 260,000. The progressivity of tax schedules varies across cantons. In some cantons, the tax schedule is entirely flat. Among cantons with progressive schedules, most use a schedule that is progressive in corporate income and some use a schedule that is progressive in return on equity.

Appendix Table A3 shows how our elasticity estimates depend on the size of the hypothetical firm we choose to define the tax rate in the municipalities (explanatory variable). The elasticities remain roughly unchanged if use a larger hypothetical firm, multiplying the levels of corporate capital and corporate income of the hypothetical firm by 1.5 and 2.5 compared to our baseline. The elasticity, however, decreases to 2.8 as we use a small hypothetical firm (corporate capital CHF 1 million and corporate income CHF 130,000). The reason for this reduction in magnitude by one fifth compared to our baseline estimate of 3.5 is that much of the variation in tax rates on small firms is due to changes in thresholds on the lower tax bracket.

If we use a very large hypothetical firm (corporate capital CHF 100 million and corporate income CHF 13 million) to determine municipalities' tax rates, we obtain an elasticity

[21] We observe Pearson correlation coefficients between corporate tax rates in a municipality and population-weighted corporate tax rates in neighboring municipalities within 20 kilometers driving distance of 0.92 in levels and 0.85 in first differences. Parchet (2019) shows that common cantonal tax schedules drive the positive correlation between personal tax rates in neighboring municipalities in Switzerland, and that local tax rates are in fact strategic substitutes.

estimate of 2.3. This estimate, however, should be interpreted with caution. As discussed in Section 4, Grisons is the only canton that used a very progressive schedule at the beginning of our sample period with corporate tax rates on very large firms above 30%. In 2008, Grisons moved to a flatter schedule in a reform that raised the net-of-tax rate by 14.4% for a very large firm and by 1.9% for an average-sized firm. The reduction in tax rates on large firms is by far the largest change in the net-of-tax rate in our data set. Grisons' 2008 tax reform, however, hardly affected small and average-sized firms, which generate the major share of the tax base in the canton. The very large hypothetical firm with corporate income of CHF 100 million corresponds to the 99.9th percentile of the distribution of corporate income across firms in Grisons prior to the reform in 2008. The remaining firms above this threshold with corporate income of CHF 100 million or more only generated 5% of Grisons' corporate tax base. Among Grisons' 112 municipalities, there is only one with corporate income generated by a firm with corporate income of more than CHF 100 million. If we exclude the canton of Grisons, we find an elasticity of 3.8 using the very large hypothetical firm (see Table A4). The elasticity estimates using an average-sized hypothetical firm remain unaffected by the exclusion of Grisons from our analysis.

Exploring margins of the elasticity

In Section 6.2 we argue that about one sixth of the elasticity from our baseline estimate is due to firm birth, firm death, and relocation of firms. The remaining candidate margins to explain the other five sixth are: real investment responses, shifting between personal and corporate income in manager-owner firms, and movements of corporate income across legal entities within a corporate group (pure profit shifting and/or real reorganization of activities across legal entities within a corporate group).

Our data allow only to a limited extent to further disentangle these remaining margins. Drawing from provisions in Swiss tax law and from estimated elasticities for different firm sizes, we argue that shifting between personal and corporate income in manager-owner firms and pure profit shifting are unlikely to explain substantial shares the estimated elasticity. Hence, we conclude that real responses play a role.

Shifting between personal and corporate income in manager-owner firms is likely to play no significant role for two reasons. First, Swiss tax law requires the manager-owner's salary to be in line with market salaries. This provision limits manager-owners' ability to shift between personal salaries and corporate income. Second, we find that the elasticity is smaller in absolute value if we restrict our sample to small firms where shifting between manager-owners' corporate and personal income is most likely to occur. If such shifting was an important margin, we would expect the elasticity to be larger rather than smaller for small firms.

In Table A7, we show how our results change if we construct municipality-level aggregates not using all corporate income but corporate income within ranges between zero and different upper bounds. We include all municipality-year combinations in this analysis, in which there are firms that generate positive corporate income of at most CHF 50,000, such that the

number of observations is the same in all regressions in Table A7.

For most of the previously used firm sizes as upper bounds, the elasticity is robust with magnitudes of around 3.3. The only exception is the smallest range, where we aggregate over all firms with corporate income smaller or equal to CHF 130,000. Here, we obtain an elasticity of 2.6. We include two additional alternatives for corporate income up to CHF 50,000 and CHF 100,000 and find that, for small upper bounds, the elasticity decreases with the choice of the upper bound. Note that firms with corporate income of CHF 100,000 or less generate 4% of of all corporate income and firms with corporate income of CHF 50,000 or less generate 2% of of all corporate income. Our results suggest that except for these very small firms, the elasticity is pretty stable across the firm size distribution.

Movements of corporate income across legal entities within a corporate group are unlikely to play a predominant role either. First, as we argue in Section 3, pure profit shifting mostly occurred through status firms that were subject to a preferential tax regime. We drop all status firms from our sample and focus our analysis on firms subject to ordinary taxation. These are often independent firms that do not belong to a corporate group and therefore have no possibility for profit shifting. Second, as we show in Table A7, we find no evidence that the elasticity is higher for larger firms. Subsidiaries of larger corporate groups are arguably more likely to be above-average in terms of corporate income. If movement of corporate income across legal entities within a corporate group were an important margin, we would expect the elasticity of large firms to be larger.

Robustness to measures of agglomeration

The extent of the agglomeration economies, which attenuate the elasticity of corporate income, is somewhat sensitive to how we define centrality of a municipality. In Appendix Table A5, we display results where we interact log net-of-tax rates with alternative measures of centrality. In the first alternative version, we only use the inverse distance to the three largest airports, which are also Switzerland's three major international airports, instead of the five largest airports. This removes the airports near Bern and Lugano compared to our baseline with the five largest airports. In the second alternative, we use the distance to Switzerland's five largest cities, Zurich, Geneva, Basel, Bern and Lausanne.

In both alternative specifications we find that agglomeration effects become less important compared to our baseline. This difference in elasticities is mainly driven by the municipalities in the southern part of Switzerland around Lugano. These municipalities are among the central locations in our baseline, but among the most non-central locations in both alternative specifications. Lugano's tax base is arguably relatively inelastic because its main competitor over corporate investment is the relatively high-tax Milan metropolitan area. Whether Lugano appears among the most central or among the most non-central municipalities in our sample will therefore affect our estimates of the relevance of agglomeration economies.

7 Corporate tax rates and tax revenue

In this section, following for example Agersnap and Zidar (2021), we discuss how changes in corporate tax rates affect corporate tax revenue. To do so, we turn the focus away from the behavior of firms themselves and study the fiscal implications of firm behavior. To evaluate the effects of changes in corporate tax rates on tax revenue, we perform the same analysis as above but with respect to changes in the tax rate instead of changes in the net-of-tax rate.

We show estimation results in Appendix Figure A4 and Appendix Table A8. Our baseline specification yields an elasticity estimate with respect to the tax rate of -0.815. This implies that a 1% increase in a municipality's corporate tax rate would lead to a decrease in aggregate corporate income in that municipality of around 0.815%. The relative levels of tax rates and net-of-tax rates, with net-of-tax rates being nearly four times as large as tax rates in our sample, determine the relative magnitudes of the elasticities resulting from the two models. The overview in Appendix Table A1 suggests that the majority of existing panel studies (Buettner, 2003 and Riedl and Rocha-Akis, 2012, but not Fossen and Steiner, 2018) agree on the elasticity of corporate income with respect to tax rates. Estimates of the elasticity of corporate income with respect to net-of-tax rates in these panel studies are, accordingly, larger (smaller) if the mean tax rate in the respective sample is lower (higher).

While large in magnitude, our estimated elasticity is smaller than 1 in absolute value. Swiss municipalities are, therefore, still on the increasing part of the Laffer curve where tax cuts do not pay for themselves. According to our baseline estimate, an increase in the corporate tax rate by 1% would translate into an increase in corporate tax revenue at all three levels of government combined by just under 0.2%. Note that this conclusion changes if we look at the federal and sub-federal levels of government separately.

We will take a closer look at the revenue effects from the canton's perspective focusing on the two cantonal tax cuts we analyze in Section 5 (in this section, by "canton" we always mean canton and its municipalities combined). Because the cantonal and federal governments tax the same corporate tax base, there are two types of vertical fiscal externalities from cantonal tax cuts. First, as in any federal country, the increase in corporate income resulting from behavioral responses to a cantonal tax cut also benefits the federal government. This type of vertical externality holds to the extent that behavioral responses do not merely reflect relocation of firms or movements of corporate income across cantons. Second, because corporate taxes are deductible from the corporate income tax in Switzerland, a tax cut increases the corporate income tax base. Thus, the federal government mechanically benefits from cantonal corporate tax cuts, irrespective of behavioral responses. As a result, the break-even elasticity for tax cuts to be self-financing is more negative than -1 from a canton's point of view.

The break-even elasticity from a canton's perspective depends on the relative tax burdens at the federal and the cantonal level. Taking into account the two kinds of vertical fiscal externalities, the break-even elasticity was -1.46 in the case of the tax cut in Lucerne (in 2010 and 2012) and -1.56 in the case of the tax cut in Appenzell Ausserrhoden (in 2008). Using our baseline estimate of the elasticity with respect to the tax rate of -0.815, these

tax reforms were far from being self-financing from the canton's perspective. However, as the synthetic control analysis in Section 5 shows, the elasticites resulting from these large reforms could be higher.

According to the the synthetic control analysis, the elasticity with respect to the tax rate temporarily attained a level of -1.4 following the reform in the canton of Lucerne. This large response is sufficient for the tax cut to finance itself (Laffer effects) when both cantonal and federal tax revenue are taken into account. However, while the federal government substantially benefited in terms of tax revenue, the elasticity would have had to be permanently more negative than -1.46 to create Laffer effects from the canton's perspective, too. In Appenzell Ausserrhoden, however, the elasticity with respect to the tax rate temporarily attained a level of -1.88, which led to Laffer effects even from the canton's perspective. For these Laffer effects to persist, the elasticity would have had to be permanently more negative than -1.56. By the end of our sample period in 2017, nine years after the reform, the elasticity had, however, decreased to -0.59.

We show post-reform corporate tax revenue relative to pre-reform levels at the federal and cantonal levels of government in Appendix Figure A5. Note, however, that spillovers from greater economic activity in the cantons of Lucerne and Appenzell Ausserrhoden following the tax reforms to personal taxes may have led to increases in combined tax revenue from corporate and personal taxes.

8 Conclusion

We estimate the responsiveness of corporate income to changes in corporate tax rates. Our analysis draws from the rich panel variation in corporate tax rates offered by decentralized taxation in Switzerland. Harmonized tax bases across jurisdictions and over time allow us to avoid a potential upward bias.

We find three main results: First, we estimate a corporate elasticity of taxable income with respect to the net-of-tax rate of around 3.5. That is, an increase in the corporate net-of-tax rate in a municipality by 1% leads to an increase in that municipality's aggregate corporate income by around 3.5%. The effect unfolds over a time span of four years. This strong response is, however, still not sufficient for tax cuts to pay for themselves. Second, we find evidence that agglomeration economies in urban centers mitigate the elasticity. In remote municipalities, on the other hand, the elasticity assumes a magnitude of up to 5. Third, we find that only about one sixth of the effect is due to firm birth, death, and relocation across municipalities.

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A Additional tables and graphs

Table A1: Estimates of the aggregate response to corporate taxes.

Citation	Setting	Methodology	Baseline estimate		$\bar{t}$
			η_t	η_{1-t}	
Buettner (2003)	1,111 German municipalities, 1980-2000	Panel	-0.816	4.56	0.152
Gruber and Rauh (2007)	U.S. C corporations, 1964-2003	GS IV	-0.2		
Riedl and Rocha-Akis (2012)	17 OECD countries, 1982-2005	Panel	-0.863		0.301
Dwenger and Steiner (2012)	German "Körperschaftssteuer," 1998-2004	GS IV	-0.5		
Devereux *et al.* (2014)	Kink at £300,000 in U.K. data, 2001-09	Bunching		0.13 – 0.17	
	Kink at £10,000 in U.K. data, 2001-09	Bunching		0.53 – 0.56	
Bachas and Soto (2018)	Costa Rica, admin. corp. tax returns, 2008-14	Bunching		3-5	
Boonzaaier *et al.* (2019)	South Africa, firm-level data 2009-13	Bunching		0.72, 0.17	
Fossen and Steiner (2018)	German municipalities, 2001 & 2004	Panel	-0.45		0.065
Coles *et al.* (2019)	U.S. C corporations, 2004-14	Bunching		0.88	
This paper	2,240 Swiss municipalities, 2003-17	Panel	-0.8	3.5	0.213

Notes: This table provides an overview of the estimates in the existing literature. We use η to denote elasticities and the sub-indices t and $1-t$ to indicate whether these elasticities relate to tax rates or to net-of-tax rates. Finally, $\bar{t}$ denotes the mean tax rate in the sample used in each of the panel studies covered in the table.

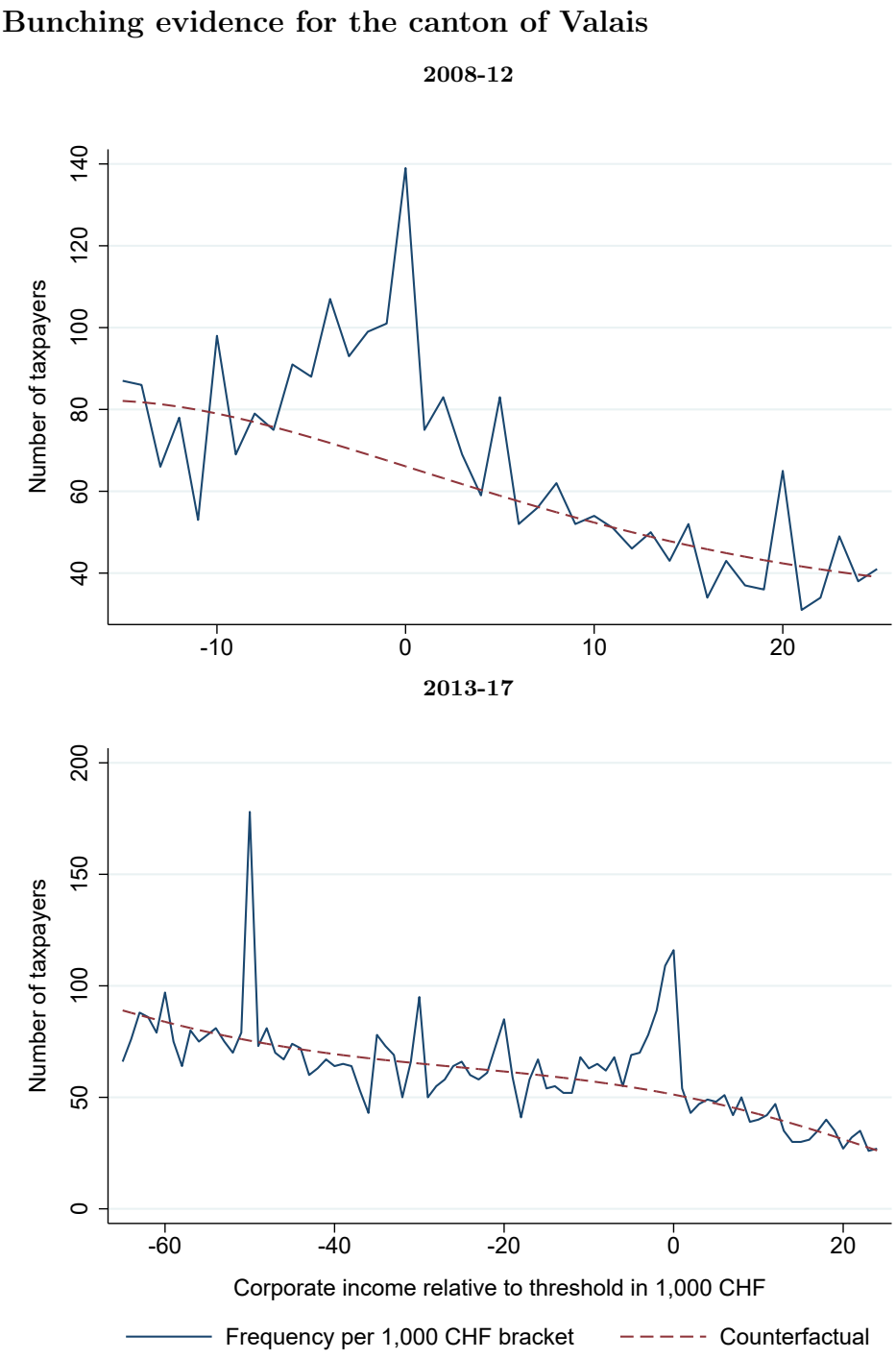


Figure A1: Evidence for bunching around kinks in the corporate tax schedule in the canton of Valais. We display the distribution of pooled data over the five-year periods 2008-2012, during which the marginal tax rate increased from 12.66% to 21.55% at CHF 100,000 and 2013-2017, during which it increased also from 12.66% to 21.55%, but at CHF 150,000. Note that the x-axis shows corporate income after tax deductions. To calculate elasticities, we convert these into pre-tax corporate income thresholds of CHF 117,520 and CHF 177,020. We find excess masses compared to the counterfactual distributions of 209 firms in 2008-12 and 213 in 2013-17. Given counterfactual densities at the respective thresholds of 66 and 51 per CHF 1,000 bin, we estimate elasticities of 0.293 and 0.257 during the two periods.

Table A2: Estimates elasticity with respect to net-of-tax rate in the distributed-lag model.

	All firms		Super stayer muni's		Super stayers	
	(1)	(2)	(3)	(4)	(5)	(6)
Event −3	-0.308	0.182	-0.117	0.401	0.011	0.650
	(0.697)	(0.756)	(0.713)	(0.786)	(0.879)	(0.964)
Event −2	-0.007	0.155	0.086	0.193	0.173	0.578
	(0.593)	(0.673)	(0.677)	(0.731)	(0.730)	(0.896)
Event 0	1.789***	2.279***	2.242***	2.813***	1.314**	2.269***
	(0.603)	(0.625)	(0.577)	(0.648)	(0.642)	(0.600)
Event +1	1.338	2.099***	1.557*	2.540***	1.476	2.569***
	(0.892)	(0.808)	(0.904)	(0.804)	(0.909)	(0.953)
Event +2	3.189***	4.135***	3.359***	4.618***	3.066***	4.754***
	(1.020)	(0.920)	(1.010)	(0.860)	(1.102)	(1.011)
Event +3	3.468***	4.684***	3.902***	5.119***	3.276**	4.391***
	(1.194)	(0.839)	(1.172)	(0.808)	(1.278)	(0.995)
Event −3 · central		-1.077		-1.163		-1.739*
		(0.902)		(0.868)		(0.892)
Event −2 · central		-0.269		-0.123		-1.151
		(0.944)		(1.003)		(1.020)
Event 0 · central		-1.557*		-1.763**		-2.986***
		(0.862)		(0.810)		(0.733)
Event +1 · central		-2.277**		-2.925***		-3.279***
		(1.075)		(1.047)		(0.974)
Event +2 · central		-3.003**		-4.010***		-5.478***
		(1.445)		(1.117)		(0.958)
Event +3 · central		-3.927***		-3.797***		-3.470***
		(0.990)		(0.817)		(1.116)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Initial corp. tax neighb. × year FE	Yes	Yes	Yes	Yes	Yes	Yes
Initial personal taxes × year FE	Yes	Yes	Yes	Yes	Yes	Yes
N municipalities	2,230	2,230	2,129	2,129	2,129	2,129
N	32,520	32,520	30,041	30,041	30,041	30,041

Notes: Event study estimates of the elasticity of the corporate income tax base relative to the year prior to tax reform. The interaction terms with childcare (*central*) indicate differences in elasticities between remote and centrally located municipalities. Controls if indicated include corporate tax rates in neighboring municipalities (<20 km) in 2003 interacted with year fixed effects and personal tax rates (on personal income and wealth) in 2003 interacted with year fixed effects. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Elasticity estimates at different points in the corporate tax schedule.

	All firms		Super stayer muni's		Super stayers	
	(1)	(2)	(3)	(4)	(5)	(6)
	k = CHF 1 million; y = CHF 130,000; $\overline{etr}$ = 0.203					
Event +3	2.843***	3.693***	3.338***	4.283***	3.523***	4.294***
	(0.961)	(0.971)	(0.936)	(0.846)	(0.891)	(0.694)
Event +3 · central		-2.944***		-3.176***		-2.590**
		(0.950)		(0.739)		(1.056)
	k = CHF 2 million; y = CHF 200,000; $\overline{etr}$ = 0.211					
Event +3	2.802**	4.028***	3.210***	4.498***	2.737**	4.151***
	(1.234)	(0.856)	(1.228)	(0.824)	(1.267)	(0.904)
Event +3 · central		-3.655***		-3.789***		-4.401***
		(1.078)		(0.842)		(0.831)
	k = CHF 2 million; y = CHF 260,000; $\overline{\text{etr}}$ = 0.210					
Event +3	3.468***	4.684***	3.902***	5.119***	3.276**	4.391***
	(1.194)	(0.839)	(1.172)	(0.808)	(1.278)	(0.995)
Event +3 · central		-3.927***		-3.797***		-3.470***
		(0.990)		(0.817)		(1.116)
	k = CHF 3 million; y = CHF 390,000; $\overline{etr}$ = 0.213					
Event +3	3.610***	4.502***	4.013***	4.872***	3.290***	4.204***
	(1.041)	(0.810)	(1.011)	(0.792)	(1.115)	(0.936)
Event +3 · central		-3.722***		-3.453***		-3.560***
		(1.142)		(1.009)		(1.168)
	k = CHF 5 million; y = CHF 650,000; $\overline{etr}$ = 0.215					
Event +3	3.511***	4.166***	3.857***	4.441***	3.120***	3.878***
	(0.972)	(0.869)	(0.940)	(0.864)	(1.005)	(0.858)
Event +3 · central		-3.440***		-3.004**		-3.622***
		(1.297)		(1.207)		(1.306)
	k = CHF 10 million; y = CHF 1,300,000; $\overline{etr}$ = 0.217					
Event +3	2.861***	3.441***	3.192***	3.660***	2.849***	3.550***
	(1.021)	(0.959)	(0.991)	(0.969)	(0.975)	(0.832)
Event +3 · central		-3.376**		-2.753***		-3.694***
		(1.420)		(1.300)		(1.413)
	k = CHF 50 million; y = CHF 6,500,000; $\overline{etr}$ = 0.219					
Event +3	2.349**	2.973***	2.681***	3.155***	2.531***	3.243***
	(1.035)	(0.987)	(1.015)	(1.007)	(0.972)	(0.849)
Event +3 · central		-3.453**		-2.689**		-3.656***
		(1.450)		(1.288)		(1.409)
	k = CHF 100 million; y = CHF 13,000,000; $\overline{etr}$ = 0.219					
Event +3	2.335**	2.966***	2.665***	3.145***	2.510**	3.228***
	(1.036)	(0.990)	(1.018)	(1.010)	(0.975)	(0.854)
Event +3 · central		-3.469**		-2.708**		-3.670***
		(1.453)		(1.292)		(1.416)

Notes: Event study estimates of the elasticity of the corporate income tax base relative to the year prior to tax reform 3 years after tax reform at different points in the corporate tax schedule. Regression specifications are the same as in Table A2. We use k to denote corporate equity capital and y to denote corporate income. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Elasticity estimates at different points in the corporate tax schedule for all cantons excluding Grisons.

	All firms		Super stayer muni's		Super stayers	
	(1)	(2)	(3)	(4)	(5)	(6)
	k = CHF 1 million; y = CHF 130,000; $\overline{etr}$ = 0.203					
Event +3	2.981***	3.974***	3.431***	4.543***	3.680***	4.568***
	(0.955)	(0.958)	(0.937)	(0.831)	(0.892)	(0.663)
Event +3 · central		-3.705***		-4.028***		-3.202**
		(1.067)		(0.851)		(0.885)
	k = CHF 2 million; y = CHF 200,000; $\overline{etr}$ = 0.210					
Event +3	2.830**	4.125***	3.156**	4.571***	2.804**	4.243***
	(1.220)	(0.847)	(1.237)	(0.834)	(1.293)	(0.931)
Event +3 · central		-4.298***		-4.613***		-4.894***
		(1.099)		(0.844)		(0.895)
	k = CHF 2 million; y = CHF 260,000; $\overline{\text{etr}}$ = 0.210					
Event +3	3.457***	4.749***	3.824***	5.178***	3.356**	4.536***
	(1.193)	(0.845)	(1.192)	(0.826)	(1.304)	(1.003)
Event +3 · central		-4.480***		-4.551***		-3.916***
		(1.021)		(0.808)		(1.057)
	k = CHF 3 million; y = CHF 390,000; $\overline{etr}$ = 0.213					
Event +3	3.564***	4.561***	3.921***	4.944***	3.316***	4.299***
	(1.079)	(0.838)	(1.063)	(0.824)	(1.153)	(0.949)
Event +3 · central		-4.254***		-4.249***		-3.979***
		(1.208)		(0.995)		(1.251)
	k = CHF 5 million; y = CHF 650,000; $\overline{etr}$ = 0.215					
Event +3	3.569***	4.171***	3.889***	4.445***	3.046***	3.680***
	(0.979)	(0.878)	(0.937)	(0.852)	(1.016)	(0.838)
Event +3 · central		-3.380***		-3.166**		-3.284***
		(1.192)		(1.094)		(1.361)
	k = CHF 10 million; y = CHF 1,300,000; $\overline{etr}$ = 0.216					
Event +3	3.829***	4.720***	4.130***	5.007***	3.052***	3.930***
	(1.072)	(0.974)	(1.049)	(0.958)	(1.083)	(0.928)
Event +3 · central		-4.391***		-4.287***		-4.270***
		(1.541)		(1.323)		(1.652)
	k = CHF 50 million; y = CHF 6,500,000; $\overline{etr}$ = 0.218					
Event +3	3.802***	4.712***	4.077***	4.965***	2.887***	3.761***
	(1.079)	(1.027)	(1.060)	(1.014)	(1.100)	(0.952)
Event +3 · central		-4.480***		-4.363**		-4.301**
		(1.630)		(1.424)		(1.741)
	k = CHF 100 million; y = CHF 13,000,000; $\overline{etr}$ = 0.218					
Event +3	3.794***	4.708***	4.065***	4.957***	2.862**	3.736***
	(1.078)	(1.031)	(1.060)	(1.018)	(1.104)	(0.955)
Event +3 · central		-4.489**		-4.371**		-4.300**
		(1.634)		(1.434)		(1.747)

Notes: Event study estimates of the elasticity of the corporate income tax base relative to the year prior to tax reform 3 years after tax reform at different points in the corporate tax schedule using data for all cantons except Grisons. The analysis is the same as in Table A3 except that we do not use observations from Grisons, which means we are left with 30,948 observations based on 2,102 municipalities in columns (1) and (2) and 28,613 observations based on 2,026 municipalities in in columns (3)-(6). We use k to denote corporate equity capital and y to denote corporate income. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: Elasticity estimates using interactions with different measures of centrality.

	All firms		Super stayer muni's		Super stayers	
	(1)	(2)	(3)	(4)	(5)	(6)
	3 largest airports					
Event +3		5.143***		5.329***		5.175***
		(1.041)		(0.984)		(1.420)
Event +3 · central		-2.715**		-2.291*		-3.216**
		(1.328)		(1.315)		(1.473)
	5 largest airports					
Event +3	3.468***	4.684***	3.902***	5.119***	3.276**	4.391***
	(1.194)	(0.839)	(1.172)	(0.808)	(1.278)	(0.995)
Event +3 · central		-3.927***		-3.797***		-3.470***
		(0.990)		(0.817)		(1.116)
	5 largest cities					
Event +3		3.990***		4.393***		3.949***
		(0.913)		(0.935)		(1.078)
Event +3 · central		-1.915		-1.729		-2.422**
		(1.337)		(1.057)		(1.009)

Notes: Event study estimates of the elasticity of the corporate income tax base relative to the year prior to tax reform 3 years after tax reform using interactions with different measures of centrality. The three largest airports are located in Kloten near Zurich, Le Grand-Saconnex/Meyrin near Geneva and in Hésingue/Saint-Louis in France near Basel. The fourth and fifth largest airports are located in Belp near Bern and in Lugano. Switzerland's five largest cities are Zurich, Geneva, Basel, Bern and Lausanne. Regression specifications same as in Table A2. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A6: Effects of corporate tax reform in neighboring municipalities.

	All firms		Super stayer muni's		Super stayers	
	(1)	(2)	(3)	(4)	(5)	(6)
	Elasticities w.r.t. own net-of-tax rate					
Event +3	2.950*	4.714***	3.527**	5.425***	2.557	4.224***
	(1.741)	(1.412)	(1.759)	(1.322)	(1.639)	(1.361)
Event +3 · central		-3.340***		-3.520***		-3.242***
		(0.991)		(0.835)		(1.127)
	Elasticities w.r.t. net-of-tax rate in neighboring municipalities					
Event +3	0.527	1.425	0.371	1.508	2.021	3.076*
	(1.401)	(1.507)	(1.204)	(1.421)	(1.472)	(1.620)
Event +3 · central		-2.666**		-3.304***		-3.055***
		(1.166)		(0.951)		(1.031)

Notes: The upper panel shows event study estimates of the elasticity of the corporate income tax base relative to the year prior to tax reform 3 years after tax reform. The regression specifications differ from the ones used in Table A2 in that here we control for the evolution of corporate tax rates in neighboring municipalities, which is potentially endogenous. The lower panel displays event study estimates of the elasticity of the corporate income tax base relative to the year prior to tax reform 3 years after tax reform with respect to changes in corporate net-of-tax rates in neighboring municipalities. We define neighboring municipalities as those located within 20km of a municipality. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

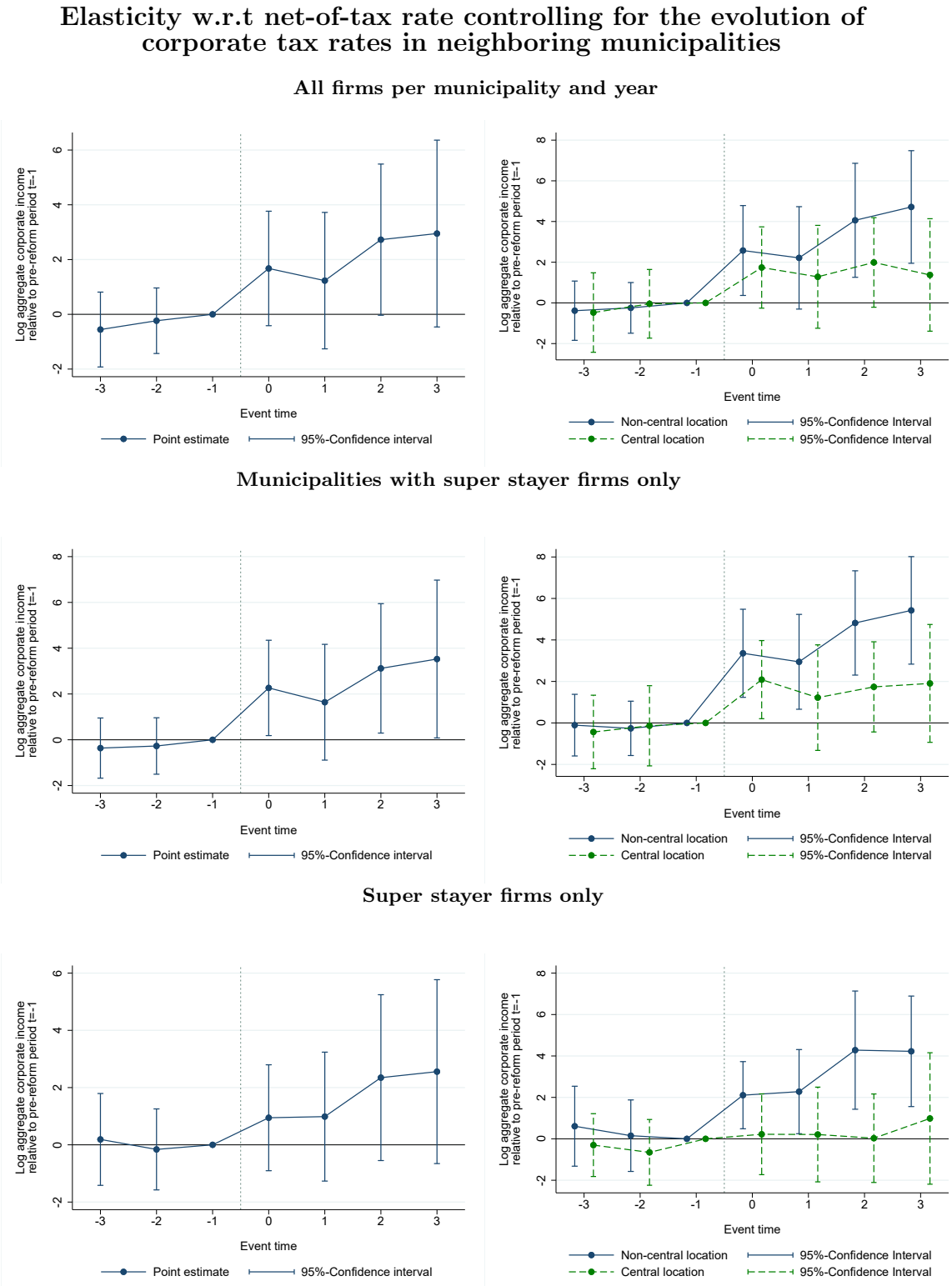
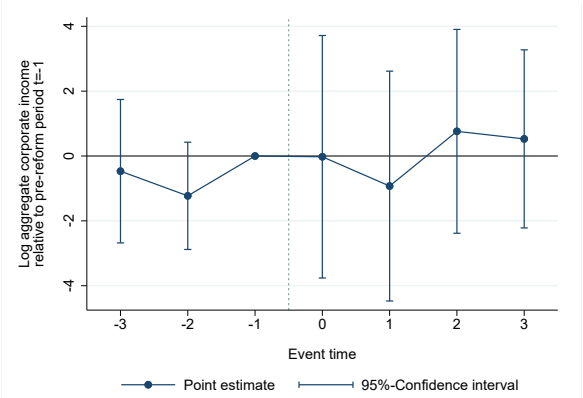
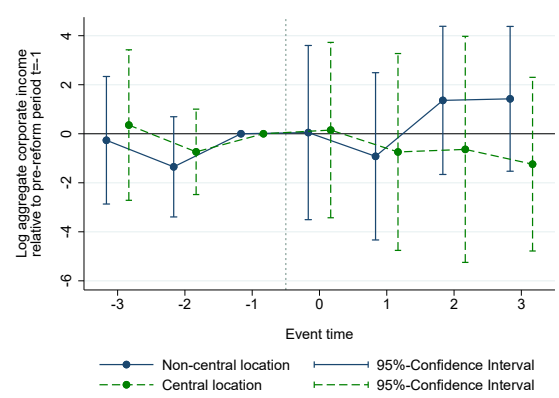


Figure A2: Distributed-lag cumulative effects according to equation (2), estimated through the first-differences empirical model (1) like in Figure 5 but now controlling for evolution of corporate tax rates in neighboring municipalities, which is potentially endogenous, rather than for initial tax rates interacted with year dummies. The estimated effects correspond to elasticities and can be found in the upper panel of Appendix Table A6.

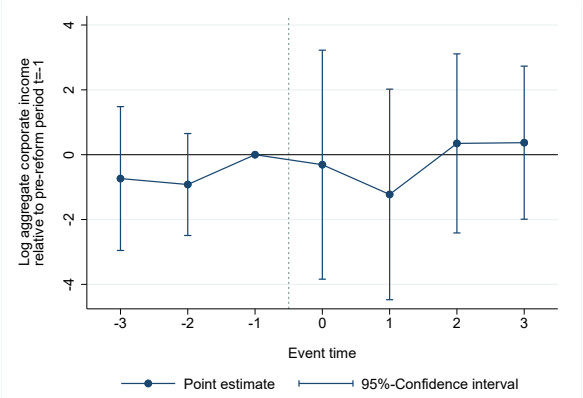
Elasticity w.r.t net-of-tax rate in neighboring municipalities

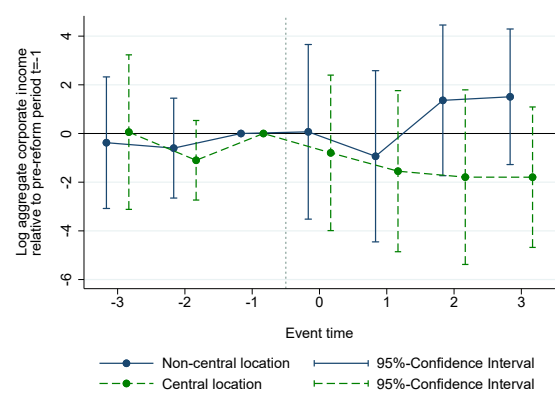
All firms per municipality and year



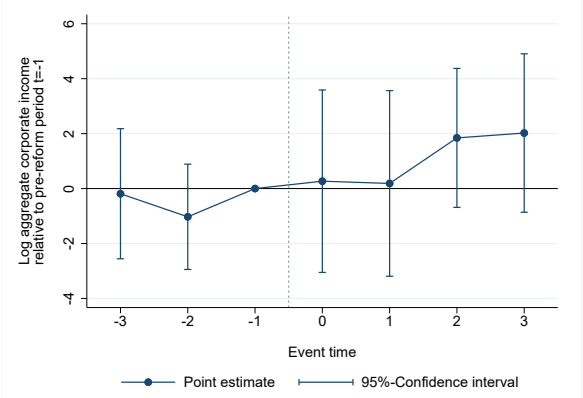


Municipalities with super stayer firms only





Super stayer firms only



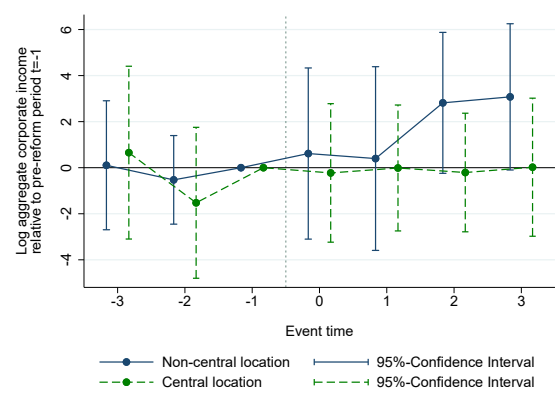


Figure A3: Distributed-lag cumulative effects, but now using corporate tax rates in neighboring municipalities within 20km as our main explanatory variable. We control the evolution of the municipalities' own corporate tax rates. The estimated effects correspond to elasticities and can be found in the lower panel of Appendix Table A6.

Table A7: Elasticity estimates by firm size.

	(1)	(2)	(3)	(4)	(5)	(6)
	Firms $\leq$ 50k		Firms $\leq$ 100k		Firms $\leq$ 130k	
Event +3	1.035**	1.200***	1.768**	2.278***	2.486***	3.234***
	(0.445)	(0.449)	(0.762)	(0.607)	(0.910)	(0.628)
Event +3 · central		-0.567		-1.583*		-2.328**
		(0.741)		(0.916)		(0.916)
	Firms $\leq$ 260k		Firms $\leq$ 390k		Firms $\leq$ 650k	
Event +3	3.363***	4.328***	3.183***	4.106***	3.355***	4.291***
	(1.047)	(0.756)	(1.042)	(0.763)	(1.110)	(0.823)
Event +3 · central		-3.016***		-2.865***		-2.923***
		(1.070)		(0.850)		(0.963)
	Firms $\leq$ 50m		Firms $\leq$ 100m		All firms	
Event +3	3.423***	4.510***	3.294***	4.360***	3.277***	4.401***
	(1.115)	(0.820)	(1.100)	(0.805)	(1.174)	(0.837)
Event +3 · central		-3.357***		-3.305***		-3.491***
		(0.709)		(0.715)		(0.830)

Notes: Event-study estimates of the elasticity of the corporate income tax base constructed following different definitions relative to the year prior to tax reform 3 years after tax reform. In all specifications, we use our baseline net-of-tax rate on a firm with CHF 260,000 in corporate capital and CHF 2 million in corporate capital. Municipality-year aggregates of corporate income include corporate income of all firms satisfying the conditions in the respective headers. We only use municipality-year combinations, for which we observe positive corporate income of firms with corporate income CHF 50,000 or less. Sample size is 30,744 in all regressions in this table. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

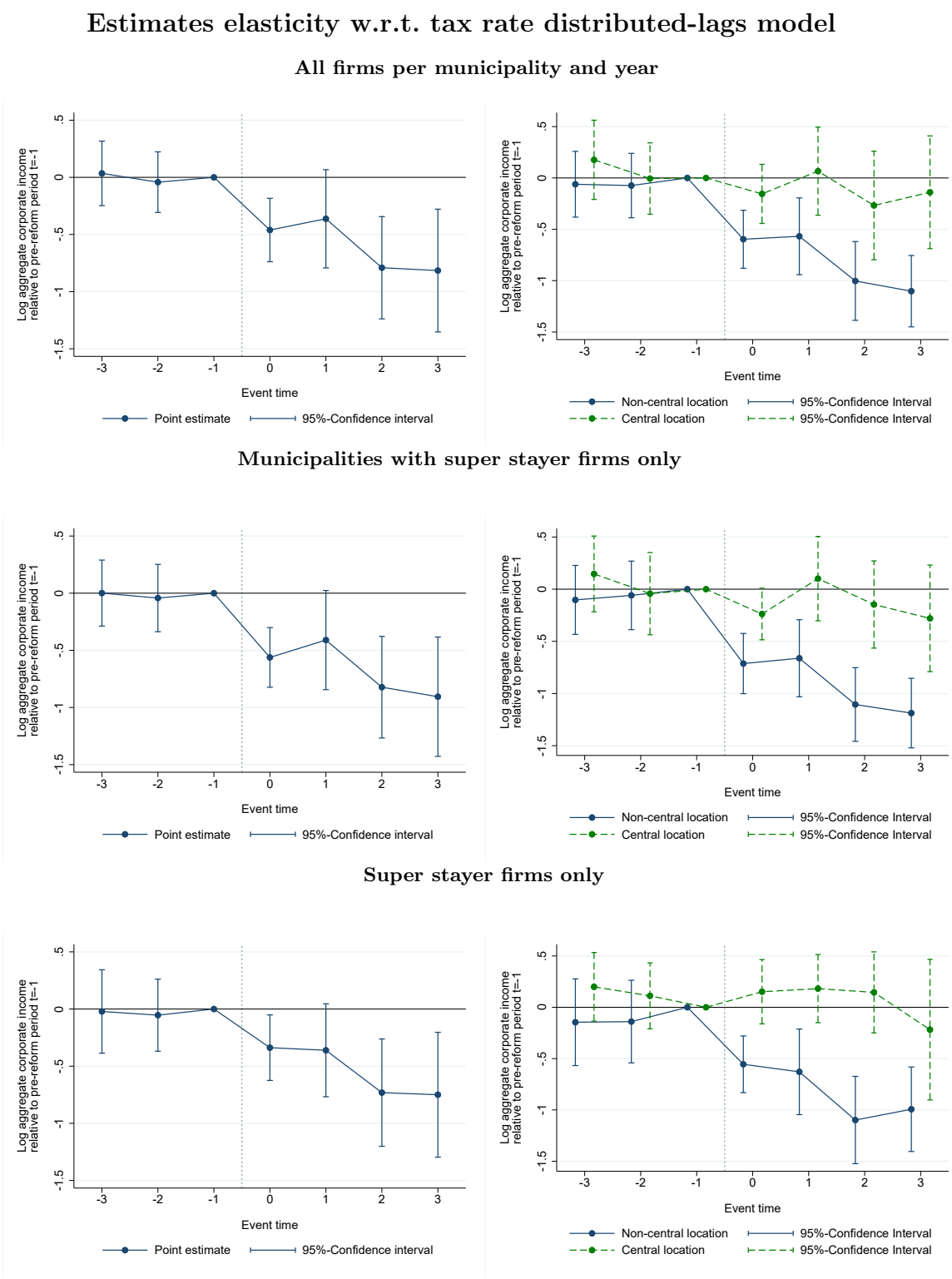


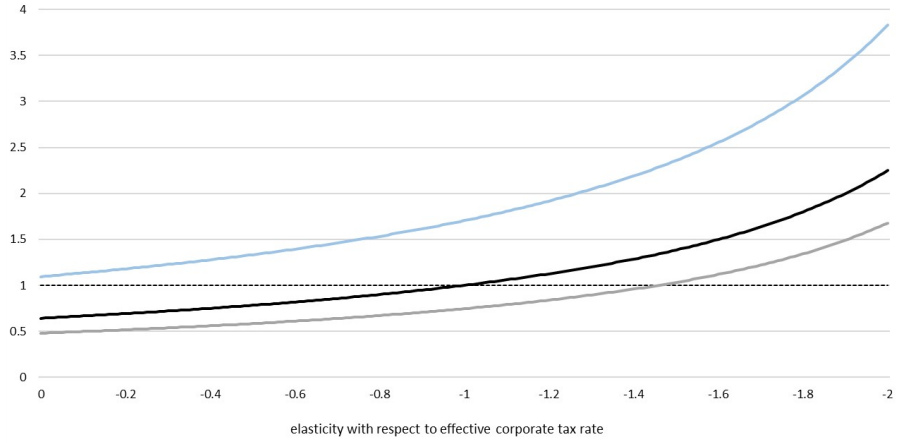
Figure A4: Distributed-lag cumulative effects as in Figure 5, but here using log tax rates instead of log net-of-tax rates on the right-hand side. The upper panel uses municipality-year aggregates of corporate income of all firms subject to regular taxation. The lower panels only take corporate income generated by a group of super stayer firms into account that stay in the same municipality throughout our sample period. Effects are the cumulated coefficients after and before the reference year, i.e. one year prior to the event. Standard errors clustered at canton level. The estimated effects correspond to elasticities and can be found in Appendix Table A8.

Table A8: Estimates elasticity with respect to tax rate in the distributed-lag model.

	All firms		Super stayer muni's		Super stayers	
	(1)	(2)	(3)	(4)	(5)	(6)
Event −3	0.035	-0.061	0.001	-0.103	-0.021	-0.145
	(0.144)	(0.163)	(0.147)	(0.169)	(0.186)	(0.215)
Event −2	-0.042	-0.074	-0.042	-0.059	-0.054	-0.140
	(0.135)	(0.160)	(0.150)	(0.168)	(0.161)	(0.205)
Event 0	-0.461***	-0.597***	-0.562***	-0.713***	-0.338**	-0.555***
	(0.141)	(0.144)	(0.133)	(0.147)	(0.146)	(0.141)
Event +1	-0.363*	-0.568***	-0.410*	-0.662***	-0.361*	-0.629***
	(0.219)	(0.191)	(0.221)	(0.188)	(0.207)	(0.213)
Event +2	-0.791***	-1.003***	-0.823***	-1.105***	-0.732***	-1.098***
	(0.228)	(0.196)	(0.227)	(0.180)	(0.240)	(0.217)
Event +3	-0.816***	-1.103***	-0.906***	-1.188***	-0.750***	-0.993***
	(0.274)	(0.177)	(0.266)	(0.170)	(0.279)	(0.210)
Event −3 · central		0.238		0.249		0.345
		(0.216)		(0.207)		(0.228)
Event −2 · central		0.068		0.017		0.251
		(0.220)		(0.223)		(0.243)
Event 0 · central		0.442**		0.475***		0.707***
		(0.183)		(0.184)		(0.172)
Event +1 · central		0.634***		0.763***		0.811***
		(0.223)		(0.217)		(0.235)
Event +2 · central		0.735**		0.958***		1.243***
		(0.308)		(0.232)		(0.240)
Event +3 · central		0.963***		0.908***		0.776***
		(0.222)		(0.184)		(0.276)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Init. corp. tax nghb. × yr FE	Yes	Yes	Yes	Yes	Yes	Yes
Init. pers. taxes × yr FE	Yes	Yes	Yes	Yes	Yes	Yes
N municipalities	2,230	2,230	2,129	2,129	2,129	2,129
N	32,520	32,520	30,041	30,041	30,041	30,041

Notes: Event study estimates of the elasticity of the corporate income tax base *w.r.t. tax rates* relative to the year prior to tax reform. The interaction terms with childcare (*central*) indicate differences in elasticities between remote and centrally located municipalities. Controls if indicated include corporate tax rates in neighboring municipalities (<20 km) in 2003 interacted with year fixed effects and personal tax rates (on personal income and wealth) in 2003 interacted with year fixed effects. Standard errors are clustered at canton level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Revenue effect of corporate tax reform in Lucerne (2010 and 2012)



Revenue effect of corporate tax reform in Appenzell Ausserrhoden (2008)

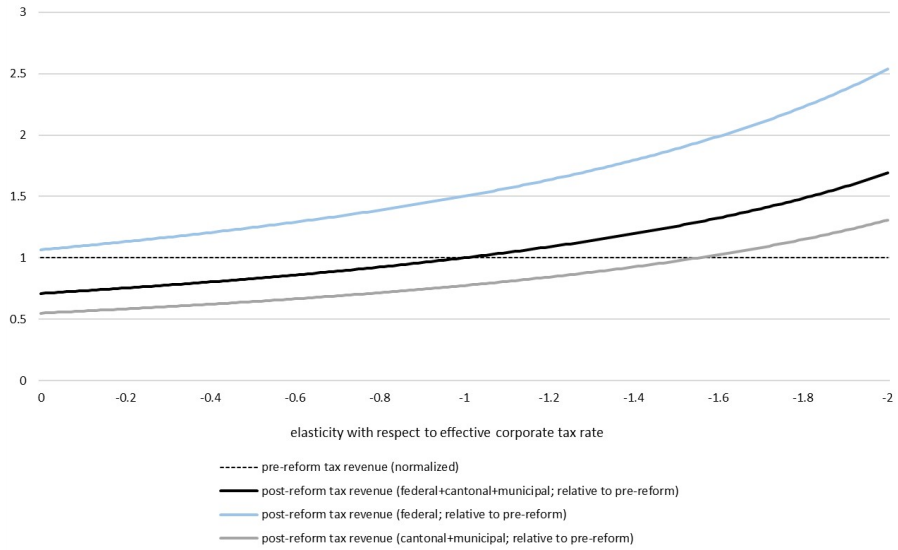


Figure A5: Corporate tax revenue in the canton of Lucerne (upper panel) and Appenzell Ausserrhoden (lower panel) after the reduction in effective corporate tax rates from 21.0% to 13.5% (Lucerne) and 18.5% to 13.1% (Appenzell Ausserrhoden) relative to pre-reform levels, as a function of the elasticity with respect to the effective corporate tax rate. A value of > 1 (< 1) indicates that the tax revenue is higher (lower) than before the reform. Due to the deductibility of the corporate tax bill from its own base, the federal level benefited from the cantonal reforms for any non-positive elasticity. For the sub-federal levels of government to benefit in terms of tax revenue would require an elasticity which is more negative than -1.46 (Lucerne) or -1.56 (Appenzell Ausserrhoden).