

Three Essays in Applied Economics

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Introduction

In the last two decades many countries have proposed structural reforms to decentralize public tasks as well as policy decisions to sub-central jurisdictions. The aim of these reforms, accordingly with the common theoretical arguments, was to produce beneficial effects such as an improved matching between citizens' preferences and policy adoption, an increase in politicians' accountability and a more efficient selection of good officials. Interestingly, these changes have been put in place in both developed countries (e.g., Italy and Spain) and developing countries (e.g., Brazil and South Africa).

As a direct consequence, local authorities have assumed an important role in the policy arena given the increased power to impact effectively citizens' welfare. As additional result, these reforms have produced in several countries a condition of *partial decentralization*, where both lower and upper level jurisdictions are put in a position to affect the final policy decisions.¹ These two effects together draw to evaluations of policies that need to consider more carefully the hierarchical structure of the decision-making process and highlight the existence of potential vertical interactions between governments.

This thesis aims at giving a substantial contribution in that direction by studying some of the economical issues that affect *local governments* policies, taking into account the multi-tiered decision-making system which is nowadays present in many federations and decentralized countries.

To do so I provide in my thesis three empirical applications. The first two chapters focus on the effect of direct democratic institutions respectively on local expenditure and expenditure decentralization. They both can be considered part of the recently growing literature often called *second generation theory of fiscal federalism*, where political incentives are crucial to describe fiscal outcomes in federal systems (Oates, 2005). Instead, the third chapter deals with the effect of taxation on firms' location choices by emphasizing the role that reforms occurred at the state level might have on local economies.

¹Jametti, Mario and Marcellin Joanis (2009). "The Rise of Partial Decentralization and Shared Responsibility Federalism", World Report on Fiscal Federalism '09, (Núria Bosch et Albert Solé, éd.), Institut d'Economia de Barcelona

The results of each chapter are based on Switzerland. This country has been a longtime federation with an outstanding variety of institutional settings which is also the reason why it is often considered a natural laboratory for research in public finance. It is composed by three levels of government and shows a high degree of political and fiscal decentralization, by leaving a prominent autonomy on policy decision to local jurisdictions. Nevertheless, several public policies are the results of decisions taken by more than one level of government (e.g., public expenditure or taxation).

In the first chapter, “How to Tame Two Leviathans? Revisiting the Effect of Direct Democracy on Local Public Expenditure in a Federation” (with Mario Jametti), I move a step forward with respect to the recent literature on direct democratic institutions, by analyzing the impact of referendum availability on local public expenditure taking into account the institutional setting both at the state and local level of government. Specifically, I empirically test how the vertical structure of direct democracy in a federal context affects expenditure decisions of sub-central governments using data from Swiss cantons and municipalities. Interestingly, most research on the effect of direct democracy in Switzerland has concentrated on cantonal (state) data. Thus, it was not possible to address the vertical interaction between cantonal and municipal governments. By using a sample of 119 Swiss municipalities for the period 1993-2007, I show that direct democracy, where present, reduces expenditure at one level of government, but this effect also depends on the existence of direct democracy at the other level of government involved in the public good provision.

The second chapter, “Direct Democracy, Partial Decentralization and Voter Information”, complements the first one by looking at the effect of direct legislation on expenditure decentralization both from a theoretical and an empirical perspective. Direct democratic institutions are expected to foster more efficient policies (e.g. reduction of wasteful public expenditure) because they strengthen citizens awareness of governments behaviour, thanks to an increased availability of information. However, this positive effect on information might be reduced in a federal country because public goods are often provided jointly by more than one level of government. The theoretical model predicts that direct democratic institutions should produce two opposite effects depending on whether the information shock is stronger at the local or at the state level. I empirically test the model by providing a *difference in differences* estimation to a sample of 406 Swiss municipalities for the period 1990-2009 where 45 either introduced or abolished the mandatory fiscal referendum on new expenditure. I verify that decentralization decreases after the introduction of direct democracy at the local level, confirming the model’s predictions.

In the third chapter, “Taxes and Firm’s Location Decisions” (with Agustin Redonda) I empirically assess the effect of corporate tax levels and tax progressivity on firms’ mobility. I estimate the effect of both dimensions on firms’ location choices in Switzerland. A low tax level and a

higher progressivity should make a location more attractive because the former makes easier firms' profit maximization, while the latter allows the reduction of the variability of expected profits. Interestingly for my purposes, the corporate tax level is decided by both cantonal and municipal authorities, while the progressivity of the tax schedule is generally a cantonal decision. For this reason I follow two different identification strategies. To address the tax level effect I use a FE-2SLS estimation where the dependent variable is the number of firms in a municipality. Interestingly, and unlike previous studies, I find a small but positive and statistically significant impact of the tax rate on the number of firms. The interpretation of this result is mainly based on the connection between taxes and public spending. Indeed, from the point of view of a firm profit maximization might come not only by a net reduction of taxes but also from the minimization of costs given by an efficient use of public funds. Finally, I estimate the tax progressivity effect on the number of firms in a municipality through a *difference in differences* technique where we take advantage of cantonal reforms of the tax schedule (i.e change from a non-flat to a flat tax rate). The results confirm how state reforms might impact directly local economy. Indeed, firms prefer on average municipalities with a progressive tax schedule and firms from the riskiest sectors are the more affected by a flat tax reform.

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Chapter 1

How to Tame Two Leviathans? Revisiting the Effect of Direct Democracy on Local Public Expenditure in a Federation

1.1 Introduction

How can one tame the Leviathan, i.e., politicians' appetite for public expenditure beyond what is desired by citizens? One of the answers appear to be: direct democracy. A vast array of empirical studies have shown a moderating impact of direct democratic institutions on public expenditures.¹ All of these studies are based on countries with strong sub federal autonomy. Prominently on the list are the U.S.A. and Switzerland. Interestingly however, prior research ignores, fully or partially, the federal setting. In other words, earlier work considers either the effect of direct democratic institutions on expenditure at one single level of government, or the impact of upper-level democratic institutions on lower-level expenditures.² To our knowledge, the full federal structure and the resulting potential vertical interdependence between upper- and lower-level democratic institutions have not been fully addressed. This despite the fact that all empirical applications use data from federations.

In this paper we analyze the impact of direct democratic institutions on public expenditure at the local level taking into account both the institutional setting at the state and local level of

¹Among others, see Matsusaka (1995), Feld and Kirchgässner (2001b), Feld and Matsusaka (2003) and Funk and Gathmann (2011).

²For example, how the referendum in Swiss cantons affects cantonal public expenditure as in Feld and Matsusaka (2003) or how the initiative in the U.S. states affects local expenditure as in Matsusaka (1995).

government. Specifically, we are interested in testing whether the impact of direct democracy at the upper level of government depends on the degree of citizen participation at the local level.

We see our paper as an important complement and extension to the literature. Feld and Kirchgässner (2001b) find that municipal fiscal referenda reduce municipal public expenditure in Switzerland. Similarly, Matsusaka (1995) and Feld and Matsusaka (2003) show that this result also holds when looking respectively at U.S and Swiss States. Funk and Gathmann (2011) also find that state fiscal referenda have a negative effect on Swiss state-level expenditure, but they do not find a significant impact on municipal expenditures. This last result is in contrast to Matsusaka (1995)'s previous findings suggesting a positive effect of upper level government direct democracy on local level expenditure.

We use a newly assembled dataset for Switzerland. It comprises information on public expenditure and institutions for 119 of the largest municipalities from 22 of the 26 cantons (states) over the period 1993 to 2007. Switzerland presents an ideal empirical background for our focus of research. First, it is a very decentralized country leaving large spending (and revenue) autonomy to two levels of sub-federal jurisdictions. The three levels of the Swiss federation, federal, cantonal and municipal, hold roughly equal shares of public spending, similarly for revenues. Second, both across and within cantons, the second-tier jurisdiction, we observe important variation in institutional settings.³ We concentrate on one particular instrument of direct democracy: the mandatory fiscal referendum.

We find in our data that taking the vertical interdependence of direct democratic institutions into account matters. Our results suggest that cantonal fiscal referenda increase municipal public expenditure for localities that do not avail of a referendum, while this expansionary effect is much reduced and statistically significantly different for municipalities that also have a fiscal referendum. Thus, in order to precisely assess the effect of direct democratic institutions on public policy outcomes in a federation, one ought to consider the full (vertical) structure of institutions. In other words, the Leviathan taming effect of direct democratic institutions of one level of government could potentially be annihilated by the lack thereof in another level of government.

The rest of the paper is structured as follows. Sections 1.2 summarizes the theoretical and empirical literature in the field while section 1.3 describes the theoretical channel of the effect of direct democracy on public expenditure and its potential vertical interaction. Section 1.4 presents the institutional setting in Switzerland, while Section 1.5 describes our dataset and the empirical methods we apply. Section 1.6 presents our results and Section 1.7 concludes.

³The situation is similar for the initiative in the U.S.A. For example, within the 20 largest cities: New York City has the initiative, while New York state does not; Boston does not have the initiative, while Massachusetts does; in California the initiative exists both at the state and local level; finally, neither Indianapolis nor Indiana have the initiative.

1.2 Literature background

There is a continuing and growing interest in exploring the effect of institutions on economic outcomes.⁴ One aspect that receives particular attention is the discussion on understanding differences in policy outcomes between representative and direct democratic systems. In both systems the citizen delegates power to politicians through elections, while in a representative system the citizen is involved only during elections, in a direct democratic system some political decisions need citizen approval. These two systems should entail the same policy outcome if the median voter theorem holds (Downs, 1957). Nevertheless, representatives' decisions can deviate from citizens' preferences either because politicians seek to maximize their own utility function (Tullock, 1980), or because, despite being welfare maximizers, they are not able to fully apprehend constituents' preferences (Matsusaka, 1992).

A first strand of theoretical literature discusses the channel through which direct democratic institutions result in political decisions closer to citizens preferences. For example, Gerber (1996) argues that direct democracy is an instrument that reduces the gap between citizen preferences and politician behavior considering a spatial voting model. When initiatives can be proposed by an interest group, the government chooses a point which is closer to the one preferred by the median voter. Instead, when there is no threat of the initiative, the government will choose its preferred policy. Similarly, Romer and Rosenthal (1979) explore the agenda-setter model considering a situation with referendum on expenditure. Referendum gives veto power to citizens on representatives' decisions. The central finding is that government expenditures are usually higher than the ones wished by the median voter and never lower. The gap between median voter's preferences and policy outcome is reduced.

Feld and Kirchgässner (2000) describe how the referendum can positively affect citizens' information and political action. Given that with direct democracy voters can decide for themselves, they have an incentive in gathering more information on the issue on the ballot. It also reduces the ability of politicians to pursue their personal goals. Thanks to referendum, politicians' work is under scrutiny, because citizens are better informed about it. Instead, Kessler (2005) comes to a somewhat different conclusion. Using a median-voter model focusing on the asymmetry of information between citizens and politicians, she argues that in direct democratic legislation the citizen does not invest in information acquisition because her vote is unlikely to be determinant. Further, under representative democracy, the politician finds it profitable to be informed because she has discretionary power. As a result, elected representatives allow the promotion of more efficient policies with respect to the ones that would have been voted in a popular ballot.

⁴For example: Acemoglu et al. (2001) highlight the relevance of inherited institutions from colonial countries as determinant of income per capita; Aghion et al. (2004) dealing specifically with the effect of political institutions find that democracy positively affects economic growth.

Pommerehne (1978) was among the first to empirically highlight the negative effect of direct democracy on public expenditure. He used data on Swiss municipalities in the year 1970 to show that the availability of a referendum in a municipality reduces public service provision. He interprets the results to highlight that in jurisdictions where decisions are taken directly by voters the policy outcome is closer to the median voter. Hence, agency cost appear to be reduced by citizen intervention, leading to a reduction in excessive government spending.

Matusaka (1995), using annual data for the period 1960-1990 on U.S. states, uncovers again a negative impact of citizen participation on expenditure. States with statutory initiative have a significantly lower level of expenditure compared to the states that do not. Further, he looks at the effect of upper level direct democracy on lower level expenditure, finding that local expenditure is higher in initiative states. To our knowledge this is the first attempt to, at least partially, address the vertical interdependence of democratic institutions.

Feld and Kirchgässner (2001a,b) study in detail the outcome of several forms of direct democracy on public policy. Using data on 131 Swiss municipalities in the year 1990 they show that mandatory referendum on budget deficits entails a reduction in public debt, expenditure and revenue. Moreover, using data on 26 Swiss cantons for the period 1986-1997 they find that expenditure and revenue are lower in cantons with a mandatory referendum on new spending projects. They also test the effect of signature requirements for initiatives, i.e., the percentage of the population required to bring an initiative to a ballot, on expenditure, revenue, debt and deficit, finding mixed results. The signature requirement in cantons with referendum increases spending while in canton without referendum it reduces spending and revenue. Feld and Matusaka (2003) have another look at Swiss cantonal institutions, this time using data for the period 1980-1998. They consider three variables representing direct democratic institutions: the presence of a mandatory fiscal referendum, the spending threshold that triggers a referendum and the initiative signature requirement. They find an important negative effect of referenda. Specifically, cantons with referendum have, *ceteris paribus*, 19% lower expenditures compared to cantons without referendum.

In essence, most of the theoretical and empirical results point to the fact that direct democratic participation of the citizen in the decision making process brings adopted policies closer to the preferences of voters.⁵ Further, since politicians have a tendency to increase public expenditure beyond what is socially optimal implies that direct democracy has the potential to be welfare improving.

But what about a federal setting? Most of the existing literature gives insights on how direct and representative democracy affect differently the degree of decentralization. Redoano

⁵Direct democracy could also lead to a common pool problem leading to increased expenditure if the financing of public goods can be shifted to a minority of the electorate, see Asatryan et al. (2013).

and Scharf (2004) show that representative democracy sustains centralization even when direct democracy would not be able to support it, because regional policy preferences are too different. Schnellenbach et al. (2010), reach the same conclusion using a slightly different theoretical model.

Feld et al. (2008) test the latter hypothesis by using again a dataset of Swiss cantonal institutions for the period 1980-1998. They consider centralization of expenditure, revenue and tax revenue as dependent variables. They confirm, in line with theory, the hypothesis that direct democracy fosters decentralization.

In a more recent contribution, Funk and Gathmann (2011) revisit the previous empirical findings, again focusing on the Swiss case. They gather information on cantonal institutions for the period 1890-2000. The dependent variables are, alternatively, cantonal expenditure, local expenditure and within-canton decentralization. The main independent variables are a dummy for the mandatory budget referendum and the initiative signature requirement. They find, in line with theory and the other empirical studies, that referenda reduce cantonal expenditure while the signature requirement increases it. Conversely, they highlight that direct democracy does not affect the vertical structure of government, i.e., upper level institutions do not affect lower level expenditure and decentralization, contrary to the findings of Matsusaka (1995) and Feld et al. (2008). They suggest that these differences are mainly a result of the empirical method. Indeed, Funk and Gathmann (2011), thanks to a long time period, can control for unobserved heterogeneity among jurisdictions using cantonal fixed effects. As already emphasized, none of the studies mentioned above, although using data from countries with a federal structure, considers the institutional setting at both the upper- and lower-level.

Vertical interactions have also been studied within the tax competition literature. Besley and Rosen (1998) were among the first that empirically estimated the presence of vertical tax externalities. They analyze tax competition between state and federal government in the U.S.A. They show that changes in excise taxes decided by federal government on goods such as gasoline and cigarettes affect positively the corresponding state taxes. Brülhart and Jametti (2006) investigate the presence of horizontal and vertical tax externalities that arise in the context of overlapping tax bases across levels of government in a federal system. Using a panel data set of Swiss cantons and municipalities, they find that vertical externalities can outweigh the more prominently discussed horizontal ones.

1.3 Theoretical Considerations

There is little theoretical work that has explored the vertical interaction among direct democratic institutions. What if two levels of government avail of potentially varying degrees of direct democratic participation in public good provision? And what about the vertical interdependence

resulting from this? We leave a full theoretical model that identifies the channels that are at work for future research.

Table 1.1: Institutional framework

	(a)		(b)	
Jurisdiction	(1)	(2)	(3)	(4)
Cantonal	No Referendum	No Referendum	Referendum	Referendum
Municipal	No Referendum	Referendum	No Referendum	Referendum

Nevertheless, given the direct effect described above it is possible that the different combinations of institutional setting might matter and therefore should be accounted for empirically. For example, consider a federation with two levels of government, say state and local, each with the possibility for direct democratic participation of its citizens. Let us also assume that these two levels jointly provide a public good and citizens are not able to distinguish each level contribution.⁶ For example, in most of Switzerland schools are jointly managed by municipal and cantonal authorities without a clear separation of tasks, such that citizens are not aware of each level's responsibility. Finally, let us take seriously the common argument that direct democracy reduces expenditure because it affects the government's potential to extract rents. This framework produces four different cases as illustrated in Table 1.1. Previous theoretical and empirical studies have only considered a subset of these cases, either only considering one level of government and ignoring the other, or only considering upper-level institutions not accounting for lower-level institutions. Our interest is in the vertical interaction of different institutional settings and its effect on lower-level expenditure.

By our example, if the lower level does not have a referendum and the state does, citizen control at the upper level of government could allow local authorities to extract more rents, in place of the cantonal one, which implies higher local expenditure. However, if also the lower level avails of direct democratic institutions this mechanism should not work because now both governments are constrained.

If vertical interactions matter then, to understand the full effect of direct democracy, one should control for all tiers of government involved in the spending process. This is exactly what we do. We test whether the existence of fiscal referendum in the state (upper level) affects local expenditure decisions and whether this effect varies with local direct democratic

⁶Joanis (2014) uses similar assumptions by building a model of shared accountability and joint responsibility within a federation. His main insight is that the degree of decentralization might be influenced by the relative political strength of central versus local governments.

participation.⁷ From the previous example, we would expect a positive effect of state level referenda on local expenditure. Further, our main focus, municipal expenditure should be higher when local government does not have referendum and the state does rather than when both, local and state, governments have referenda.

Our newly assembled database allows us to consider the full array of direct democratic instruments, which is the main contribution of our paper. More specifically, all previously mentioned studies use the state (or canton) as the unit of observation. As such, these authors are not able to control for the institutional variation at the local level. By shifting our unit of observation to the local governments, we can control for the differential effect of state referenda depending on the existence of local referenda.

1.4 Institutional setting in Switzerland

Switzerland is often used as a natural laboratory to test theoretical predictions of fiscal federalism.⁸ The country has three levels of government: federal, cantonal and municipal, each with wide ranging autonomy both in expenditure and revenue decisions. During the period 1990-2009 the expenditure (revenue) shares averaged 32% (31%) for federal, 41% (41%) for cantonal and 27% (28%) for local administrations. These shares are quite stable over time. At the sub-central level each cantonal constitution defines the basic framework for public service provision. Indeed, some services are solely provided by one level of government (cantonal or municipal), while for a considerable range of public goods there is expenditure sharing by both levels of government.⁹

Finally, localities provide some services based on a cantonal mandate. Table 2.1 presents the contribution in percent of total spending per category by each level of government. While Defense is almost exclusively in the hand of the federal government, cantons carry the bulk of expenditure in Health, Security and Education. Similarly, municipalities are the main actors regarding Environment, Social Housing and Culture and Recreation.

Municipalities also have large autonomy in setting tax rates within their respective cantonal constitutions. It should be noted that, contrary to many other federations, both sub-central levels of government essentially share the same tax bases, i.e., municipalities' main source of revenues are taxes on personal and corporate income and wealth.

Similarly, all three levels of government have an array of direct democratic instruments at hand in their respective decision making process. Also in this case, there is heterogeneity among

⁷By referring to Table 1.1, this means that we are going to test, first, whether municipal expenditure is significantly different between case (a) and case (b) and, second, whether this effect is different between case (3) and case (4).

⁸Among others: Kirchgässner and Pommerehne (1996), Brülhart and Jametti (2006) and Brülhart et al. (2012)

⁹Indeed, for many public service categories all three levels of government are involved to varying degrees.

Table 1.2: Destination of public expenditure by level of government in percentage, 2009

	State	Cantons	Municipalities	Total
Administration	57%	23%	20%	100%
Defense	91%	4%	5%	100%
Security	10%	64%	26%	100%
Economy	41%	38%	21%	100%
Environment	17%	22%	61%	100%
Social housing	1%	17%	82%	100%
Health	3%	84%	13%	100%
Culture and recreation	8%	32%	60%	100%
Education	9%	60%	31%	100%
Welfare	42%	38%	20%	100%

Source: Swiss Federal Department of Finance

Table 1.3: Use of direct democratic institutions, 1990-2010

	Federal	Cantons	Municipalities*
Initiative	76	354	187
Optional referendum	67	362	337
Mandatory referendum	45	1374	2918

Source: C2D, Micotti and Bützer (2003).

*Based on 91 municipalities for the period 1990-2000

cantons and municipalities. For larger municipalities the two main instruments are the popular initiative and the referendum. We concentrate on the existence of mandatory fiscal referenda within a jurisdiction. Note that fiscal referenda can be mandatory or optional.

The optional referendum is generally triggered by the collection of a certain number of signatures in a given interval of time, while for the mandatory referendum there often exists a threshold on the expenditure amount after which a referendum must be held. In Table 1.3 we show the use of these direct democratic instruments by level of government. The municipal data we report are from Micotti and Bützer (2003) who account for 91 municipalities for the period 1990-2000. We see that mandatory referendum is, by far, the most used in the two sub federal jurisdictions. Similarly, Figure 1.1 illustrates the institutional variation for each canton in our dataset. Besides the significant variation in institutional settings across cantons, we observe a large number of cantons (both with and without referendum) displaying institutional variation

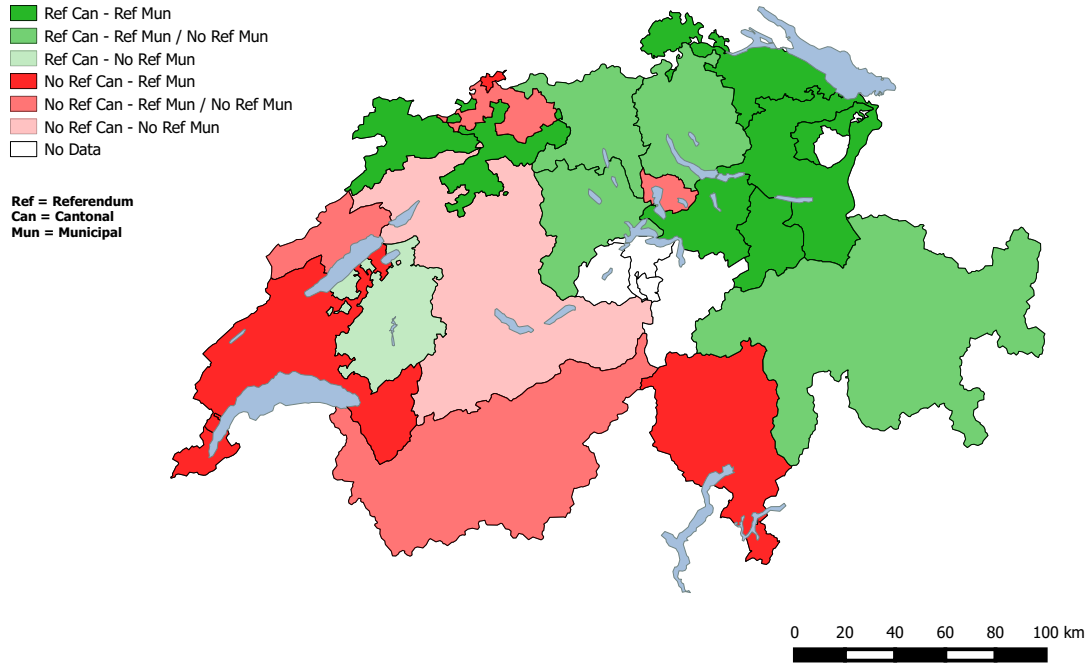


Figure 1.1: Variability of mandatory fiscal referendum in Switzerland.

within the canton.

Thus, Switzerland presents an ideal setting to empirically test our hypothesis, with important variation at all levels of government in expenditure decisions as well as in the institutional framework. All this in an otherwise fairly homogeneous setting of a small country.

1.5 Data and empirical model

1.5.1 Data

To test our hypothesis we assembled a database including annual observations of 119 of the largest municipalities belonging to 22 Swiss cantons over the period 1993 to 2007. We use as dependent variable (the log of) net municipal expenditure per capita. This value is net of transfers that are received from other jurisdictions, i.e., we exclude both vertical and horizontal transfers. Net figures correspond to expenditure decisions entirely under the autonomy of the municipality and are our main focus.¹⁰

¹⁰See Buettner and Wildasin (2006) on how the municipal fiscal budget is affected by intergovernmental transfers.

Table 1.4: Details on institutional interaction and municipal expenditure

		Canton		
		Referendum	No Referendum	Difference
Municipality	Referendum	3,368 (36%)	3,307 (29%)	59
	No Referendum	3,847 (8%)	3,301 (27%)	546***
	Difference	-479***	6	

Notes: The table shows, for each possible institutional interaction, the average value of the net municipal expenditure per capita. It also reports the difference and the significance of the t-stat for equality of means. In parenthesis the share of municipalities belonging to each case.

We obtained information on cantonal direct democratic institutions from Fischer (2009). We consider whether the canton has a mandatory fiscal referendum for new spending projects or not. Some cantons changed their legislation in the period covered by our data, but this variation is small. In 1995, 17 cantons over 26 had mandatory fiscal referendum. In 2007 the number of these cantons decreased to 16. In total 5 cantons changed at least once.¹¹ The municipal institutional setting is taken from a new database at the local level by Bützer (2007).¹²

About 65% of the municipalities in our sample have a mandatory fiscal referendum. This institution is almost invariant over time for our sample period. The only change is the municipality of Volkestwil in 2002 which adopted a mandatory fiscal referendum. Some changes occurred concerning the thresholds that trigger mandatory referendum. Interestingly for our identification strategy is that there have been no changes at the municipal level following any of the changes in cantonal legislation. Although the number of municipalities considered is not large, our sample allows us to consider all possible institutional interactions. As reported in Table 1.4 during the period covered in our analysis 27% of the municipalities are without referendum in cantons without referendum, while 8% are municipalities without referendum in cantons with. Municipalities with referendum that belong to cantons without referendum are 29% of the total, while 36% of the municipalities with referendum are in cantons also with referendum.

Table 1.4 also presents the average of local expenditures for each case in our sample. Yearly expenditure is highest (about CHF 3,800 per capita) in municipalities without referendum located in cantons with referendum, and lowest (CHF 3,300) for municipalities without referendum in cantons also without referendum. Two of the four cases present differences that are statistically

¹¹Funk and Gathmann (2011) present details of the variation for the period 1890-2000.

¹²Feld et al. (2011) use the same data source to revisit the analysis done by Feld and Kirchgässner (2001a). We extend Bützer's (2007) dataset by including information on a few additional municipalities: Basel, Glarus, Horgen, Lenzburg, Romanshorn, St. Moritz, Sursee and Zofingen.

significant. First, in cantons availing of mandatory fiscal referenda, municipalities with this instrument spend roughly 12% less than municipalities without it. Second, for municipalities without referendum, a cantonal referendum increases local expenditure by almost 17%.

Table 1.5: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Municipal expenditure p/c	3375.34	1478.53	777.18	18295.57	1785
Mandatory ref. (mun)	0.64	0.47	0	1	1785
Mandatory ref. (can)	0.44	0.49	0	1	1785
Population (Log) (mun)	9.77	0.67	8.51	12.79	1785
Share pop foreigner (mun)	0.25	0.08	0.07	0.51	1785
Share pop < 20 (mun)	0.21	0.02	0.15	0.28	1785
Share pop > 64 (mun)	0.16	0.03	0.07	0.24	1785
Area (mun)	0.20	0.27	0.02	2.54	1785
Unemployment (mun)	4.12	2.02	0.2	12.3	1782
University (mun)	0.07	0.26	0	1	1785
Urban center dummy (mun)	0.42	0.49	0	1	1785
Federal tax on income p/c (mun) (Log)	2.13	0.50	0.57	4.70	1785
Left wing (mun)	0.26	0.17	0	0.8	1782
Ministers (mun)	7.31	3.43	3	30	1782
Parties in Gov (mun)	3.95	0.95	2	8	1782
Language (can)	0.28	0.45	0	1	1785
Left wing (can)	0.27	0.12	0	0.6	1785
Dependency ratio (can)	59.25	16.38	-170.20	73.34	1785
Population (Log) (can)	12.97	0.82	10.54	14.08	1785

To go beyond unconditional average effects we supplement the institutional information with an array of control variables covering socio-economic and political characteristics. Specifically, we control for *population* to consider possible economies of scale in the provision of public goods. We use population age shares for old and young (*share pop > 64* and *share pop < 20*), to consider differences in the demand of public goods. The *share of foreigners* is included for the same reason. Municipal *area* proxies higher costs in provision of public services, as area is closely related to municipal topography. *Unemployment* controls both for the economic environment as well as the effect on social security, thus we should expect a positive effect on expenditure. The presence of a *university* in a municipality should affect positively the level of expenditure either because of direct funding or because of related facilities. We also control for municipalities that are *urban centers*, to consider the possible higher demand for public goods for central places.

Given that data on income are not available by municipality we use the amount of *federal tax on income* paid per capita. Again with this variable we control for the demand of public goods and use it as a proxy for tax revenues (see below).

Further, we control for political variables. The number of *ministers* and the number of *parties in the government* should be positively related with expenditure because of the common pool problem (Roubini and Sachs, 1989). The share of *left-wing* ministers in the executive is usually used as proxy for citizens' preferences. Left-wing parties should be more in favor of government intervention implying a higher level of expenditure. Table 1.5 presents summary statistics of the data and Appendix Table A.1 gives the definition and source of each variable.

1.5.2 Empirical model

The model we estimate is:

$$Y_{ict} = \beta_1 MunRef_i + \beta_2 CanRef_{ct} + \beta_3 MunRef_i * CanRef_{ct} + \beta_4 \mathbf{X}_{ict} + t_t + \epsilon_{ict} \quad (1.1)$$

where i denotes the municipality, c the canton and t the year. The dependent variable Y is the log of municipal expenditure per capita. $MunRef$ and $CanRef$ are dummy variables whether a municipality or a canton avails of a mandatory fiscal referendum, respectively. X_{ict} are other control variables including the political and socio-economic ones discussed above, while t_t are year fixed effects. ϵ_{ict} is the error term.

We start by estimating the model in Equation (2.9) without considering institutional interaction, mainly for comparison to prior studies. We then proceed to add the interaction term to test our main hypothesis. Prior to presenting our results, discussion of a few methodological points is in order.

Cantonal heterogeneity

Funk and Gathmann (2011) find that cantonal unobserved heterogeneity affects in an important way the impact of direct democratic institutions on public expenditure. To control for unobserved heterogeneity they include canton fixed effects.

Ideally, our estimation of Equation (2.9) would also include canton fixed effects. However, as mentioned above, the institutional variability at the cantonal level is very small. As such, the effect of a mandatory cantonal referendum would only be identified by those municipalities which belong to cantons with changes in the year of the change. In our case, this would be only 43 over a sample of 1785 observations. We thus report results using cantonal fixed effects as a robustness check to our baseline results.

However, accounting for cantonal heterogeneity is important. Therefore, we control, as an alternative to fixed effects, for observable cantonal differences in most of our specifications, i.e., we extend the set of controls \mathbf{X}_{ict} by canton level variables. We include a dummy for Latin *language* cantons to control for cultural differences across regions. Further, we control for political preferences using the share of seats of *left wing* parties in the cantonal parliament. To take into account the demand side we include *cantonal population* and the *dependence ratio*. In addition, we use dummy variables for the cantons of Basel-City and Geneva. Both city-cantons, with special (cantonal) revenue sharing agreements between the city and the (much smaller) other municipalities in the canton. Summary statistics are included in Table 1.5.

As a further robustness check, we use random effects estimation. Given the structure of the dataset we use an unbalanced, nested error component model. Our dataset is the classical example of a hierarchical and unbalanced panel (Baltagi et al., 2001).

Endogeneity

An important issue, inherently difficult to deal with when analyzing the effect of institutions on outcomes is the potential endogeneity of institutions. Indeed, unobserved characteristics (for example fiscal conservatism) could determine both the choice of institutions and the level of expenditure. As mentioned before, in our dataset we cannot control for unobserved stable cantonal characteristics via the inclusion of canton fixed effects. Further, Funk and Gathmann (2011) use institutions of neighboring jurisdictions as instruments. In our situation, this would mean that we instrument our municipal referendum variable by a (weighted) average of institutions in neighboring jurisdictions. We cannot apply this identification strategy, since not all (neighboring) municipalities are contained in our sample.

We address the issue in three ways. First by including observable cantonal characteristics (see above).¹³ Second, institutions are highly persistent. The introduction of fiscal referenda both at cantonal and municipal levels starts in the end of the 19th century. For most of the cantons and municipalities in the sample, the set of institutions has been in place decades before the beginning of our sample. We thus regard institutions at least as predetermined. We would argue that this approach of identification is strengthened by the fact that, as mentioned above, no municipality in our sample changed institutions following any of the (few) cantonal changes we observe.

Finally, to acknowledge that our variation is mostly cross-sectional, we run a specification using municipal averages.

¹³Feld et al. (2008) widely argue that in Switzerland such endogeneity is a minor issue after one controls for the main cultural differences (e.g., language and religion) between cantons.

Inference

We use as baseline standard errors clustered by cantons, since the dependent variable is explained by variables that are observed on a more aggregate level (Moulton, 1990).¹⁴ In our case, the cantonal referendum and controls. Further, given the panel structure of our dataset, serial correlation on expenditure could arise. Thus, as a robustness check we cluster the errors at the municipal level. Finally, given that our observations are geographical units we control for spatial correlation among municipalities by using the method proposed by Conley (1999).

1.6 Results

1.6.1 Main results

In Table 1.6 we show the results of our analysis without considering the interaction term. The effect of direct democracy on expenditure in our sample seems to be coherent with previous findings and in contrast with others.

As the results of the cross-sectional analysis by Feld and Kirchgässner (2001b) we find that direct democratic institution at municipal level has a negative direct effect on local expenditure. By looking at the first two columns of Table 1.6 this is robust to controlling for socio-economic and political variables.

In columns (3) and (4) of Table 1.6 we show that cantonal referendum affects municipal expenditure positively in our sample. This is coherent with the finding of Matsusaka (1995) but in contrast with Funk and Gathmann (2011). Municipalities that belong to cantons with mandatory referendum present an expenditure level that is around 15% higher (column 4) than the ones belonging to cantons without referendum.

In the last two columns of Table 1.6 we include both the municipal and cantonal referendum dummies, but without the interaction term. The results of our main variables vary only slightly and they are both significant.

The control variables that are always significant are the *share of young population*, the municipal *area*, the *university* dummy and the *federal tax income*. A younger population negatively affects municipal expenditure, while municipal area, a university and income have a positive effect.

In Table 1.7 we present our main results including the interaction term. Our model performs quite well, in the full specification we explain more than 50% of the variation in our data. Further, the coefficients on the controls do not differ much from Table 1.6. As such we do not discuss them further here.

¹⁴Alternatively, to take into account the limited number of clusters at hand, we used the wild-bootstrap method proposed by Miller et al. (2008). Results do not change and are available upon request.

Table 1.6: Model without interaction term for the period 1993-2007

	(1)	(2)	(3)	(4)	(5)	(6)
Mandatory ref. (mun)	-0.022 (0.081)	-0.030 (0.037)			-0.065 (0.072)	-0.078** (0.037)
Mandatory ref. (can)			0.148** (0.062)	0.172*** (0.050)	0.156** (0.061)	0.181*** (0.051)
Population (Log) (mun)		0.010 (0.037)		0.008 (0.034)		0.010 (0.034)
Share pop foreigner (mun)		0.459 (0.340)		0.131 (0.307)		0.088 (0.308)
Share pop < 20 (mun)		-3.525* (1.875)		-4.362** (1.690)		-4.320** (1.631)
Share pop > 64 (mun)		0.690 (1.094)		0.137 (1.222)		0.226 (1.144)
Area (mun)		0.141** (0.052)		0.127** (0.046)		0.129*** (0.045)
Unemployment (mun)		0.005 (0.014)		0.021 (0.012)		0.021 (0.013)
University (mun)		0.281*** (0.077)		0.220** (0.079)		0.212** (0.081)
Urban center dummy (mun)		0.079 (0.049)		0.079* (0.042)		0.093** (0.043)
Federal tax on income p/c (mun)		0.193** (0.079)		0.206** (0.075)		0.202** (0.074)
Left wings parties - cabinet (mun)		-0.232* (0.117)		-0.140 (0.113)		-0.159 (0.112)
Parties in Gov (mun)		-0.026 (0.025)		-0.024 (0.024)		-0.022 (0.024)
Ministers (mun)		0.009 (0.006)		0.005 (0.006)		0.005 (0.006)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cantonal controls	Yes	Yes	Yes	Yes	Yes	Yes
Basel and Geneva dummy	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.100	0.486	0.138	0.531	0.141	0.534
N	1782	1780	1782	1780	1782	1780

Notes: The dependent variable is the log annual municipal per capita expenditure. Standard errors in parenthesis. Standard errors are clustered at the cantonal level. *p < 0.1, **p < 0.05 and ***p < 0.01.

Table 1.7: Model with interaction term for the period 1993-2007

	(1)	(2)	(3)
Mandatory ref. (mun)	0.008 (0.075)	-0.011 (0.049)	-0.007 (0.047)
Mandatory ref. (can)	0.278** (0.107)	0.290*** (0.073)	0.298*** (0.069)
Mandatory ref. (can)*(mun)	-0.183 (0.128)	-0.150* (0.079)	-0.182** (0.075)
Population (Log) (mun)		-0.007 (0.036)	0.024 (0.033)
Share pop foreigner (mun)		0.113 (0.320)	0.199 (0.275)
Share pop < 20 (mun)		-3.759** (1.563)	-3.882** (1.509)
Share pop > 64 (mun)		0.360 (1.159)	0.508 (1.130)
Area (mun)		0.154*** (0.052)	0.135*** (0.043)
Unemployment (mun)		0.029** (0.013)	0.025* (0.012)
University (mun)		0.204** (0.088)	0.197** (0.083)
Urban center dummy (mun)		0.093* (0.049)	0.088* (0.042)
Federal tax on income p/c (mun)		0.228** (0.081)	0.209*** (0.071)
Left wings parties - cabinet (mun)			-0.210* (0.110)
Parties in Gov (mun)			-0.023 (0.023)
Ministers (mun)			0.006 (0.006)
Year FE	Yes	Yes	Yes
Cantonal controls	Yes	Yes	Yes
Basel and Geneva dummy	Yes	Yes	Yes
Significance inter + (can) ¹	**	***	***
Significance inter + (mun) ²	-	*	**
R ²	0.154	0.535	0.545
N	1782	1782	1780

Notes: The dependent variable is the log annual municipal per capita expenditure. Standard errors in parenthesis. Standard errors are clustered at the cantonal level.

*p < 0.1, **p < 0.05 and ***p < 0.01.

¹ joint significance level of cantonal referendum and interaction

² joint significance level of municipal referendum and interaction

Municipal referendum has a positive sign in the first column and negative in the last two. However, they are not significant in any of the specifications. Cantonal referendum is always significant at the 1% level with a positive sign. These results are in line with the ones without the interaction term.

The interaction term between cantonal and municipal referendum is always negative and statistically significantly so in columns (2), where we add the socio-economic controls, and (3), where we further include political variables. Thus, a municipal referendum seems to significantly reduce the positive effect on expenditure from cantonal referendum.

More in detail, considering the last column of Table 1.7, if the municipality does not have a referendum this effect is stronger (0.298) than the case in which municipality have the referendum (0.298-0.182=0.116). The F-statistic to test for joint significance of the coefficients Mandatory ref. (can) and Mandatory ref. (can)*(mun) is significant at the 99% confidence level.

Our data thus confirms our hypothesis that cantonal referendum affects municipal policies depending on whether it also has a referendum or not. Following our intuition, it seems that if citizens control is at just one level of government, then the other level of government, if it is free to choose, spends more. These higher expenditures from a political economy point of view could represent rent seeking of politicians. Then, in order to tame the Leviathan in a federation, it is not enough to tighten the control of citizens at just one level of government. The only way to reduce it, seems to be by extending direct democratic instrument to both levels of government. Our results could also explain why Funk and Gathmann (2011) did not find a statistically significant effect of cantonal referendum on municipal expenditures, as they are unable to control for the within-canton institutional variation. Our results suggest that this variation does indeed matter.

1.6.2 Robustness checks

In Table 1.8 we show our results after subjecting the baseline regression in column (3) of Table 1.7, which we repeat in column (1), to different robustness checks.

First, in column (2) we present the results using only the cross-section variation in our sample using time-averages of our data. The results remain virtually unchanged.

Second, we deal with the possible bias related with cantonal unobserved heterogeneity. In column (3) we use a random effect estimation. Again, only cantonal referendum and the interaction term are significant.

Table 1.8: Robustness checks

	OLS (1)	OLS - Cross section (2)	Random Effect (3)	Fixed Effect (4)	OLS (5)	OLS (6)	OLS - Spatial (7)
Mandatory ref. (mun)	-0.007 (0.047)	0.071 (0.080)	-0.010 (0.050)	-0.043 (0.050)	-0.045 (0.046)	-0.007 (0.060)	-0.007 (0.044)
Mandatory ref. (can)	0.298*** (0.069)	0.297*** (0.080)	0.109*** (0.035)	0.080* (0.040)	0.266*** (0.065)	0.298*** (0.052)	0.298*** (0.061)
Mandatory ref. (can)*(mun)	-0.182** (0.075)	-0.207** (0.098)	-0.103** (0.042)	-0.066 (0.046)	-0.148** (0.069)	-0.182*** (0.066)	-0.182*** (0.069)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demo-Eco controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Federal tax on income P/C (mun)	Yes	Yes	Yes	Yes	No	Yes	Yes
Political controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cantonal controls	Yes	No	Yes	No	Yes	Yes	Yes
Basel and Geneva dummy	Yes	Yes	Yes	No	Yes	Yes	Yes
Cantonal FE	No	No	No	Yes	No	No	No
Level of clustering	Cantonal	Cantonal	Cantonal	Cantonal	Cantonal	Municipal	Spatial
R ²	0.545	0.670	0.444	0.683	0.485	0.545	0.545
N	1780	73	1780	1780	1780	1780	1780

Notes: The dependent variable is the log annual municipal per capita expenditure. In column (3) both dependent and independent variables are averaged over-time. Standard errors in parenthesis. In columns (1-2-3-4-5) standard errors are clustered at the cantonal level. In column (6) standard errors are clustered at the municipal level. In column (7) spatial correlated standard errors. Neighbourhood distance cutoff of 15 km. *p < 0.1, **p < 0.05 and ***p < 0.01.

The effect of cantonal referendum on local expenditure is now (0.109) if the municipality does not have a referendum, and $(0.109-0.103=0.006)$ in the case in which the municipality has the referendum. According to this set of results, the cantonal effect on local expenditure is erased by the presence of referendum also at the municipal level. Column (4) reports the results by using cantonal fixed effects. The variables of interest still present the signs that we previously found, but we lose, as expected, significance of the interaction term. Cantonal referendum is now significant only at the 10% level.

We control for municipal per capita income in all of our specifications. Since personal income represents an important tax base for municipalities, this would imply that income and expenditure might be jointly determined through the municipal budget constraint, and as such would be endogenous. In column (5) we show that this does not affect our main results, omitting the income variable.

Finally, we deal with possible issues related to the error term. In column (6) we cluster standard errors at the municipal level. By doing so we deal with possible serial correlation. As in Table 1.7 municipal referendum is not significant while the cantonal is. Also the interaction term is still significantly negative at the 1% level, confirming our hypothesis. Column (7) presents the results accounting for spatial correlation that could be present since the observations represent geographical units. We show results that consider as neighbors all municipalities that are within a distance of 15 km. The interaction term now turns out to be significant at the 1% level.

Overall, all our robustness checks confirm our main results.

1.7 Conclusion

We revisit empirical findings on the relationship between direct democratic instruments and public expenditure. While most of the earlier empirical research was based on data from federations, those studies did not, or only partially, address the potential vertical structure of those instruments. In other words, prior research focused on the effect of direct democracy in one level of government on the public expenditure of that same level, or of the effect of upper-level direct democracy on lower-level expenditure. By changing the unit observation to the lower level of government, our dataset allows to control for the existence of direct democratic instruments at two levels of government. In particular, we can investigate whether upper-level (state) direct democracy has a differential effect on local public expenditure depending on the existence of lower-level (local) direct participation of the citizen in policy decisions.

Using a newly assembled database of Swiss municipalities in 22 cantons (states) over the period 1993 to 2007, we consistently find that local expenditures increase with the presence of mandatory fiscal referenda at the canton level. However, this effect is significantly reduced by the

presence of such referenda also at the municipal level. In some specifications, the expansionary effect on expenditure of upper-level direct democracy is actually eliminated by the presence of fiscal referenda at the local level.

We would argue that this novel result, while interesting in itself, has much wider relevance for policy and empirical research. Our results show that the full variation of institutions at different levels of government should be considered when addressing empirically the impact of direct democracy on policy decisions in a federation. Further, our results suggest that concentrating on direct democratic instruments at one level of government (e.g., state) might not be enough to bring policy decisions closer to voters preferences, as rent extraction might be increased by another authority, unconstrained by citizen control. To effectively tame the Leviathan all levels of government involved in the public good provision should present some degree of direct democracy.

Our paper is mainly empirical. In future research we intend to investigate also on a more theoretical level the channels through which vertical interaction between direct democratic instruments at different levels of government play out. Further, we seek to understand how variation in institutions in a federation can affect the degree of decentralization.

1.A Appendix

Table 1.A.1: Data description

Variable Name	Description	Source
Municipal expenditure p/c (Log)	Natural logarithm of expenditure net per capita	Own calculation on the basis of data from Statistiques des Ville Suisses
Mandatory ref. (mun)	Dummy variable = 1, in case mandatory referendum exist, and zero otherwise (municipal)	Bützer (2007)
Mandatory ref. (can)	Dummy variable = 1, in case mandatory expenditure referendum exist, and zero otherwise (cantonal)	Fischer (2009)
Mandatory ref. (mun)*(can)	Mandatory ref. (mun)*Mandatory ref. (can)	Own calculation
Population (Log) (mun)	Natural logarithm of municipality population	Own calculation on the basis of data from Swiss Federal Statistical Office
Unemployment (mun)	Share of unemployment people	Statistiques des Ville Suisses
Share pop foreigner (mun)	Share of foreigner on municipal population in 2000	Statistiques des Ville Suisses
Share pop < 20 (mun)	Share of people with age < 20 on municipal population in 2000	Statistiques des Ville Suisses
Share pop > 64 (mun)	Share of people with age > 64 on municipal population in 2000	Statistiques des Ville Suisses
Area (mun)	Municipal surface	Swiss Federal Statistical Office
University (mun)	Dummy variable = 1, in case municipality with university, and zero otherwise	Own calculation
Urban center dummy (mun)	Dummy variable = 1, in case municipality is a urban center, and zero otherwise	Own calculation
Federal tax on income p/c (Log) (mun)	Average municipal federal tax paid on income. Linear interpolation is used for missing years.	Statistiques des Ville Suisses
Parties in Gov (mun)	Number of parties in cabinet (municipal)	Own calculation on the basis of data from Statistiques des Ville Suisses
Left wings (mun)	Share of seat in the cabinet own by a left party (Socialist, Green and other local left parties)	Own calculation on the basis of data from Statistiques des Ville Suisses
Ministers (mun)	Number of minister in cabinet (municipal)	Own calculation on the basis of data from Statistiques des Ville Suisses
Population (Log) (can)	Natural logarithm of cantonal population	Own calculation on the basis of data from Swiss Federal Statistical Office
Left wings (can)	Share of seat in the parliament own by a left party (Socialist, Green and other left parties)	Own calculation on the basis of data from Swiss Federal Statistical Office
Dependency ratio (can)	(Number of people aged 0-19 and those aged 65 and over) / (Number of people aged 20-64)	Own calculation on the basis of data from Swiss Federal Statistical Office
Language (can)	Dummy variable = 1, in case the municipality belong to a non-German speaking canton	Own calculation

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Chapter 2

Direct Democracy, Partial Decentralization and Voter Information

2.1 Introduction

The literature emphasizes how countries allowing for direct legislation produce economic outcomes that are different compared to the ones of pure representative democracies.¹

Few theoretical and empirical papers have assessed the effect of direct democracy on the level of decentralization. In a theoretical contribution Redoano and Scharf (2004) suggest that direct democracy should foster a higher level of decentralization. However, empirical analysis has produced contrasting results. On the one hand Feld et al. (2008) confirm this theoretical prediction by showing that Swiss cantons (states) with fiscal referenda experience a higher level of decentralization while on the other hand Funk and Gathmann (2011), again using a sample of Swiss cantons, conclude that direct democratic institutions produce no effects on the allocation of public expenditure between levels of government.

Although the two analyses are different in terms of period of time considered and identification strategy used, they both focus on an aggregate state level measure of decentralization. This last point constrains the analysis since variation of direct democratic institutions at the local level cannot be taken into account. The problem with such an approach is that Swiss sub-federal jurisdictions play a central role in determining expenditure decentralization, meaning that their institutional settings might be important in defining the dependent variable. Indeed, Swiss municipalities experience a large autonomy in controlling availability of direct democratic institutions as well as in tax setting and public expenditure decisions.

Therefore, in this analysis I want to identify the effect of direct democracy on decentralization

¹Among them: Hinnerich and Pettersson-Lidbom (2013), Feld and Matsusaka (2003), Gerber (1996) and Matsusaka (2005)

and as a novelty from previous empirical studies I focus on local level institutions. In order to do so I run a *difference in differences* analysis on a panel of 406 Swiss municipalities for a period of 20 years. Among these municipalities, 45 either introduced or abolished one of the more relevant direct democratic institutions in Switzerland, namely the mandatory referendum on new expenditure. I show once again that different decision making processes produce different policy outcomes. Direct democracy at the local level decreases decentralization. Further, it also decreases the amount of transfers that a lower level jurisdiction receives from the state level. These results are robust to a variety of controls. Most importantly, the effect of mandatory municipal referendum on decentralization is still robust after I control for possible task assignment and direct democratic institutional changes at the cantonal level.

These results are in line with the prediction of a companion theoretical analysis. I set up a simple theoretical model on the effect of direct democracy on decentralization where, unlike Reoano and Scharf (2004), task assignment decisions are assumed to be exogenously determined. I follow this strategy in order to have a model that is coherent with the actual Swiss institutional setting. In Switzerland, as in many other countries, task assignment is defined in federal and sub-federal constitutions as well as in special laws. However, Swiss citizens are called to vote in favour or against any change decided to existent constitutions, which means that task assignment is essentially decided solely through direct legislation. In other words, task assignment in Switzerland does not boil down to a representative versus direct democracy issue. Hence, I move towards the effect that direct democracy might have on governments' electoral incentives. To do so, I follow Joanis (2014) where substantial attention is given to vertical interaction between governments. Theoretically, direct democratic institutions are expected to foster more efficient policies (e.g., reduction of wasteful public expenditure) because they strengthen citizens awareness of government's behaviour thanks to an increased availability of information. Thus, in this model direct democracy is viewed as an instrument able to affect positively citizens' information about politicians. However, in a federal country this positive effect might be reduced because public goods are often provided jointly by more than one level of government which might avail of different degrees of citizen participation. Additionally, if these two governments share the responsibility of public good provision they will have common electoral incentives. Given this environment, both governments will find it convenient to move expenditure to the government less exposed to citizen scrutiny, eventually affecting the actual level of decentralization.

As a result, direct democratic institutions should produce two opposite effects depending on whether its influence on citizens' information is stronger at the local or at the state level. Direct democracy positively affects decentralization if it is stronger at the upper level, as shown by Feld et al. (2008), while it negatively affects decentralization if it is stronger at the lower level, as I show in this paper.

The remainder of the paper is organized as follow. Section 2.2 introduces to the related literature. Section 2.3 outlines the model and the testable hypothesis. Section 2.4 provides institutional background on Switzerland, while Section 2.5 describes the dataset and the empirical strategy. The results along with further robustness checks are reported in Sections 2.6 and 2.7. Section 2.8 concludes.

2.2 Literature review

The standard approach on fiscal federalism is based on the influential work of Oates (1972). The “Decentralization theorem” suggests that tasks should be assigned to sub-central government when the gains from tailoring policies to local communities are higher than the losses from the presence of inter-regional spillovers. This result is driven by the assumptions of uniform provision across the country by central level authorities and governments that aim to maximize citizens’ welfare.

In recent years, a series of studies reformulate this conclusion by introducing a political economy perspective. This strand of the literature is also known as second generation theory of fiscal federalism (Oates, 2005). Besley and Coate (2003) carried out a paper related to the one of Oates (1972) by relaxing his basic assumptions. Government objective functions take into account political incentives and centralization does not imply uniform provision anymore. The authors assume the provision of public goods as the outcome of a political process. When centralization is in place the bargaining process involves delegates elected from different jurisdictions. Hence, a common pool problem arises producing an over provision of public goods. In contrast with previous results, the only case in which centralization reaches efficiency is when there are identical regions and spillovers effects are complete. Nevertheless, the author confirms the intuition of Oates that heterogeneity and spillovers are the core elements in the decentralization problem.

The second generation theory considers also the possible positive effect of fiscal federalism on government’s accountability. One of the main arguments is the presence of yardstick competition. Besley and Case (1995) consider a model where citizens compare own policy outcomes with neighbouring jurisdictions. Under the assumption of similar shocks, rational voters will take into account performance comparison while they vote. Hence, policy choices among neighbouring jurisdictions become interdependent given the possible strategic behaviour of politicians. The authors test the model prediction using U.S. state level data. Yardstick competition works as a fiscal restraint.²

Other authors move the attention from the horizontal interactions among sub-central levels

²Bordignon et al. (2003) confirm these results by looking at the presence of yardstick competition among local governments in Italy.

of government to the vertical interactions between central and local levels of government.

For example, Joanis (2014) produces a theoretical analysis by moving away from the classical hypothesis of complete centralization or decentralization assuming a condition of partial decentralization. In the latter more than one level of government provide a specific public good. The model is structured on a pure moral hazard political agency model. Strategic behaviours arise because of the asymmetric information of governments with respect to voters, that eventually triggers a reduction on the accountability benefits of decentralization. The main results predict that decentralization crucially depends on the relative rents from holding office, besides political conditions and competence of both levels of government. The author finally suggests that partial decentralization is desirable only if the benefit of complementarity in good provision is higher than the cost due to the reduction in accountability.³

Therefore, it seems that there is a positive effect on politicians accountability if we look at horizontal interaction between same level jurisdictions (Besley and Case, 1995); while a negative effect might arise if we look at the jurisdictions of two or more different levels (Joanis, 2014).⁴

Few theoretical and empirical studies predict how decision making process institutions (i.e., direct vs. representative democracy) can define the extent of fiscal decentralization.

Redoano and Scharf (2004) look at the centralization process of tasks. In this case the authors consider centralization as equalization of policies across regions. They show that under representative democracy, voters from a pro-centralization jurisdiction can affect delegates conduct from a reluctant jurisdiction by choosing representatives which present similar preferences. Thus, centralization has a higher probability to occur when the decisions are taken through representative rather than direct democracy.

Empirical analysis have been done to test this theoretical prediction. Both Funk and Gathmann (2011) and Feld et al. (2008) show results by using data on Swiss cantons. The latter confirm the hypothesis that direct democracy encourages decentralization while the former did not find any significant effect of direct democracy on the level of decentralization. One of the main differences in these two studies is the identification strategy. On the one hand, Feld et al. (2008) consider direct democracy as a predetermined characteristic of cantons suggesting that endogeneity is a minor issue in this analysis. Given this assumption they rely on a pooled cross section - time series analysis where a high number of controls are used to compensate for the absence of fixed effects. On the other hand, Funk and Gathmann (2011) allow the effect to be identified by those jurisdictions that experienced an institutional change over the 100 years period they consider. To do so, they exploit a first dimension of endogeneity by using fixed effects at the cantonal level, thus controlling for unobserved heterogeneity among jurisdictions.

³Jametti and Joanis (2011, 2014) empirically confirm the model predictions.

⁴Brulhart and Jametti (2006) show that in a context of tax competition vertical interaction between government might be more relevant than the horizontal one.

Further, they provide a robustness check, to control for a second type of endogeneity that stems from the reasons leading cantons to change institutions. Hence, they use an instrumental variable approach by instrumenting direct democratic institutions on the availability of the same institution in neighbouring cantons and with the number of signatures to launch a constitutional initiative.

In a separate paper Galletta and Jametti (2012) look at the effect of state direct democracy on local level expenditure. They have done an extension of previous works by allowing for variation of institutions over the two levels of government involved in the public good provision. They found that direct democracy at the state level foster an increase of local public expenditure. However, this effect is lower when also local government experience direct legislation. Thus, vertical interaction of decision making process institutions seems to play a role.

2.3 Model

2.3.1 The economic framework

The theoretical structure draws on Joanis (2014), where vertical interaction of governments characteristics have been found to present a major impact on decentralization. My framework focuses specifically on the role played by direct democracy in determining decentralization. For this reason I see my model as a simplified version of Joanis (2014) where more elements are considered in the analysis. I emphasize the informative effect that direct legislation produces on citizen awareness of government actions and how this will eventually affect the level of decentralization.

There are two time periods $t = 1, 2$ and two levels of government $i = s, l$ (state and local) that jointly provide a public good g in a given local jurisdiction where citizens have homogeneous preferences.⁵ Citizens' preferences are characterized by a quasi-linear utility function.

$$u(g, c) = g^\sigma + c \quad (2.1)$$

where $0 < \sigma < 1$ while g and c are the consumption of a public and a private good respectively.

The public good output is given by a CES production function in which the inputs are given by each level of government contribution:

$$g = ((g^s)^\theta + (g^l)^\theta)^{\frac{1}{\theta}}, \quad (2.2)$$

where $0 < \theta < 1$, which implies that the inputs are not perfect substitutes. It is worth noting that, differently from Joanis (2014), the two governments are assumed to be equally competent in the provision of the public good.

⁵Given that citizens are homogeneous population is normalized to one.

Each government levies a lump sum tax x^i such that

$$X = x^s + x^l, \text{ with } x^i = \tau g^i, \quad (2.3)$$

is the amount that taxpayers devote to taxes. τ is the unit cost of production, which is assumed to be equal for both levels of government.

Finally, all citizens have an endowment of the private good, y , which is either consumed or used to pay taxes

$$y = X + c. \quad (2.4)$$

2.3.2 Voters, politicians and elections

Let us assume that the cost of production, τ , and the share of each government's revenue, x^i , are unknown by voters. Further, voters have imperfect information on each government's contribution to public good provision g^i and thus on the actual level of public good, g . In addition, citizens are assumed to trust incumbents' pre-electoral announcement about implemented policies. Given the asymmetric information with respect to voters, politicians would behave rationally by claiming a level of expenditure higher than the actual one. Therefore, voters will systematically misconceive in excess public expenditure.

Accordingly, a crucial point in this model is played by the interrelation between the decision making process and voters information about actions of politicians. Ability of voters in understanding the real effort of each level is strongly related with the type of decision making process they experience. What I assume here is that direct and representative democracy produce different outcomes in terms of citizens' awareness of political issues. While in the former, decisions are taken directly by citizens or at least they are called to confirm politicians' decisions, in the latter officials act with no immediate control. Information is more easily accessible under direct democracy because it allows both a higher level of transparency and a higher participation in the public debates preceding policies decision. Benz and Stutzer (2007) reviews in details empirical and theoretical findings that validate this argument.

From this basic insight, I assume that $\delta^i \in [0, 1]$ is a parameter that is positively related with the availability of direct democratic institutions in a jurisdiction. The closer δ^i is to 1, the greater is the citizen's capacity to perfectly assess the level of public expenditure. Both governments know the values of these parameters while it is unknown to citizens. Therefore, by taking into account the effect of direct democracy on information, citizens are expected to observe $\tilde{g}^i = (\delta^i)^{-1} g^i$ from a contribution g^i .

Governments from the two levels are assumed to obtain utility from being in office. Basically, politicians seek reelection because they receive "ego-rents" from holding office (e.g., the prestige of power).

Finally, I assume that at the end of period 1 elections take place at both levels. Voters will choose between the incumbent and a challenger who is going to be in power in period 2. I assume that the probability of reelection, η , is positively related to the perceived utility $\tilde{u}(\tilde{g}, c)$ according to a function $F(\tilde{u})$, where $F' > 0$, $F'' < 0$ and $0 < F(\tilde{u}) < 1$.⁶ Therefore, government will choose g^i such that it maximizes their own probability of reelection. All considered, the reelection rule will be affected by the decision making process at both levels of government eventually affecting the level of decentralization.

2.3.3 Decentralization equilibrium

I can now solve the model to derive the equilibrium level of decentralization in the first period of the game.

Remembering that governments have to take into account citizens assessment on each level contribution, instead of the real effort, we obtain:

$$\max_{g^i} F(((g^i(\delta^i)^{-1})^\theta + (g^{-i}(\delta^{-i})^{-1})^\theta)^{\frac{\sigma}{\theta}} + y - \tau(g^i + g^{-i})), \quad (2.5)$$

From the first order conditions of the maximization problem in (2.5) we get the two best response functions

$$0 = F'(\cdot) \left[\sigma(\delta^l)^{-1} (g^l(\delta^l)^{-1})^{\theta-1} ((g^l(\delta^l)^{-1})^\theta + (g^s(\delta^s)^{-1})^\theta)^{\frac{\sigma}{\theta}-1} - \tau \right], \quad (2.6)$$

$$0 = F'(\cdot) \left[\sigma(\delta^s)^{-1} (g^s(\delta^s)^{-1})^{\theta-1} ((g^l(\delta^l)^{-1})^\theta + (g^s(\delta^s)^{-1})^\theta)^{\frac{\sigma}{\theta}-1} - \tau \right], \quad (2.7)$$

for the local and the state government respectively.

By solving equation (2.6) and (2.7) for an interior solution we find the spending ratio value of equilibrium :

$$\frac{g^l}{g^s} = \left(\frac{\delta^l}{\delta^s} \right)^{\frac{\theta}{\theta-1}} \approx DEC \quad (2.8)$$

that is the main component in the usual definition of decentralization (i.e., $\frac{g^l}{g^l+g^s}$).

By looking at Equation (2.8), and noticing that the exponent is negative, we see that the higher (lower) the value of δ^l , due to the presence (absence) of direct democratic institutions

⁶As in Joanis (2014) one might interpret the function F as the probability that the utility experienced by citizens is higher than a random threshold that would make citizens willing to reelect the incumbent.

at the local level, the lower (higher) the level of decentralization. On the contrary, the higher (lower) the value of δ^s the higher (lower) the level of decentralization.

How do we explain this result? Citizens vote for the incumbent when they perceive that spending in the public goods is adequate to satisfy their preferences. However, citizens' beliefs about public goods provision are affected to a large extent on the availability of transparent information. In the model this depends crucially on the availability of direct democracy. Thus, each government finds it convenient to allocate expenditure to the level that has the lowest presence of direct democratic instruments so that it can claim a higher level of expenditure (i.e., a higher supply of public services) during the electoral campaign. By doing so they both increase the probability of reelection. Indeed, for a given level of expenditure g the lower is δ (i.e., absence of direct democratic institutions) the higher is the positive effect on the probability of election.⁷ From the previous arguments we can derive the following hypothesis.

Hypothesis 1 *Introduction (or strengthening) of direct democratic institutions at the local level should decrease decentralization, while introduction (or strengthening) of direct democratic institutions at the state level should increase decentralization.*

In the following sections I test the first part of the hypothesis by using Swiss changes to direct democratic institutions that occurred at the local level (municipalities). The second part has been already tested with contrasting results. Feld et al. (2008) confirmed while Funk and Gathmann (2011) rejected the hypothesis.

2.4 Swiss institutional setting

Switzerland is a federal country with three levels of government: national, cantonal and municipal. Each tier has a similar share of total expenditure and revenue. This situation has been quite stable over time: considering the period 1990-2009 the expenditure (revenue) shares averaged 32% (31%) for federal, 41% (41%) for cantonal and 27% (28%) for local administrations. Moreover, sub-central jurisdictions experience a large autonomy in setting both expenditure and taxation which produce a very low vertical imbalance.

Although a recent reform proposes a more clear division of tasks between cantonal and federal levels, still many tasks are jointly carried out with contributions of all levels of government. Nevertheless, if not explicitly defined in the Swiss constitution, decisions concerned with the actual division of tasks is mainly chosen by cantons. Table 2.1 shows the financial effort, of cantons and municipalities, for different categories of public services.

⁷In principle, complete centralization or decentralization will be the outcome with no predetermined task assignment rules.

Table 2.1: Destination of public expenditure by level of government in percentage, 2009

	Cantons	Municipalities
Administration	44%	56%
Security	71%	29%
Education	63%	37%
Culture	34%	66%
Health	87%	13%
Welfare	61%	39%
Transport	57%	43%
Environment	22%	78%
Economy	72%	28%
Total	60%	40%

Source: Swiss Federal Department of Finance

In general, both cantons and municipalities levy taxes on personal income and wealth as well as corporate income and capital. Note that the largest contributions to the revenue come from taxes on personal income.

Further, constitutions define the availability of direct democratic instruments. Most importantly, in all three levels a constitutional reform requires citizens approval. This is a relevant institutional characteristic that make more reasonable in the Swiss context to move the theoretical intuition away from the task assignment issue usually considered in previous studies. Once again this means that even if the reform for a higher involvement of citizens is decided by the government it has to be accepted by voters.

All three levels of government democratically elect executive and legislative branches.⁸ Further, they provide a variety of direct democratic instruments at citizens disposal. Once again, there is heterogeneity on the availability of these instruments depending on the canton and the municipality considered.

Apart the communal assembly, initiative and referendum are the most common kinds of direct democratic instruments. With initiatives citizens directly promote new laws, or the modification of old ones, while with referenda they confirm or not a previous decision taken by the legislative branch. Referendum might be optional or mandatory. In the first case the referendum takes place only after that citizens collect a certain number of signatures within a defined interval of

⁸In many small municipalities the legislative branch is the communal assembly in which decisions are taken directly by citizens. There are also situations in which both parliament and the assembly coexist and this is also the case for two rural cantons Glarus and Appenzell-Innerrhoden.

time, while in the latter all new decisions have to be confirmed by popular vote.

For sub-central jurisdictions a predominant type of referendum is the mandatory fiscal referendum on new expenditure. This kind of budget referendum makes compulsory for governments to ask citizens the approval for specific expenditure (once or repeated) that exceed a given threshold.

In the empirical analysis I consider mandatory fiscal referendum on new expenditure as the main expression of direct democracy. Although the variety of instruments just presented, this kind of referendum allows to highlight connections between direct democratic institutions and citizens' information developed in the theoretical model.

2.5 Data and empirical model

2.5.1 Data ⁹

I assembled a panel of 406 Swiss municipalities belonging to the 26 Swiss cantons considering yearly observations for the 20-year period from 1990 to 2009 inclusive.¹⁰

My sample is composed by those municipalities that have met the following criteria: first, have provided information on categorical expenditure for at least 15 years in the 20 years period considered; second, have not experienced either a merge with other municipalities or a split, again in the 20 years period.

Among these municipalities other two alternative criteria needed to be satisfied: first, being part of the sample already studied in Bützer (2007) which reports detailed information on direct democratic institutions; second, to have answered and provided information for at least two years to a survey in which we asked for laws necessary to codify direct democratic institutions.¹¹ After all, 54 and 352 municipalities satisfied respectively the first and the second criteria.

The dependent variable, *decentralization*, is measured as the share of municipal per capita public expenditure of the total municipal and cantonal per capita public expenditure.¹² There-

fore, $decentralization = \frac{local\ exp\ p/c}{local\ exp\ p/c + state\ exp\ p/c}$.

It is worth noting that this is a peculiar way of computing decentralization when information at state level expenditure are not directly imputable to a specific municipality. I basically assume that citizens from one canton, regardless the municipality of residence, experience the

⁹I am thankful to Marco Tarchini for excellent assistantship in collecting information on municipal legislation.

¹⁰Switzerland had 2596 municipalities at the beginning of 2010.

¹¹We asked 425 municipalities to provide all the different versions of the municipal constitutions in force starting from 1990. We received answer from 352 of them, reporting a rate of response of 83%. Further, we looked at the cantonal constitution when a municipality specifically refers to it.

¹²Municipal level expenditure come from official, but not published, data provided by the Swiss Federal Department of Finance.

same cantonal amount of public good provision. A similar assumption is implicitly underlying Funk and Gathmann (2011) and Feld et al. (2008) when considering aggregate centralization measure as dependent variable. Indeed, they assume that each municipality in a canton has the same level of expenditure. Clearly, for them this is a minor issue given that they focus on cantonal level institutions.

Table 2.2: Sample details

Canton	Abbreviation	N. of municipalities in the sample	N. of municipal reforms	Cantonal level reforms (year)
Aargau	AG	28	1	Yes (2003)
Appenzell Ausserrhoden	AR	17	0	No
Appenzell Innerrhoden	AI	3	0	No
Basel-Landschaft	BL	59	0	No
Basel-Stadt	BS	2	0	No
Bern	BE	34	5	Yes (1993)
Fribourg	FR	1	0	No
Geneva	GE	8	0	No
Glarus	GL	1	0	No
Graubünden	GR	19	2	No
Jura	JU	2	0	No
Lucerne	LU	35	2	No
Neuchâtel	NE	6	0	Yes (2002)
Nidwalden	NW	9	3	No
Obwalden	OW	7	0	Yes (1999)
Schaffhausen	SH	15	4	No
Schwyz	SZ	3	0	No
Solothurn	SO	9	2	No
St. Gallen	SG	34	2	No
Thurgau	TG	2	0	No
Ticino	TI	2	0	No
Uri	UR	14	3	No
Valais	VS	7	0	Yes (1994)
Vaud	VD	11	0	Yes (1999-2004)
Zug	ZG	4	0	No
Zürich	ZH	74	21	Yes (1999)
TOT	-	406	45	7

The main explanatory variable is *mandatory ref.* which is equal to 1 if a municipality avails of the mandatory referendum on new expenditure and 0 otherwise. Contrary to previous research

Table 2.3: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
<i>Dependent variable</i>					
Expenditure Decentralization p/c:					
- Total	0.367	0.089	0.077	0.651	6646
- Administration	0.535	0.108	0.063	0.933	6572
- Security	0.238	0.107	0	0.833	6572
- Education	0.454	0.14	0	0.87	6572
- Culture	0.519	0.219	0	0.98	6572
- Health	0.126	0.128	0	0.948	6572
- Welfare	0.345	0.149	0	0.89	6572
- Transport	0.309	0.13	0	0.789	6572
- Environment	0.674	0.161	0	0.986	6572
- Economy	0.152	0.179	0	0.968	6572
Transfers (Log)	-1.101	0.908	-5.994	1.324	4305
Share of transfers	0.099	0.081	0	1	4305
<i>Independent variables</i>					
Mandatory ref. (mun)	0.515	0.5	0	1	6646
Population (Log) (mun)	8.52	1.179	4.522	12.818	6646
Population (Log) (can)	12.722	1.093	9.516	14.117	6646
Share pop foreigner (mun)	0.165	0.094	0	0.527	6646
Share pop foreigner (can)	0.175	0.053	0.055	0.38	6646
Dependency ratio (mun)	0.63	0.083	0.375	1.002	6646
Dependency ratio (can)	0.613	0.046	0.519	0.858	6646
Left wing (mun)	0.26	0.121	0	0.896	6395
Left wing (can)	0.271	0.106	0	0.857	6409

I found several institutional changes at the municipal level. This is due to the larger number of small municipalities considered. Indeed changes occurred only in small municipalities, while the largest ones seem to have a more stable institutional setting. Table 2.2 reports the numbers of municipalities by canton and the changes in institutions that were verified during the 20 years period considered at both municipal and cantonal level.

Location of municipalities in the sample

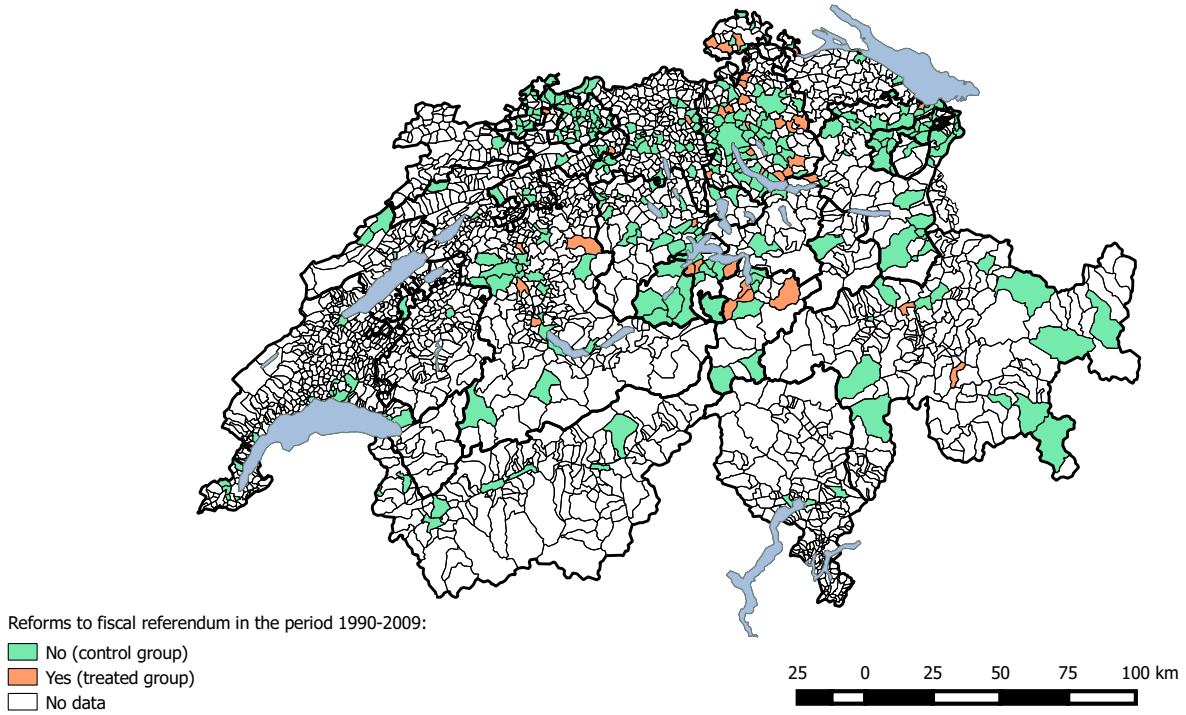


Figure 2.1: Location of municipalities in the sample.

In the sample 45 of the 406 municipalities changed their institutions (40 introduced and 5 abolished the referendum). Figure 2.1 shows a map of the municipalities and where they are located in Switzerland. Although not directly addressed, cantonal institutions are also taken into account. Overall, changes in cantonal institutions occurred in 7 out of 26 cantons (Zurich, Bern, Obwalden, Neuchatel and Valais abolished the referendum; Aargau introduced it; Vaud introduced and remove it).

Finally, as reported in Table 2.3, I use socio-economic and political controls at both levels of government. By controlling for *Population* I allow for economies of scale in the provision of public goods and control for potential mechanical effects due to the dependent variable that report a per capita measure. *Dependency* ratio and share of *foreigner* is included to shape the

demand of public goods. I also included the percentage of votes received by the *left-wing* parties in national election as a proxy for citizens preferences.¹³

2.5.2 Empirical model

The model I estimate is:

$$Y_{ict} = \alpha_i + \lambda_t + \beta MunRef_{it} + \delta \mathbf{X}_{ict} + \epsilon_{ict} \quad (2.9)$$

where i denotes the municipality, c the canton and t the year. The dependent variable Y is the level of expenditure decentralization. $MunRef_{it}$ is a dummy variable with value 1 or 0 whether the municipality avails of a mandatory fiscal referendum or not. α_i are municipal fixed effects, λ_t are year effects. \mathbf{X}_{ict} are other control variables and ϵ_{ict} is the error term.

By using this strategy I apply a linear regression model with a *difference in differences* estimator where the treatment is the introduction of a fiscal mandatory referendum at the local level. Thus, the sample is composed by a treated group of 45 municipalities that introduced or abolished referendum, and a control group of 361 municipalities that do not change their institutional setting. From the model predictions I should expect that treated municipalities experienced a reduction in decentralization. In other words I expect a negative sign for the estimated coefficient of $MunRef$.

Basic analysis

The main requirement in a *difference in differences* analysis is the parallel trend assumption. Given the panel structure of the dataset, I address this issue by using a variety of municipal and cantonal fixed effects and linear time trends. By doing so I control for both idiosyncratic temporary shocks and differentials in macro trends.

Causality

The recognition of a clear causal effect of institutions on policy outcomes has always been a difficult challenge. While the use of a *difference in differences* estimation helps by reducing the omitted variable bias, other checks are needed to claim causality. Ideally an instrumental variable approach would have been able to produce clear results. However, because of a lack of good instruments, I follow an approach in the spirit of a Granger (1969) test of causality as suggested

¹³Other controls might be included but the data would not be appropriate for the empirical strategy because in Switzerland much of the information on municipal features are accessible only from a ten-yearly national census.

by Angrist and Pischke (2009).¹⁴ In this case I estimate:

$$Y_{ict} = \alpha_i + \lambda_t + \sum_{\tau=0}^4 \beta_{-\tau} MunRef_{i,t-\tau} + \sum_{\tau=1}^4 \beta_{+\tau} MunRef_{i,t+\tau} + \delta \mathbf{X}_{ict} + \epsilon_{ict} \quad (2.10)$$

I add to the main specification variables that identify leads and lags of 4 years with respect to the institutional changes. Given that just few municipalities abolished the referendum, this part of the analysis relies to those municipalities that introduced referendum. Thus, I expect the sum of the dummy variables that refer to periods antecedent the change to be significantly different from 0 with a negative sign, while the ones that refer for the period after the adoption to be not significantly different from 0.

Heterogeneous effects

Shared responsibility in the public good provision is a basic assumption in the theoretical model. However, the decentralization index I am using considers expenditure from tasks that might be accomplished by just one of the two governments. To deal with this problem I look at decentralization of specific categories of expenditure. In principle the results should emphasize how referendum affects decentralization negatively for those categories in which the governments share the responsibility in public provision. However, one might also expect that the effect is higher in those categories that are more important for citizens in terms of electoral decisions.

Cantonal transfers

Another concern about the dependent variable is that it allows to identify only marginally the effect of institutional changes at municipal level on cantonal expenditure. Thus, to overcome this issue I run an additional analysis in which I use two alternative dependent variables. The first one is the log of per capita amount of *transfers* that each municipality receives from the canton. This measure gives an idea of the overall effect of a municipal referendum on the cantonal contribution to municipalities. *Share of transfers* is the second variable, which represents the amount of municipal revenue given by cantonal transfers divided by the municipal expenditure. This variable works as a proxy of the cantonal effort to finance municipal expenditure. Given the model's intuition I expect that municipal referendum has a negative effect on these measures.

¹⁴Funk and Gathmann (2011) use an instrumental strategy that relays on potential spatial correlation between municipal institutions. They instrument direct democratic institution by considering the presence of the same institution in neighbouring jurisdictions. I would ideally use the same approach, however my sample does not allow me to have information on all neighbouring jurisdictions of a specific municipality. Therefore, I might produce results that are biased given that the instrument would be based on incomplete information.

Inference

In all the estimations I use standard errors clustered two-ways by municipality-year to adjust for any possible correlation in the error term due to the panel structure (Cameron et al., 2011).

2.6 Results

2.6.1 Main results

Initial estimates of equation 2.9 are reported in Table 2.4. These first results show that overall direct democracy at the municipal level negatively affects decentralization, confirming the model's prediction. In the first column I report the results that include just the main independent variable, a dummy for the presence of the mandatory referendum, with socio-demographic controls and municipal as well as time fixed effects. The results show that decentralization decreases once referendum is introduced, but the coefficient is quite small and not significantly different from 0. In column (2) I add municipal time trends to control for possible different shocks or trends at municipal level. Here, the sign is still negative but this time significantly different from zero at 10%. The coefficient shows that the introduction of a referendum at the lower level reduces decentralization by 1.2 percentage-points.

In the last column, (3), the coefficient of interest is again negative, but now it turns to be significant at the 99% level. By adding canton-year fixed effects I control for any change that happened at the cantonal level over the period considered. The estimated coefficient suggest a reduction of decentralization of 1.9 percentage-points given the introduction of a referendum at the local level. Basically, the identification here is given by comparing municipalities that change institutions with the ones in the same canton that do not change in a specific year. I consider this to be the most challenging identification strategy because it takes into account not just the different municipal trends but also actual changes in cantonal task assignments or cantonal availability of direct democracy. This last consideration is of particular interest because it allows me to go a step forward with respect to what has already been done in the literature by Funk and Gathmann (2011) and Feld et al. (2008). I estimate the effect of municipal referendum on decentralization conditional on changes at the cantonal level such that I control for any omitted vertical effects related with the dependent variable.

However, even in my analysis, I am yet not able to asses the whole impact, given the way in which the dependent variable is computed. Indeed, this is mainly affected by changes of the municipal expenditure. So, the effect of municipal mandatory referendum on cantonal expenditure is not clearly identified. Nevertheless, theoretically this should make the negative effect of municipal referendum on decentralization even larger. For this reason, I present further results

Table 2.4: Expenditure decentralization for the period 1990-2009

	(1)	(2)	(3)
Mandatory ref. (mun)	-0.001 (0.005)	-0.013* (0.007)	-0.019*** (0.006)
Population (Log) (mun)	-0.064*** (0.022)	-0.178*** (0.046)	-0.219*** (0.048)
Share pop foreigner (mun)	-0.057 (0.058)	-0.049 (0.083)	-0.060 (0.076)
Dependency ratio (mun)	0.152*** (0.047)	-0.081 (0.079)	-0.029 (0.070)
Left wing (mun)	-0.007 (0.029)	0.002 (0.022)	0.009 (0.023)
Population (Log) (can)	0.119* (0.071)	-0.020 (0.101)	
Share pop foreigner (can)	-0.184 (0.214)	0.297 (0.293)	
Dependency ratio (can)	0.106 (0.078)	-0.033 (0.174)	
Left wing (can)	-0.021 (0.037)	-0.031 (0.033)	
Year FE	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes
Municipality \times time trend	No	Yes	Yes
Canton \times year fixed effects	No	No	Yes
R ²	0.208	0.437	0.545
N	6395	6395	6395

Notes: The dependent variable is *decentralization* which is calculated as municipal share of cantonal and municipal expenditures. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.

in section 2.6.4 to confirm an effect of local referendum on cantonal contribution to local good provision.

2.6.2 Causality

Table 2.5: Expenditure decentralization for the period 1990-2009 with Leads and Lags

	(1)	(2)	(3)
Mandatory ref. (mun) $\sum_{\tau=0}^4 \beta_{-\tau}$	0.012 (0.032)	-0.034 (0.031)	-0.076*** (0.026)
Mandatory ref. (mun) $\sum_{\tau=1}^4 \beta_{\tau}$	0.041* (0.021)	-0.001 (0.022)	-0.018 (0.017)
Population (Log) (mun)	-0.071*** (0.023)	-0.177*** (0.047)	-0.217*** (0.049)
Share pop foreigner (mun)	-0.046 (0.058)	-0.027 (0.083)	-0.035 (0.076)
Dependency ratio (mun)	0.157*** (0.049)	-0.086 (0.079)	-0.027 (0.069)
Left wing (mun)	-0.005 (0.030)	-0.000 (0.023)	0.008 (0.024)
Population (Log) (can)	0.117 (0.072)	-0.027 (0.102)	
Share pop foreigner (can)	-0.171 (0.217)	0.305 (0.299)	
Dependency ratio (can)	0.112 (0.079)	-0.040 (0.179)	
Left wing (can)	-0.023 (0.038)	-0.027 (0.033)	
Year FE	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes
Municipality \times time trend	No	Yes	Yes
Canton \times year fixed effects	No	No	Yes
R ²	0.210	0.438	0.545
N	6308	6308	6308

Notes: The dependent variable is *decentralization* which is calculated as municipal share of cantonal and municipal expenditures. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.

The estimation of Equation 2.10 is reported in Table 2.5. The first two coefficients are in order the sum of the lag coefficients and the sum of the lead coefficients. The first two columns show no clear evidence of causality. However, the inclusion of cantonal-year fixed effects, shown in column (3), suggests something important for the analysis: anticipatory effects are not revealed while post-treatment effects are negative and significantly different from 0, as expected. Although this result does not allow to get rid of the potential endogeneity issue, it emphasizes the direction of the effect, confirming that the institutional variation comes before the change in the level of decentralization.

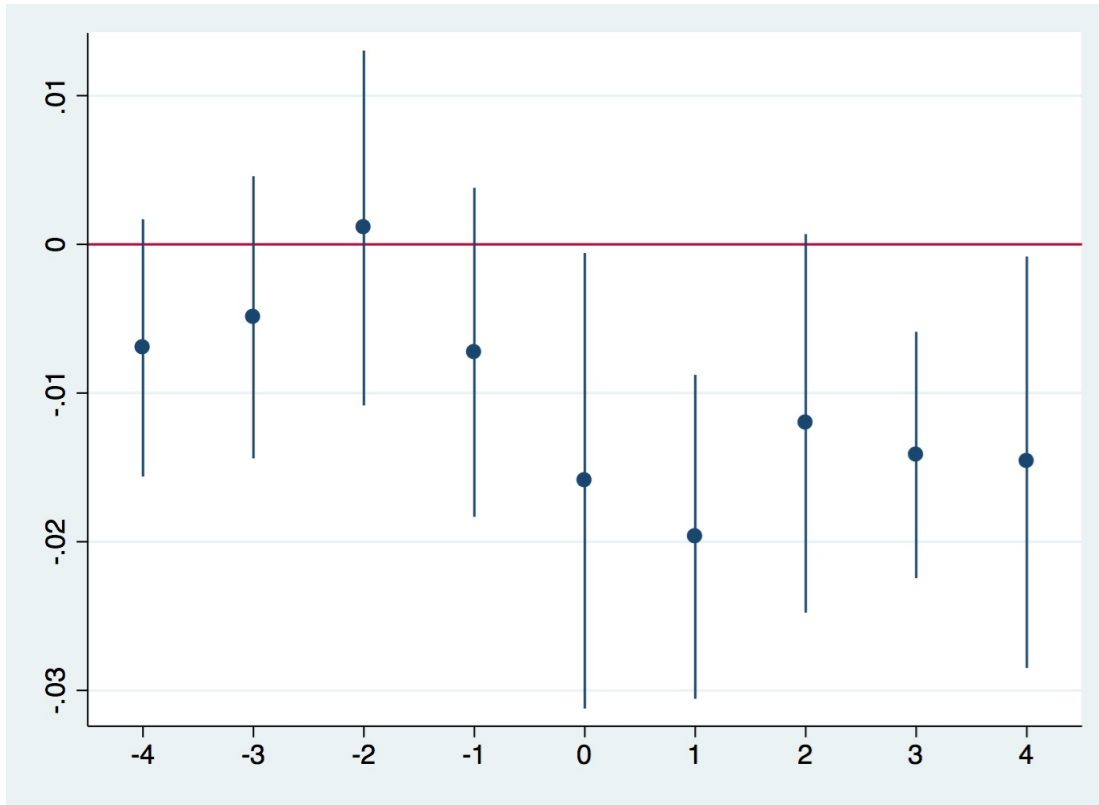


Figure 2.2: Time relative to the introduction of mandatory municipal referendum.

To give more information, Figure 2.2 shows the estimated coefficients of lags and leads and the respective confidence interval. Apart from the second year before the change, all the coefficients are negative. However just the lags are significantly negative. Moreover, the largest jump on decentralization appears the same year of the change. A further reduction arrives the first year after the change, while from the second year there is a stabilization of the negative effect, which is still in the range of 1-2%. The introduction of referendum seems to affect decentralization and it appears to be not just a temporary effect related to the year of the change.

Table 2.6: Expenditure decentralization for the period 1990-2009 by expenditure categories

	Administration	Security	Education	Culture	Health	Welfare	Transport	Environment	Economy
Mandatory ref. (mun)	-0.016 (0.012)	-0.016 (0.010)	-0.008 (0.007)	-0.016 (0.018)	-0.017* (0.009)	-0.002 (0.007)	-0.019* (0.011)	-0.017 (0.014)	-0.043** (0.021)
Population (Log) (mun)	-0.219** (0.090)	-0.203*** (0.068)	-0.124** (0.059)	-0.004 (0.091)	-0.108** (0.051)	-0.100** (0.042)	-0.291*** (0.100)	-0.187 (0.124)	-0.205** (0.097)
Share pop foreigner (mun)	-0.172 (0.172)	0.173 (0.105)	-0.100 (0.107)	-0.021 (0.226)	0.190* (0.106)	0.052 (0.116)	-0.396** (0.155)	-0.060 (0.132)	0.190 (0.209)
Dependency ratio (mun)	-0.191 (0.143)	-0.247** (0.109)	0.022 (0.119)	-0.360* (0.207)	0.297*** (0.100)	0.079 (0.106)	-0.225 (0.166)	-0.043 (0.174)	0.038 (0.186)
Left wing (mun)	-0.004 (0.050)	0.073 (0.060)	0.004 (0.035)	0.002 (0.103)	0.012 (0.042)	-0.076 (0.047)	0.070 (0.053)	-0.039 (0.070)	0.049 (0.073)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality \times time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Canton \times year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.464	0.351	0.646	0.320	0.690	0.659	0.507	0.695	0.630
N	6321	6321	6321	6321	6321	6321	6321	6321	6321

Notes: The dependent variable is *decentralization* which is calculated as municipal share of cantonal and municipal expenditures by category. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.

2.6.3 Heterogeneity

Table 2.6 presents the results for 9 different categories of expenditure. The coefficient of primary interest is negative in all the columns but statistically significant only for the categories: Health, Transport and Economy.¹⁵ The decrease in decentralization is around 2% for the first two categories while 4% for the latter.

Although this finding corroborates that there is some effect in act for some jointly provided public goods, many important categories are not affected by the introduction of a fiscal referendum. For example, education in Switzerland is one of the categories that presents the highest level of joint provision, however the referendum coefficient in the regression where education expenditure decentralization is the dependent variable is not significant and also very small in size.

Thus, is not clear whether referendum affects decentralization in categories for which the two levels of government are de facto mutually responsible more than in others.

2.6.4 Cantonal transfers

As already discussed, the dependent variable I have used so far does not allow to produce a clear connection between municipal direct democratic institutions and cantonal effort. Therefore, I examine the effect of municipal fiscal referendum on cantonal conduct by using two dependent variables namely *transfers* and *share of transfers*. Due to data constraints the sample takes into accounts 372 municipalities.¹⁶ Table 2.7 shows the effect of direct democracy on the two variables using the three different specifications already presented in the baseline estimation of Table 2.4.

In all the three alternative models the estimated coefficient for the dummy on direct democracy is negative for both dependent variables.

The first three columns show the results when *transfers* is used as dependent variable. Apart from the last column, direct democracy seems to not affect significantly the amount of transfers that a municipality receives from the cantonal government. Indeed, column (3) shows that the introduction of direct democracy reduces by 25% the p/c amount of grants that a canton delivers to a municipality. This effect is rather strong. However, for the purpose of this study, transfers have to be considered more in a relative dimension to municipal effort rather than in their absolute value.

Thus, the last three columns exploit the effect on the *share of transfers*. In column (4) direct democracy is not statistically significant. However, in the last two columns I find that it is

¹⁵Feld et al. (2008) found that cantonal fiscal referendum significantly decrease centralization for expenditure in health, welfare, education and the economy.

¹⁶Now, the sample has 45 treated and 327 non treated municipalities.

Table 2.7: Cantonal grants for the period 1990-2009

	Transfers			Share of Transfers		
	(1)	(2)	(3)	(4)	(5)	(6)
Mandatory ref. (mun)	0.074 (0.088)	-0.208 (0.133)	-0.252** (0.118)	-0.003 (0.010)	-0.022* (0.013)	-0.020* (0.010)
Population (Log) (mun)	-0.859** (0.384)	-0.896 (0.701)	-1.200* (0.681)	-0.020 (0.051)	0.025 (0.066)	0.020 (0.064)
Share pop foreigner (mun)	-0.326 (1.232)	2.901* (1.694)	1.679 (1.380)	0.019 (0.108)	0.200 (0.210)	0.084 (0.162)
Dependency ratio (mun)	3.620*** (0.699)	0.979 (1.528)	0.291 (1.433)	0.270*** (0.075)	0.063 (0.159)	-0.048 (0.140)
Left wing (mun)	-1.694*** (0.622)	-0.668 (0.640)	-1.142* (0.605)	-0.119 (0.077)	-0.115 (0.086)	-0.173** (0.075)
Population (Log) (can)	-0.176 (1.663)	-0.589 (2.082)		0.071 (0.172)	0.055 (0.241)	
Share pop foreigner (can)	-5.352 (4.515)	-0.388 (7.210)		-0.328 (0.437)	0.995 (0.991)	
Dependency ratio (can)	0.036 (1.335)	-0.578 (3.725)		-0.157 (0.174)	-0.614 (0.542)	
Left wing (can)	1.498* (0.810)	0.446 (0.740)		0.120 (0.129)	0.123 (0.124)	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality \times time trend	No	Yes	Yes	No	Yes	Yes
Canton \times year fixed effects	No	No	Yes	No	No	Yes
R ²	0.052	0.309	0.510	0.056	0.317	0.533
N	4099	4099	4099	4099	4099	4099

Notes: The dependent variable is in first three columns *transfers* which is the log per capita amount of cantonal grant to each municipality, while in the last three columns is *share of transfers* which is calculated as the municipal revenue given by cantonal transfers divided by the municipal expenditure. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.

significant at the 90% confidence interval level. The introduction of a referendum at the local level decreases the share of expenditure financed through cantonal grants by 2%.

These results confirm empirically that by introducing referendum at the local level there is a direct effect also on cantonal fiscal decisions. Interestingly, the negative coefficient is coherent with the pattern expected from the theoretical background. Policies promoted by municipalities that introduced referendum are now more transparent for citizens. This entails that increasing the probability of reelection is more “expensive” than before. Therefore, cantons rationally reduce transfers to these municipalities, not just in absolute value but also relatively to the local public expenditure.

2.7 Sensitivity analysis

2.7.1 Control groups

The results I have obtained so far are all based on a *difference in differences* analysis, which denotes a comparison between a treated and a control group where the treatment is the introduction of the fiscal mandatory referendum. Hence, an important feature is the selection of a valid control group. Even though I control for several characteristics and include different fixed effects still the control group composition matters in defining the effect of direct democracy. Thus in this section, as a first robustness check, I replicate the previous analysis by using samples that change depending on specific municipalities attributes.

Table 2.8 shows the estimations of the preferred specification, column (3) of Table 2.4, by including each time municipalities that have common characteristics with the treated group.

In the first three columns I deal with the fact that the treated group is mainly composed by small municipalities while in the control group also the largest ones are included. I reduce the sample conditional on municipal’s size: column (1) considers municipalities with a population lower than 20,000, column (2) population lower than 10,000 and column (3) population lower than 5,000. Again the results are all negative and significant. The effect is still similar to what I already found of nearly -2% percentage-points.

Given that the treated group is composed by municipalities that belong to 9 of the 26 Swiss cantons, in column (4) I show the estimation of the model by including just those cantons where at least one municipally is considered as treated. The results confirm the baseline finding. This is true also for the estimation shown in column (5) where I exclude from the analysis all those municipalities that belong to a latin Canton (Ticino, Vaud, Valais, Neuchatel, Geneva and Jura). Indeed, the treated group of municipalities is just from German speaking cantons.

Finally, in the last column (6), I consider observations only from the treated group. This *fixed effects model* allows me to estimate the difference in outcome before and after the treatment.

Table 2.8: Sensitivity analysis - Control group

	(1)	(2)	(3)	(4)	(5)	(6)
Mandatory ref. (mun)	-0.019*** (0.006)	-0.021*** (0.006)	-0.017* (0.010)	-0.019*** (0.006)	-0.018*** (0.006)	-0.018*** (0.007)
Population (Log) (mun)	-0.218*** (0.051)	-0.212*** (0.054)	-0.218*** (0.071)	-0.220*** (0.050)	-0.204*** (0.058)	-0.120 (0.079)
Share pop foreigner (mun)	-0.078 (0.080)	-0.100 (0.088)	-0.085 (0.115)	-0.048 (0.082)	-0.039 (0.099)	0.128 (0.221)
Dependency ratio (mun)	-0.037 (0.071)	-0.033 (0.078)	-0.044 (0.084)	-0.023 (0.074)	0.021 (0.094)	-0.153 (0.271)
Left wing (mun)	0.010 (0.024)	0.016 (0.026)	0.047 (0.035)	0.019 (0.025)	0.002 (0.028)	0.069 (0.116)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality \times time trend	Yes	Yes	Yes	Yes	Yes	Yes
Canton \times year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.538	0.521	0.426	0.534	0.557	0.561
N	5863	4422	2583	5783	3897	773

Notes: The dependent variable is *decentralization* which is calculated as municipal share of cantonal and municipal expenditures. Column (1) considers municipalities with less than 20,000 inhabitants, column (2) considers municipalities with less than 10,000 inhabitants and column (3) considers municipalities with less than 5,000 inhabitants. Column (4) includes those municipalities that belongs to cantons in which at least one municipality change institution, column (5) includes only german speaking cantons and column (6) considers only treated municipalities. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.

In this way I leave out potential bias driven by the control group composition, but in principle I identify just an average treatment effect on the treated. Once again the negative effect of mandatory referendum on total decentralization is confirmed. Mandatory referendum decreases decentralization by 1.8 percentage-points which is nearly the same as the main analysis.

2.7.2 Outliers

As already noticed the results of this analysis are mainly identified by 45 municipalities who modified the provision of direct democratic instruments. Therefore, it is important to check whether just few of these municipalities are the ones which drive the results.

In addition, a further robustness check is needed to compensate for possible mistakes in the reported information on municipal public expenditure. More in detail, data on public expenditure I am using are taken from a survey done by the Swiss Ministry of Finance in 2009 in which it has been asked to a large sample of municipalities to fill a form with detailed information on their balance from 1990 to 2009 by following an updated version of the “Chart of Accounts and Functional Classification”. Potentially this update might have produced incorrect information for some of the municipalities and thus I take seriously into account the sensitiveness of the results to outliers. All the tests are computed considering the model of column (3) of Table 2.4.

As a first check I follow the procedure applied by Lovenheim and Owens (2014) by running a simple permutation test where I regress my main specification 45 times removing each time a treated municipality.¹⁷ Each estimation reports a negative and significant coefficient for the dummy on municipal referendum. The value range between -0.021 and -0.015.¹⁸ This test confirms that there is not a single municipality that defines the whole effect.

I perform now some tests on potential joint effect coming from more than one treated municipalities. To do so, I start by removing from the analysis those municipalities that have anomalies in the residuals.

Figure 2.3 presents a scatter graph in which the Y axis reports the residual of the preferred specification by excluding the dummy variable *mandatory ref.*, while the X axis measures the residual from a regression in which *mandatory ref.* is the dependent variable and the regressors are the same as the main specification. This graph allows me to focus on the relationship between decentralization and the mandatory referendum excluding the other variables. In this case I am looking for observations that behave unusually and that might affect the slope of the line representing the coefficient. I identify two municipalities with this characteristic: Wildberg (index

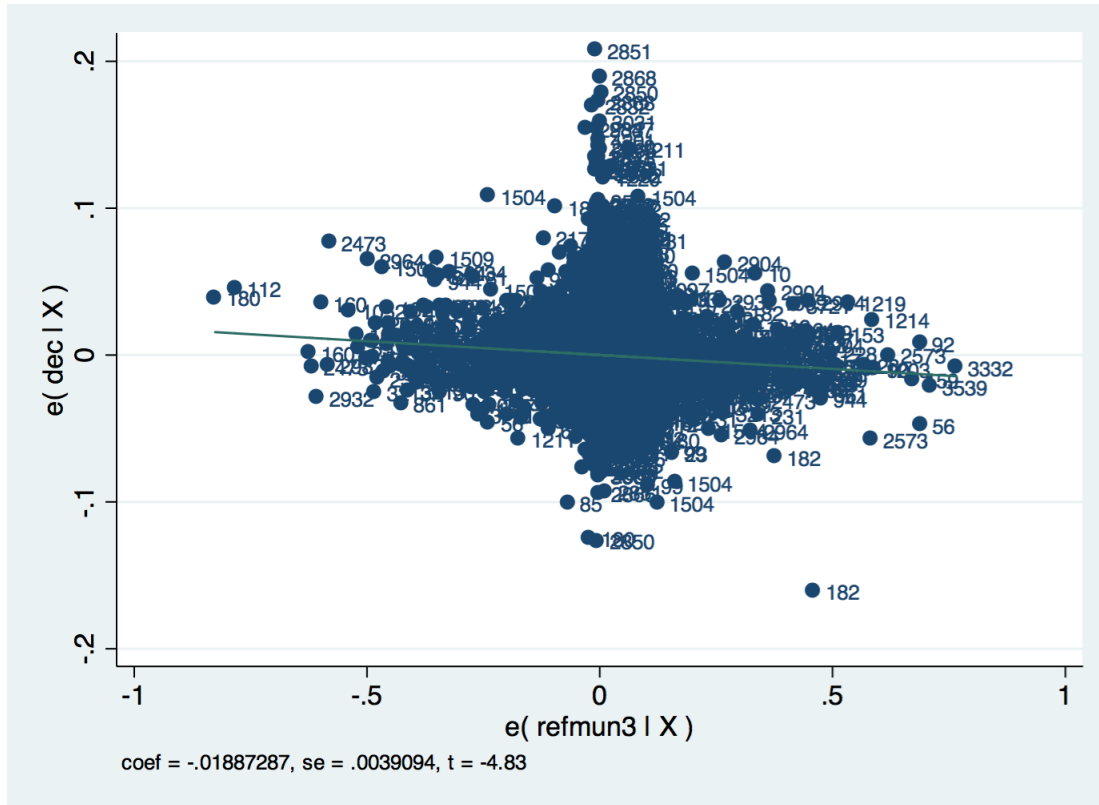
¹⁷Lovenheim and Owens (2014) test how public aids limitation to students convicted for drug offenses affect their education achievement. Interesting for my aim, they deal with a small treated group composed by 46 students.

¹⁸Detailed results in Table 2.A.1 in the appendix.

Table 2.9: Sensitivity analysis - Outliers

	(1)	(2)
Mandatory ref. (mun)	-0.014*** (0.005)	-0.012** (0.006)
Population (Log) (mun)	-0.229*** (0.048)	-0.234*** (0.050)
Share pop foreigner (mun)	-0.075 (0.076)	-0.078 (0.079)
Dependency ratio (mun)	-0.026 (0.070)	-0.017 (0.064)
Left wing (mun)	0.011 (0.023)	0.011 (0.023)
Year FE	Yes	Yes
Municipality FE	Yes	Yes
Municipality \times time trend	Yes	Yes
Canton \times year fixed effects	Yes	Yes
R ²	0.550	0.557
N	6358	6272

Notes: The dependent variable is *decentralization* which is calculated as municipal share of cantonal and municipal expenditures. Column (1) considers all municipalities but Wildberg (index 182) and Emmetten (index 1504) while column (2) considers all municipalities but the treated ones with a studentized residual with absolute value higher than 3 for at least one year. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.



182) and Emmetten (index 1504). Therefore, I run again a regression of the main specification by excluding these two municipalities from the sample. As reported in column (1) of Table 2.9 the coefficient for *mandatory ref.* is still negative and significantly different from 0 at the 99% confidence interval. However, it increases from -0.019 to -0.014.

I go further with respect to the graphical analysis by removing all those municipalities that present, at least for one year, a studentized residual with absolute value higher than 3.¹⁹ This means that I drop 7 treated municipalities, two of them are the ones already excluded. Although *mandatory ref.* coefficient is still significant and with negative sign it increases a bit to -0.011 as shown in column (2) of Table 2.9.

Summing up, these results seem to add support to the expected negative effect of direct democracy on decentralization if this is considered at the local level.

¹⁹Studentized residuals are residuals corrected for their standard errors. They can be described as the t statistic which would have a dummy variable on whether that specific observation would be included in the regression or not. Thus by assuming 3 as threshold I implicitly exclude those observation for which the dummy is significant at the 1 percent level (Belsley et al., 1980).

2.8 Conclusion

In this analysis I show that direct democracy affects expenditure decentralization differently from a pure representative democracy.

From a theoretical perspective I emphasize how direct democracy can work as an information tool that make more transparent governments decisions and how expenditure decentralization is affected by that. When two or more levels of governments jointly provide a public good they become mutually responsible from a citizen's point of view. Thus, politicians from different levels jurisdictions that aim to be reelected have similar objective function. To maximize their probabilities of being in charge the next period they find convenient to move expenditure to the level where the control of citizens is the lowest (i.e., representative democracy) such that any "false" electoral claims about the goodness of their activities is difficult to be understood. Therefore, the model predict that decentralization should increase if direct democracy is introduced at the cantonal level and decrease if direct democracy is introduced at the local level.

I empirically test the latter point of the prediction by using a newly assembled dataset with a sample of 406 Swiss municipalities over a period of 20 years. In this sample 45 municipalities either introduced or abolished a mandatory referendum on new expenditure. Thanks to these changes over time I use a *difference in differences* approach and by controlling for a number of fixed effects I confirm that decentralization decreases once a municipality strengthens citizen's participation. As enhancement from Funk and Gathmann (2011) and Feld et al. (2008) I show results that are robust to changes that might be happened at the other level of government either in terms of task assignment or direct legislation instrument availability.

I estimate a reduction of 1.9 percentage-points of decentralization which calculated at the mean suggests a decrease of decentralization of about 5%. To produce a more clear result, let us assume that referendum introduction makes expenditure move from the municipal to the cantonal, with no effect on the total amount of expenditure. On average a municipality from the sample spends per each inhabitant around 4,600 CHF and a canton 8,000 CHF. Therefore, as pure speculative consequence the introduction of a mandatory referendum on new expenditure would decrease the per capita local expenditure of 700 CHF with a respective increase in the cantonal one.

Finally, direct democracy does not seem to be more effective for categories of expenditure in which more than one government is the provider, while it affects negatively and significantly the transfers from the cantonal to the municipal level. The latter point makes even stronger the evidence of a vertical interaction between decision making process and policies' decisions. This implies, as a general insight, the need to carefully take into account institutional conditions that does not refer solely to the level of observation considered.

2.A Appendix

Table 2.A.1: Sensitivity analysis - Permutation test

Index Excluded Municipality	Coefficient	Stand. Error	Index Excluded Municipality	Coefficient	Stand. Error
10	-0.020***	0.005	1099	-0.018***	0.006
23	-0.019***	0.006	1203	-0.018***	0.005
28	-0.019***	0.006	1214	-0.019***	0.005
54	-0.019***	0.006	1219	-0.020***	0.005
56	-0.018***	0.006	1504	-0.016***	0.005
81	-0.018***	0.006	1506	-0.018***	0.006
90	-0.018***	0.006	1509	-0.018***	0.006
92	-0.019***	0.005	2473	-0.017***	0.005
99	-0.018***	0.006	2573	-0.018***	0.005
112	-0.018***	0.006	2904	-0.021***	0.005
113	-0.018***	0.006	2932	-0.020***	0.006
117	-0.019***	0.006	2964	-0.017***	0.005
151	-0.018***	0.006	2971	-0.020***	0.005
153	-0.019***	0.006	3332	-0.019***	0.005
159	-0.019***	0.006	3539	-0.018***	0.006
160	-0.018***	0.006	3721	-0.020***	0.005
180	-0.018***	0.006	4034	-0.017***	0.005
182	-0.015***	0.005			
199	-0.019***	0.006			
228	-0.019***	0.006			
231	-0.018***	0.006			
551	-0.018***	0.006			
861	-0.019***	0.006			
944	-0.018***	0.006			
954	-0.019***	0.006			
957	-0.019***	0.006			
1052	-0.018***	0.006			

Notes: The table reports estimates for the dummy *mandatory ref. (mun)* where each time a municipality is left out from the sample. The dependent variable is *decentralization* which is calculated as municipal share of cantonal and municipal expenditures. The independent variable are the same used in column (3) of Table 2.4. Standard errors in parenthesis. Standard errors clustered two ways by municipality and by year. *p < 0.1, **p < 0.05 and ***p < 0.01.

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Chapter 3

Taxes and Firm's Location Decisions

3.1 Introduction

The effect of fiscal policies on firms' location decisions has been studied in several sub-fields of economics such as public economics, industrial organization and economic geography. Fiscal policy is crucial for firms when decide where to settle their plants and, interestingly, there are several channels through which its impact arises. Taxation is probably the most relevant one but, as it has been highlighted in previous studies, the provision of public goods by local governments has an important impact on firms' location decisions as well.¹ In this paper we focus on the impact of local taxes on firms' location choices by assessing the impact of two different effects: the effect of the corporate tax rate (*tax level effect*) and the effect of the introduction of a flat tax schedule (*flat-tax effect*).

Profit taxation affects the investment choices of firms in, at least, two ways: through the level of corporate tax rates and through characteristics such as the simplicity or the progressivity of the tax schedule in place. Previous literature has mainly been focused on the former effect. In an important contribution to this literature, Carlton (1983) assesses the impact of fiscal policy on both location and employment decisions of new firms. He introduced the estimation of corporate location choices through the conditional-logit model (which is formally derived from a representative firm's stochastic profit function) and was among the first to study new business location. Feld and Kirchgassner (2003) analyze the regional distribution of firms and employment through Swiss cantons showing that corporate and personal income taxes deter firms to settle in a canton and reduce cantonal employment. Devereux et al. (2007) and Brülhart et al. (2012) assess the interconnections between agglomeration and the sensitivity of firms' investment decisions to tax differentials. The former paper focuses on the impact of agglomeration economies on the sensitivity of firms' location choices to local fiscal incentives, finding that the impact of these

¹See for instance, Becker et al. (2012).

incentives is more important in attracting firms to regions where the stock of existing companies is larger. Instead, Brühlhart et al. (2012) focus on the power of agglomeration forces in order to mitigate a race-to-the-bottom tax competition. The authors test whether agglomeration partly or fully offsets firms' sensitivity to tax differentials. They use data on new firms and find that corporate taxes discourage firm births less in more spatially concentrated sectors. Becker et al. (2012) assess the impact of municipal business tax rates on location decisions of foreign multinational enterprises in Germany. The authors focus on the number of foreign multinational firms, the level of employment and the fixed assets of these firms. Their results show a negative (and small) impact of business tax rates levied by municipalities on all the three alternative measures mentioned before.

Strikingly, there are few empirical studies covering the impact of the tax schedule on firms' location decisions. Cullen and Gordon (2007), its companion paper Cullen and Gordon (2006), and Bacher and Brühlhart (2013) are among the rare papers giving empirical evidence of the effects of the tax law on entrepreneurial activity.² Cullen and Gordon (2007) use U.S. individual tax return data and find that taxes do matter for entrepreneurial risk taking. The authors forecast that a reduction in corporate taxes stimulates business activity but their forecast of the impact of a tax cut on business risk taking is more uncertain and varies by specification, showing no response or a small increase in entrepreneurial risk taking. In Cullen and Gordon (2006), the authors simulate the effect of a flat tax reform on the amount of entrepreneurial activity. They show that moving from a progressive to a proportional tax schedule reduces entrepreneurial risk-taking. Finally, the closest study to ours is Bacher and Brühlhart (2013). The paper explores the implications of changes in the average tax burden, the progressivity of the tax schedule, and the complexity of the tax code for entrepreneurial activity, measured by counts of firm births using Swiss data. Results suggest a negative impact of average taxes and complicated tax codes on firm birth rates. On the other hand, tax progressivity has a positive effect on firm births, suggesting the existence of an insurance effect from progressive taxation that favors entrepreneurial risk taking. Unlike Bacher and Brühlhart (2013), we proxy firms' location choices by the total number of firms in a particular municipality rather than by firm births. Moreover, there are several methodological distinctions when assessing the effect of progressivity and we do not consider the tax complexity effect. Finally, there are significant differences in terms of data. Our data set covers a longer period (23 versus 5 years) and the number of municipalities is considerably higher as well (around 1,700 versus 750). This might explain differences in the results concerning the tax level effect. We will come back to most of these issues in sections 3.4 and 3.5.

²It is worth noting that other studies have been carried out on the economic effects of a flat tax reform on personal income taxation. For example, Gorodnichenko et al. (2009), using Russian micro-data find a reduction in tax evasion after the introduction of a flat tax rate instead of a progressive one.

This paper extends previous empirical research by estimating the effects of both corporate income tax rates and the introduction of a flat-tax reform on firms' location decisions in Switzerland. Why Switzerland? The Swiss Federation is a highly decentralized country and has a particular fiscal system that makes this country a unique scenario to test our research hypotheses. The effective corporate tax rate in Switzerland is set by both cantonal and municipal authorities while the progressivity of the tax schedule is only decided by cantons. To test how corporate taxes affect the location decisions of firms, we constructed a unique data set based on Swiss data disaggregated at the local level covering more than 60% of the totality of Swiss municipalities during the 1985-2008 period.

Interestingly, and in contrast to previous studies on this issue, our results suggest that corporate tax rates have a positive and statistically significant impact on firms' location decisions. Indeed, we find a small but not negligible positive effect of corporate taxes on the number of firms that decide to settle in a given city. This counter-intuitive result is a key finding and should be analyzed in a broader context where municipalities do not only compete to attract firms by setting tax rates but also in other dimensions such as creating business-friendly environments. Concerning the flat-tax reform, the estimates of our flat-tax dummy show a negative and statistically significant effect on the number of firms. On average, firms tend to prefer to settle in municipalities located in cantons where a progressive tax schedule is applied. This result supports the existence of an *insurance effect* from progressive corporate income taxes for risk-averse entrepreneurs.³

The rest of the paper is structured as follows. In section 3.2 we present a brief description of the fiscal context in Switzerland showing the features that make the Swiss Federation an almost ideal setting to develop our study. Section 3.3 describes the data set. In section 3.4 we focus on the *tax level effect* by describing the empirical framework, main estimation issues and results of our first estimation model. Similarly, in section 3.5 the focus is on the *flat-tax effect*. Finally, section 3.6 provides some concluding remarks.

³The insurance effect we want to test for is the one defined by Bacher and Brülhart (2013) and states that tax progressivity should encourage risk-taking entrepreneurial activities. Its main intuition is as follows: keeping the expected after-tax profit constant, tax progressivity should act as an insurance device because it reduces the variance of profits more than linear taxation.

3.2 The fiscal context in Switzerland⁴

Switzerland is a highly decentralized country composed of three levels of government. Indeed, the Swiss Federation has a unique fiscal system that makes this country an outstanding scenario to develop our study. In 1998 the federal government reformed its corporate tax schedule by introducing several modifications. For instance, since then, capital is not taxed at the federal level and corporate taxes shifted from a non-flat to a flat tax rate. The federal government currently taxes profits at a flat tax rate of 8.5% and does not tax capital at all. The lower tiers of government (cantons and municipalities) have important degrees of freedom concerning their fiscal competencies. Cantons are free to tax personal income and wealth as well as corporate profits and capital. Similarly, municipal governments have an important autonomy in levying taxes on either of these items. The total tax revenue raised is roughly equally divided among the three levels of government. Moreover, while the federal government collects the main part of its tax revenue from indirect taxes, the VAT and specific consumption taxes like the mineral oil tax; cantons and municipalities strongly depend on tax revenues coming from personal and corporate income and wealth taxes. In both cases, personal income tax accounts for the biggest portion of total tax revenue (61% for cantons and 68% for municipalities) whereas corporate taxes on profit and capital represent 18% (16%) and wealth taxes only 8% (9%) of cantonal (municipal) tax revenue.

In this paper we mainly focus on corporate profit taxes. How are corporate taxes set in Switzerland?⁵ Why is the Swiss fiscal system particularly adequate for our study? Let us briefly describe some interesting features of the Swiss fiscal system that are relevant for our paper. In a first stage, each canton sets a tax schedule where a basic statutory tax rate is defined. This tax schedule can only be modified by changing the cantonal tax law. Then, every year, cantonal parliaments set a cantonal multiplier to be applied to the statutory tax rate and municipalities (that take the cantonal tax schedule and, thus, the respective statutory tax rate as given) do the same by setting a municipal tax multiplier on an annual basis.⁶ To sum up, the (simplified)

⁴In this section we only describe the characteristics of the Swiss fiscal system that are relevant for this paper. For a more complete description see, for example, Feld and Kirchgassner (2003), Parchet (2013) and the report edited by the Swiss Fiscal Conference, *L'Imposition des Personnes Morales* (2012). Moreover, this section describes the general tax setting process representing the majority of cantons and municipalities in Switzerland. Particular cases and exceptions are taken into account when working with the data.

⁵Given the scope of this paper, we mainly focus on corporate taxes but the setting processes of personal income and corporate taxes are usually very similar.

⁶There cases in which other institutions such as parishes might set their own tax multipliers applying a similar methodology but, because of data constraints, we only consider the tax multipliers set at the cantonal and municipal levels. These are, clearly, the most important ones.

effective tax rate (*ETR*) for a firm settled in municipality i in canton c is as follows:

$$ETR = \frac{T_{ic}}{\hat{\Pi}} \quad (3.1)$$

where $T_{ic} \equiv \tau_c \times (\eta_c + \eta_{ic})$, τ_c is the basic statutory tax rate, η_c is the cantonal multiplier, η_{ic} is the multiplier applied by municipality i in canton c and $\hat{\Pi}$ is the firm's gross profit.

Unlike the shared setting process of the *ETR* described before, and interestingly for our identification strategy, the main characteristics of the tax schedule such as its progressivity and the deductions to be applied are determined only at the cantonal level. In other words, local jurisdictions can only influence the *ETR* by applying municipal multipliers but, on the other hand, the application of a proportional or a progressive tax schedule is entirely decided by cantonal authorities. This is crucial for our second identification strategy where we aim at assessing the impact of the introduction of a flat-tax schedule on firms' location choices. To do so, we take advantage of the several reforms applied by cantons that decided to switch from a progressive to a proportional tax schedule. As we can observe from table 3.1, the number of cantons that switched from a progressive to a flat-tax schedule rose from 0 up to 14 during the period of our sample and, interestingly, no canton switched from a flat to progressive tax schedule.

3.3 Data and descriptives⁷

To test how corporate taxes affect the location decisions of firms, we constructed a unique data set based on Swiss data disaggregated at the municipal level. We have data for almost 1,700 municipalities mainly coming from two different sources. First, the multi-annual Business Census (BC) carried out by the Federal Statistical Office is the only exhaustive census to collect data on all private and public businesses and workplaces in Switzerland. The BC records establishments (of which there can be several per firm) and attributes them to a NACE sector according to their self-declared principal activity and gives information on the location and the employment level of all Swiss firms. Second, we have assembled a municipality-level data set on local taxes and other control variables from a variety of sources. We mainly use these data to compute the effective tax rate. It is worth mentioning that the BC had been conducted three times per decade (i.e. in years ending with 1, 5 and 8) and took place for the last time in 2008.⁸ Thus, our data set conforms a panel of almost 1,700 Swiss municipalities (accounting for roughly 60% of the total number of local jurisdictions) and seven years (1985, 1991, 1995, 1998, 2001, 2005 and 2008). To the best of our knowledge, this is the first study using data on corporate taxes

⁷We are thankful to Raphaël Parchet for having provided us a lot of information and data described in this section

⁸The Business Census was conducted until 2008 when it was substituted by STATNET.

Table 3.1: Sample details

Canton	Abbreviation	Database	N. of municipalities in the sample	Flat-Tax reform (year)
Aargau	AG	No	-	No
Appenzell Ausserrhoden	AR	No	-	Yes (1993)
Appenzell Innerrhoden	AI	Yes	6	Yes (1995)
Basel-Landschaft	BL	No	-	No
Basel-Stadt	BS	No	-	No
Bern	BE	Yes	371	No
Fribourg	FR	Yes	152	No
Geneva	GE	Yes	45	Yes (1999)
Glarus	GL	No	-	No
Graubünden	GR	No	-	No
Jura	JU	Yes	60	Yes (1990)
Lucerne	LU	Yes	86	Yes (1991)
Neuchâtel	NE	No	-	No
Nidwalden	NW	No	-	Yes (1995)
Obwalden	OW	No	-	Yes (1995)
Schaffhausen	SH	Yes	27	Yes (2008)
Schwyz	SZ	Yes	30	No
Solothurn	SO	No	-	No
St. Gallen	SG	Yes	81	Yes (2007)
Thurgau	TG	Yes	80	Yes (2006)
Ticino	TI	Yes	134	Yes (1995)
Uri	UR	No	-	Yes (2007)
Valais	VS	Yes	131	No
Vaud	VD	Yes	317	Yes (2002)
Zug	ZG	No	-	No
Zürich	ZH	Yes	171	Yes (2005)
Tot	-	14	1689	14

covering such an important number of Swiss municipalities and years. Interestingly, these data allow us to disentangle the effect of taxes on firms' location decisions depending on the sector of activity. In addition, and unlike data used by previous studies, our sample covers a 23-years period.⁹ This is relevant given that firms might be more likely to react to fiscal policies in the medium-term rather than immediately. Finally, the data give us enough degrees of freedom to run different specifications and robustness checks that are described in detail in sections 3.4.1 and 3.5.2.

Our dependent variable, the *number of firms*, accounts for the total number of firms at the municipal level and ranges from a minimum of 1 firm in few small localities to a maximum of more than 26,000 in the city of Zürich. Unlike recent papers that have focused on firm births or entry, our dependent variable is given by the stock of firms. Let us spend a few lines on this choice. The main argument given by studies using new firms data is that they control (although imperfectly) for the potential simultaneity bias that might arise because of local firms influencing the tax setting process through the tax base. In other words, entrants are supposed to be more unlikely to significantly influence pre-existing local tax rates. However, even if this argument holds, we have decided to consider the stock of firms for several reasons. First of all, working with the whole sample considerably increases our number of observations. Second, it is worth mentioning that in Switzerland there is a large number of new firms that disappear after the first years of activity. The magnitude of this share goes from 20% after the first year of activity to 50% after five years of activity, might be an issue in order to identify the medium and long-term impacts of the fiscal policy.¹⁰ Finally, the fact of new firms being less likely to influence pre-existing local tax rate does not necessarily hold for small municipalities where the presence of one big firm might make a difference in terms of economic activity. Indeed, the municipal policy maker of such a jurisdiction might have strong incentives to modify the local tax rate in order to attract an important firm to her municipality. One could think that incentives behind such a strategic choice might be stronger than those present when considering the pre-defined tax base (i.e., the stock of firms). To say it differently, companies that are already set in a given municipality might have to incur in important fixed costs in order to react to marginal tax changes and move from one jurisdiction to another. Thus, the elasticity of a firm that has to decide where to settle might be higher to the one of a firm that has to decide whether to move to another jurisdiction or not. Hence, following standard taxation theory, new firms might actually have a relatively more important impact on local tax setters than the firms that are already part of the local tax base.

⁹Bacher and Brühlhart (2013), for instance, observe their explanatory variables for only 5 years (2001 and 2005).

¹⁰For more details check the *Taux de survie des nouvelles entreprises* published on the Federal Statistical Office's website: <http://www.bfs.admin.ch/bfs/portal/fr/index/themen/06/02/blank/key/02/ueberlebensraten.html> (last access July 30, 2014).

Our main explanatory variable, *corporate tax rate*, accounts for the *ETR* computed as in Equation 3.1. To construct this variable we follow Brülhart et al. (2012) in order to compute the tax rate by considering a firm with a median-capital and profitability according to the distribution of all Swiss firms. Like our dependent variable, *corporate tax rate* presents important variation in both time and the cross-sectional dimensions as shown in Figure 3.1.¹¹ It ranges from a minimum of 3.26% to a maximum of 30.67% roughly ten times higher.¹²

We have gathered data on corporate tax rates by asking for the cantonal and municipal multipliers directly to cantonal authorities. Where we did not received answer or where the data was not available for the period we are working with, we exploited the fact of many municipalities applying the same multiplier for both personal and corporate incomes because a cantonal law constrains them to do so. In these cases, we replicate the corporate income multiplier by the personal income one for which we have data for the totality of Swiss municipalities from 1980 to 2011 (Parchet, 2013). In addition, for the cases where there is no formal law constraining municipal tax authorities to set a unique multiplier, we computed (by canton) the correlation of both municipal multipliers based on yearly data coming from a sub-sample of more than 600 municipalities (representing roughly 25% of all Swiss municipalities) for the period 2001-2011 for which we have data on both tax instruments. In these cases, and in order to minimize the potential bias coming from errors in the data, we decided to keep in our sample only the cantons where this correlation was higher than 95%. For these cantons, again, we used the personal income multiplier. To sum up, we only consider for our study municipalities located in cantons where i) we have the real data on the local corporate income multipliers or ii) the tax multipliers for personal and corporate incomes are the same (either by cantonal law or by a non-written agreement or tradition showing a correlation of 95% or higher in our sub-sample). After this procedure, we end up with a sample of 1,689 municipalities which accounts for around 60% of total Swiss local jurisdictions and 70% of all firms. More precisely, our final sample is composed of the following 14 cantons: Zürich, Bern, Lucerne, Appenzell Inn., St. Gallen, Vaud, Valais, Jura, Schwyz, Fribourg, Schaffhausen, Thurgau, Ticino and Geneva.¹³ Finally, the following 12 cantons were not included in our sample either because we did not get any data or because the correlation among the multipliers was lower than 95%: Uri, Obwalden, Nidwalden, Glarus, Zug, Solothurn, Basel-Stadt, Basel-Landschaft, Appenzell Aus., Graubünden, Aargau and Neuchâtel.¹⁴

¹¹In the presence of two or more municipalities merging, the *corporate tax rate* is computed by taking the average value of previous jurisdictions' *corporate tax rates*.

¹²It is worth recalling that these values does not include federal taxation.

¹³The first 8 cantons impose (by law) that personal income and corporate multipliers are the same. The latter 6 ones, were included because of high correlation between both tax instruments in our sub sample.

¹⁴We are currently waiting for some cantonal authorities to send us the requested data. Hence, in near future, we expect to extend our sample by including, at least, some of the 12 cantons left out.

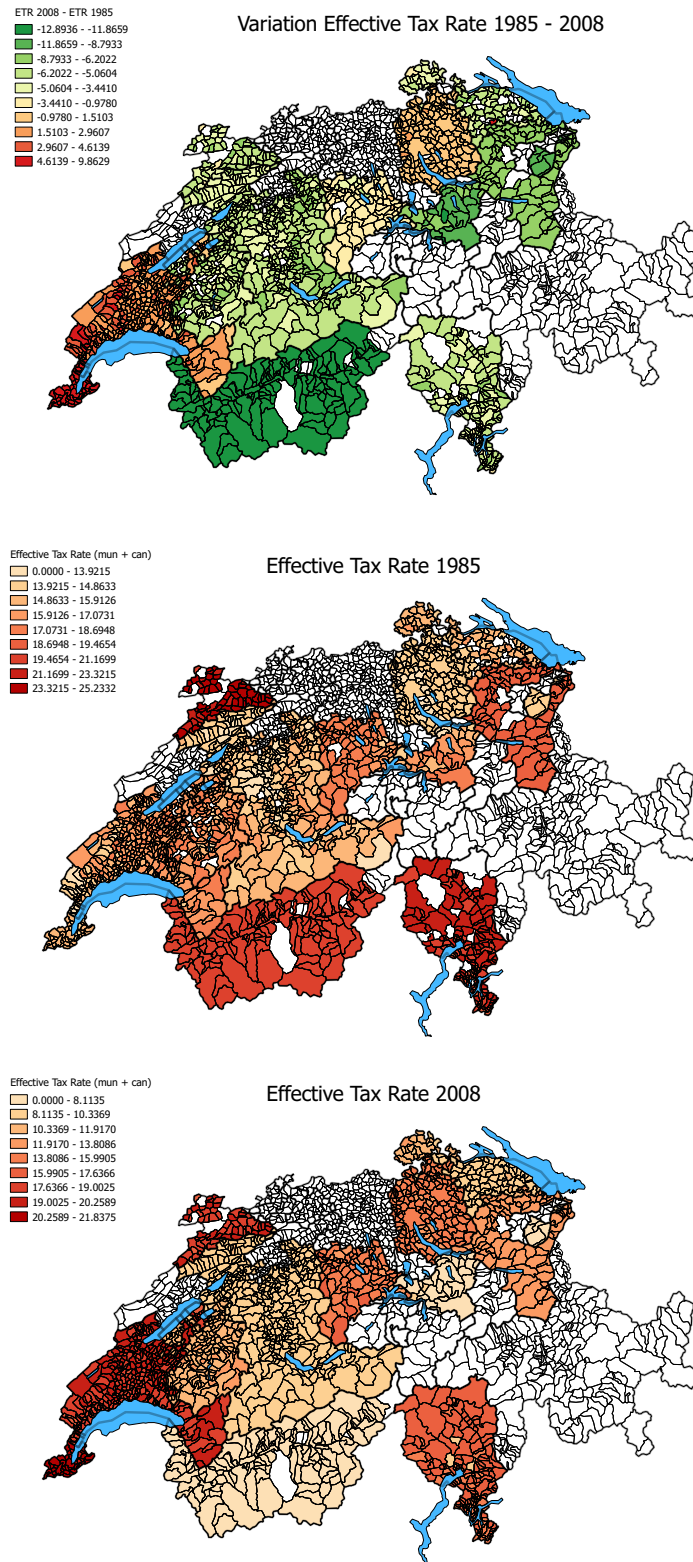


Figure 3.1: Effective corporate tax rate variation within and between municipalities

Finally, our sample includes 9 cantons that switched from a progressive to a flat-tax schedule: Lucerne, Jura, Appenzell Inn., Ticino, Geneva, Zürich, Vaud, Schaffhausen and St. Gallen, and 5 cantons that did not switch: Bern, Valais, Schwyz, Fribourg, Thurgau.

Table 3.2: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
<i>Dependent variable</i>					
Number of firms	156.08	777.26	1	26172	11648
Number of firms with one employee	40.16	204.75	1	7602	11450
Number of firms with more than one employees	117.29	577.73	1	19816	11579
Number of private firms	142.09	723.7065	1	24756	11626
Number of public firms	14.74	57.56	1	2019	11267
Number of firms low risk sectors	62.97453	252.5668	1	8821	11544
Number of firms high risk sectors	92.87773	517.9462	1	18143	11540
<i>Independent variables</i>					
Corporate tax rate	15.065	3.866	3.265	30.667	11648
Flat tax dummy	0.244	0.43	0	1	11648
% Inactive and unemployed	2.338	1.988	0	28.947	11648
Population (in 1.000)	3.06	11.495	0.021	382.577	11648
% Young (≤ 15)	19.742	3.718	0	43.636	11648
% Old (≥ 65)	14.191	4.556	2.446	57.447	11648
% Foreigners	10.844	8.811	0	53.569	11648
% German speaking population	52.934	43.005	0	100	11648
% Left votes in national ballots	18.591	9.596	0	70.100	11648
Personal income tax rate	26.339	3.207	6.351	43.171	11648
% Protestant population	42.746	29.982	0	100	11648

Table 3.2 presents summary statistics. Other than our dependent variable and main regressor described before, we use a set of variables that are included as control in addition to municipal fixed effects. Those variables take into account demographic and political characteristics as well as *personal income tax rates* at the municipal level. It is worth mentioning that we assume municipal fixed effects to be a good proxy to control for local public expenditure. This strong assumption comes from the evidence of a small variation of municipal expenditure over time. Indeed, from the year 1990 to 2011 the aggregate local expenditure has increased on average in real terms by roughly 0.4% a year. Moreover, the direct inclusion of public expenditure in this analysis would have had two main constraints. First of all data availability. Disaggregated data at the municipal level going back in time to the 1980s is unfortunately not available in Switzerland. Second, even if we had data we would have faced a clear problem of endogeneity which is difficult to overcome. Public expenditure would present endogeneity concerns with respect to our dependent variable, *number of firm*, and our main regressor, *corporate tax rate*.

3.4 Tax level effect

3.4.1 Empirical model

To test the corporate tax level effect on the number of firms in a given municipality, we estimate the following model:

$$Y_{ict} = \beta_1 T_{ict} + \beta_2 \mathbf{X}_{ict} + \delta_i + \gamma_t + \epsilon_{ict} \quad (3.2)$$

where i denotes the municipality, c the canton and t the year. The dependent variable Y_{ict} accounts for the number of firms. T_{ict} is our main explanatory variable and denotes the (simplified) effective corporate tax rate paid by a firm located in municipality i , canton c and year t . \mathbf{X}_{ict} is the set of control variables previously described. δ_i and γ_t are, respectively, municipal and year fixed effects and, finally, ϵ_{ict} is the error term.

Endogeneity

A common issue concerning empirical taxation studies is potential endogeneity. More specifically, in our setting, endogeneity could arise from two different sources: omitted variable and reverse causality biases. As mentioned in section 3.3, this is ordinary in taxation studies and we are aware that fully eliminating of endogeneity in these kind of settings is a very hard task. We nevertheless aim at considerably reducing endogeneity by estimating a fixed effects two-stage least squares model.

On the one hand, by including municipal fixed effects we reduce the omitted variable bias by allowing time-invariant unobserved heterogeneity to be correlated with the consolidated tax rate. On the other hand, we deal with the reverse causality issue by using an instrumental variable (IV) strategy. As Chirinko and Wilsom (2010), we exploit a political instrument in a spatial setting. We instrument the corporate tax rate of a given municipality with the average vote share obtained by left-wing parties in federal elections in neighbour municipalities within a ray of 15 kilometers.

This strategy satisfies the two conditions needed to have a valid instrument: i) it is relevant because voter's preferences of neighboring jurisdictions affect taxes in these jurisdictions in the same way that voter's preferences in municipality i affect its own taxation decisions, and ii) it is exogenous because voter's preferences of neighbor jurisdictions are unrelated to policy decisions in municipality i . By considering federal elections instead of local ones we rule out potential concerns on the exogeneity of the instrument coming from the presence of yardstick competition.

Dependent variable

We use as a dependent variable a measure that aggregates together all Swiss firms. However, one might expect heterogeneous effect of corporate taxes on different kind of firms. Hence, as a robustness check we replicate our baseline estimation by using alternative definitions of our dependent variable.

A first concern arises from considering jointly firms with one and more than one employee. We actually expect the latter kind of firms to be more affected by corporate taxation in their location decisions. Indeed, uni-personal firms might be more affected by personal income taxation or could even reveal a very low reaction to taxes if their economic activities are focused on a local market (e.g. plumbers or painters).¹⁵ Therefore, we estimate the model, separately, by using firms with just one and more than one employee.

In addition, we also consider separately private and public firms. While private firms can be seen as simple profit maximizers, public firms might consider other aspects that influence their activities and location decisions. On the one hand, public firms could be created to satisfy a public need and profit maximization would not exactly represent their aim. On the other hand, one could expect political representatives to be the main driving force to decide where to locate such a firm. Under both scenarios we would expect a reduced sensitivity of public firms to corporate taxes.

Inference

Our estimations report standard errors clustered at the municipal level in order to account for potential serial correlation inherent to the panel structure of the dataset. One might expect that clustering the errors at the cantonal level would be a good alternative given that a relevant part of the effective taxation is decided by cantons (Moulton, 1990). However, such a strategy would leave us with only 14 clusters which, as Cameron et al. (2011) suggest, might produce a bias even stronger than clustering at the observation level. In addition, clustering at the cantonal level will add noise because our instrumental strategy is based on a variable that is not bounded at the cantonal level. Nevertheless, we introduce in several specifications canton specific time trends in order to partially control for changes that occurred at the cantonal level.

Table 3.3: The effect of tax rates on the number of firms

	(1)	(2)	(3)	(4)	(5)	(6)
Corporate tax rate	0.044** (0.021)	0.009 (0.006)	0.017** (0.008)	-0.104** (0.047)	0.052* (0.030)	0.073** (0.034)
Corporate tax rate ²				0.002** (0.001)	-0.001 (0.001)	-0.001* (0.001)
% Inactive and unemployed			-0.001 (0.003)			-0.002 (0.003)
Population in 1,000			0.035** (0.015)			0.035** (0.015)
% Young (≤ 15)			-0.000 (0.002)			-0.000 (0.002)
% Old (≥ 65)			-0.001 (0.002)			-0.001 (0.002)
% Foreigners			-0.000 (0.002)			-0.001 (0.002)
% German speaking population			-0.005** (0.002)			-0.005** (0.002)
% Left votes in national ballots			0.001* (0.001)			0.001* (0.001)
Personal income tax rate			-0.003 (0.004)			-0.009 (0.006)
% Protestant population			-0.004** (0.002)			-0.004** (0.002)
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Canton x time trend	No	Yes	Yes	No	Yes	Yes
RMSE	0.208	0.182	0.182	0.232	0.184	0.187
Weak instrument test (F- stat)	16.568	170.393	143.287	7.151	48.878	36.640
N. Observations	11646	11646	11646	11646	11646	11646
N. Municipalities	1689	1689	1689	1689	1689	1689

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Log(total number of firms). Corporate tax rate is instrumented by the average values of the % of left votes on national election for all municipalities within a radius of 15 km of a given municipality.* $p < 0.1$, ** $p < 0.05$ and *** $p < 0.01$.

3.4.2 Results

Baseline results

In Table 3.3 we report 6 different specifications where *corporate tax rate* is instrumented as explained in section 3.4.1 and the dependent variable is the logarithm of the *number of firms*. The instrument is statistically valid for all the specifications.¹⁶ Hence, the estimated β_1 represents the semi-elasticity of number of firms with respect to the corporate tax rate. In column (1) we include only *corporate tax rate* and both municipal and year fixed effects. In column (2) we add a canton specific time trend whereas in column (3) we also control for other municipal characteristics by including our set of controls. All these columns show a positive coefficient for the variable of interest but only the estimates in columns (1) and (3) are statistically significant. Looking at column (3), our estimate suggests that a one percentage-point increase in the effective corporate tax rate raises the number of firms by 1.7%. Evaluated at the mean, this would imply an increase of 2.5 firms. Although quite small in size, this result contrasts the common wisdom suggesting that an increase in the level of taxation should negatively affect municipal attractiveness for firms.¹⁷

We are aware of the controversy of our previous result. Thus, in order to test for a potential non linear relationship, in the last three columns (4-6) we replicate the previous specifications by adding the *corporate tax rate squared*. Despite column (4) where *corporate tax rate* has a negative sign, the other two columns in which more controls are considered confirm a positive sign for taxation. Interestingly, in column (6) the coefficient of *corporate tax rate squared* is significant and negative. This finding emphasizes that the positive effect of taxation is actually decreasing. However, we still find a positive and statistically significant impact of the tax rate on the number of firms. Again, the effect is rather small. Indeed, a 1 percentage-point increase in the effective corporate tax rate (evaluated at the sample mean) will produce an increase in the number of firms in a given municipality of around 4%. Therefore, by taking seriously our estimation, a municipality will stop attracting new firms by rising taxation over 28.3%.

Our interpretation of this result is mainly based on the interconnections of taxes and public spending. One would expect taxes to be a way of getting access to public goods. As it is well known, Switzerland is a country with sound political and economic contexts where, for instance,

¹⁵For example, Gordon and Slemrod (2000), by looking at U.S. empirically show the presence of income shifting between personal and corporate tax bases.

¹⁶The reported weak instrument test refers to the one proposed by Kleibergen and Paap (2006). All first stage regressions are reported in the Appendix.

¹⁷It is worth noting that we are not the first to find this counter intuitive result: for example Duranton et al. (2011) found a positive effect of local taxation on new firms (although significant only for some of their specifications) by looking at a sub-sample of English municipalities.

Table 3.4: The effect of tax rates on the number of firms (private vs. public- one vs. more than one employees)

	Baseline	One employe	More employees	Public firms	Private firms
	(1)	(2)	(3)	(4)	(5)
Corporate tax rate	0.073** (0.034)	0.003 (0.062)	0.096** (0.037)	-0.013 (0.043)	0.080** (0.036)
Corporate tax rate ²	-0.001* (0.001)	0.001 (0.001)	-0.002*** (0.001)	0.000 (0.001)	-0.001** (0.001)
% Inactive and unemployed	-0.002 (0.003)	0.010** (0.004)	-0.004 (0.003)	0.009** (0.005)	-0.001 (0.003)
Population in 1,000	0.035** (0.015)	0.050** (0.021)	0.028** (0.012)	0.036** (0.018)	0.028** (0.012)
% Young (≤ 15)	-0.000 (0.002)	-0.005* (0.003)	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)
% Old (≥ 65)	-0.001 (0.002)	0.006* (0.003)	-0.004* (0.002)	0.005** (0.003)	-0.002 (0.002)
% Foreigners	-0.001 (0.002)	0.002 (0.003)	-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.002)
% German speaking population	-0.005** (0.002)	-0.005 (0.003)	-0.002 (0.002)	-0.002 (0.002)	-0.004 (0.002)
% Left votes in national ballots	0.001* (0.001)	0.001 (0.001)	0.000 (0.001)	-0.001 (0.001)	0.002** (0.001)
Personal income tax rate	-0.009 (0.006)	-0.001 (0.011)	-0.010 (0.007)	0.006 (0.008)	-0.012* (0.007)
% Protestant population	-0.004** (0.002)	-0.006** (0.003)	-0.003** (0.002)	-0.001 (0.002)	-0.004** (0.002)
Municipal FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Canton x time trend	Yes	Yes	Yes	Yes	Yes
RMSE	0.187	0.336	0.202	0.227	0.207
Weak instrument test (F- stat)	36.640	39.242	36.008	37.168	36.665
N. Observations	11646	11443	11575	11250	11624
N. Municipalities	1689	1682	1687	1658	1688

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is: in column (1) Log(total number of firms), in column (2) Log(total number of firms with one employe), in column (3) Log(total number of firms with more than one employees), (4) Log(total number of public firms) and in column (5) Log(total number of private firms). Corporate tax rate is instrumented by the average values of the % of left votes on national election for all municipalities within a radius of 15 km of a given municipality. * p < 0.1, ** p < 0.05 and *** p < 0.01.

the levels of corruption are very low.¹⁸ These are key features for the intuition behind our interpretation of the results. In such a particular context, citizens and firms would expect the local government to spend each marginal Swiss franc collected by the tax administration in an efficient way. Therefore, we might think that the negative effect of higher-taxation on firms' profits could be offset by a second-order effect on costs, for instance, through a better provision of infrastructure or human capital.

Robustness checks

In Table 3.4 we replicate our model estimation, by allowing for different dependent variable definitions. In column (1) we show our preferred estimation (column (6), Table 3.3). In columns (2) and (3), we split the sample and consider, separately, firms with only one employee (column (2)) and firms with more than one employee (column (3)). As we expected *corporate tax rate* is significant only when we consider firms with more than one employee. Moreover, we confirm the positive effect of taxes found in the baseline regression as well as the validity of our instrument.

We find a similar result when distinguishing between public and private firms (columns (4) and (5), respectively). Public firms seem to be not affected by taxation in their location decisions. Private firm instead are positively and significantly affected by taxation.

3.5 Flat-tax effect

3.5.1 Theoretical intuition

As mentioned before, the introduction of a flat-tax reform has, at least, two different effects on firms' location choices: a positive impact given by the simplicity of the tax schedule and a negative one given by a reduction in the progressivity of the tax system i.e., the *insurance effect*.¹⁹

Given that the effect of tax progressivity on firms' location choices is not as straightforward as the impact given through the simplicity of the tax law, let us highlight the basic theoretical intuitions through a simple numerical example.²⁰

Let's assume a *risk averse* firm that, with equal probability, could make either a 50,000 CHF profit (*bad* outcome) or a 150,000 CHF profit (*good* outcome) in time $t + 1$. Further, let's

¹⁸The *corruption perception index (2013)*, from transparency international, shows that Switzerland is among the least 10 corrupted countries in the world.

¹⁹It is worth mentioning that, in our sample, none of the switcher cantons apply tax exemptions. Thus, by introducing a flat-tax reform, they automatically incur in a reduction in the progressivity of the applied tax schedule.

²⁰This can be seen as numerical application of the theoretical framework described by Bacher and Brühlhart (2013).

assume that in time t , the entrepreneur chooses to settle the headquarter of her firm either in jurisdiction i or j which only differ in their tax schedules: the former applies a proportional or flat tax schedule while the latter applies a progressive one. Indeed, while jurisdiction i implements a 20% flat tax rate, jurisdiction j applies a progressive tax schedule with two tax brackets: a 12% tax rate that applies to profits up to 50,000 CHF and a 34% tax rate rate that applies to profits above 50,000 CHF. Thus, if the firm decided to locate in municipality i , it would make an after-tax profit of 40,000 CHF under the *bad* scenario or a 120,000 CHF profit if the *good* outcome happened. Therefore, the expected tax payments would equal 20,000 CHF and the expected net profits would be 80,000 CHF. Similarly, if the firm located in jurisdiction j , its after-tax profit would be 44,000 CHF under the *bad* scenario and 116,000 CHF under the *good* one. Note that, both the expected tax payments and net profits are the same as those in jurisdiction i i.e., 20,000 CHF and 80,000 CHF, respectively. However the expected profit variability decreases if the firm decided to settle in jurisdiction j . Given the risk aversion assumption, the firm will prefer to locate in jurisdiction j where a progressive tax schedule is applied because the aforementioned *insurance effect* of such a schedule reduces the uncertainty on future profit realizations. In other words, along with a reduction of the complexity of the tax system, a flat tax will produce a strong reduction in the level of progressivity and thus, one would expect that the introduction of a flat-tax schedule would negatively affect the attractiveness of a municipality for firms unless the positive effect given by a simpler tax system more than offsets the negative impact of the *insurance effect*.

3.5.2 Empirical model

To estimate the effect of a flat tax on the number of firms we estimate the following equation:

$$Y_{ict} = \beta_1 FT_{ct} + \beta_2 \mathbf{X}_{ict} + \delta_i + \gamma_t + \epsilon_{ict} \quad (3.3)$$

where, again, i denotes the municipality, c the canton and t the year. The dependent variable is the same as in the previous model. FT_{ct} is a dummy taking the value of 1 for municipalities located in cantons where a flat tax schedule is applied and 0 otherwise. \mathbf{X}_{ict} is the set of controls described before that now also includes the effective tax rate, T_{ict} . As in the first specification, δ_i and γ_t are the municipal and year fixed effects and ϵ_{ict} is the error term.

It is worth noting that despite Equations (3.2) and (3.3) rely on a similar specification, they actually produce results that are differently identified. Indeed, equation (3.3) identifies the effect of the introduction of a flat-tax trough the municipalities that belong to those cantons that had switched from a progressive to a flat tax schedule.

Ideally, we would have used as dependent variable the number of firms aggregated at the cantonal level. However, we decided to stick to the stock of firms at the municipal level for two reasons. First, given that we are using 14 cantons, the number of observations would have been too small to precisely estimate our model. Second, and most importantly, an essential control variable in this model is the *ETR* which, as already emphasized, is crucially dependent on municipal decisions.

Endogeneity

Our main regressor, the *flat-tax dummy*, does not present major problems of endogeneity. As a cantonal choice is unlikely to be related to the municipal stock of firms, the introduction of a flat-tax reform affects exogenously both the municipal tax setting and firms' location decisions.

Nevertheless, the arguments discussed in section 3.4.1 concerning the endogeneity of the *tax level effect* are still valid when estimating this model. Therefore, we use the same instrumental variable strategy to control for it.

Sector Riskiness

Our baseline estimation allows us to verify the average effect of the introduction of a flat-tax reform. However, theoretically one might also expect certain sectoral heterogeneity i.e., the mentioned effect could also depend on the sector's profit variability. Firms belonging to sectors with high profit variability should be attracted more by jurisdictions with a progressive taxation than firms with a lower profit variability. Therefore, as a robustness check we estimate different versions of the model where we consider, alternatively, low and high-risk sectors to see whether results differ and thus are in line with our expectations.

Unfortunately, national statistics on profits at the firm or sectoral levels are not available. In order to get around this data constraint, we constructed a riskiness indicator based on data from Orbis (Bureau van Dijk) from which we gathered comparable financial and business information on nearly 3 million firms from the EU-15 countries over 9 years (2004-2012).²¹

We assume that the distribution of sectors among the different levels of riskiness is the same in EU-15 and Switzerland. Our definition of sector riskiness is directly inspired on theoretical models where profit variability is the main reason to preferring a progressive tax schedule rather than a proportional one, e.g. Bacher and Brühlhart (2013). The standard deviation of profits within sectors represents our riskiness index.

Ideally we would have used a time-variant measure of riskiness. However, given that the data on profits are available just for 2 of the 8 years of our panel, we decided to use the time-average

²¹EU-15 area countries are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

of the standard deviation of profits within sectors.

3.5.3 Results

Baseline results

Our baseline results are shown in Table 3.5.²² Column (1), the simplest specification, where only municipal and year fixed effects are included, shows a positive effect of the *flat tax dummy* on the number of firms. Column (2) and (3) where we add our set of controls, are in line with the existence of the *insurance effect* i.e., the coefficient of the *flat-tax dummy* is negative and statistically significant. Interestingly, the results for *corporate tax* confirm what we already found in section 3.4.2. It is worth noticing that once again our instrument performs well.

A flat-tax reform significantly reduces the number of firms in a given municipality. In terms of magnitude, the coefficient of the *flat-tax dummy* in our preferred specification, column (3), suggests that by switching from a progressive to a proportional tax schedule would decrease the number of firms by roughly 12%. Considering an average municipality, in our sample, this kind of reform would translate in a reduction of roughly 18 firms.

This result fosters the idea that the positive effect given by the simplicity of a flat-tax schedule is actually more than offset by the negative effect arising through a reduction in progressivity.

Robustness checks

In Table 3.6 we assess whether there exist sectoral heterogeneities in the effect described before by mainly focusing on different sub-sample of firms. Whereas in column (1) we present, again, our preferred specification (column (3) of Table 3.5), columns (2) and (3) show the estimations in which the dependent variable accounts for, respectively, low or high risk sectors as defined in section 3.5.2. In column (2) we use a sub-sample that only includes firms belonging to those sectors from the lower-half of the riskiness distribution (low-risk sectors). Similarly, in column (3) we only include firms belonging to those sectors from the upper-half of the riskiness distribution (high-risk sectors). Although the coefficients are negative and significant in both estimations (i.e., -0.089 for low-risk and -0.138 for high-risk sectors, respectively) their magnitude is different and, thus, so it is the size of the impact on firms' location choices. In other words, the flat-tax reform reduces by 8.9% the number of firms on low risk sectors and by 13.8% on high risk sectors. Thus, the negative impact is 55% stronger for high-risk sectors compared to low-risk ones.

²²We use errors clustered at the municipal level for the same arguments described in section 3.4.1.

Table 3.5: The effect of a flat tax rate on the number of firms

	(1)	(2)	(3)
Flat tax dummy	0.159*** (0.055)	-0.094*** (0.032)	-0.124*** (0.041)
Corporate tax rate	-0.087*** (0.034)	0.108** (0.048)	0.153** (0.061)
Corporate tax rate ²	0.002*** (0.001)	-0.002** (0.001)	-0.003** (0.001)
% Inactive and unemployed			-0.003 (0.003)
Population in 1,000			0.036** (0.015)
% Young (≤ 15)			0.000 (0.002)
% Old (≥ 65)			-0.000 (0.002)
% Foreigners			-0.001 (0.002)
% German speaking population			-0.007*** (0.003)
% Left votes in national ballots			0.002* (0.001)
Personal income tax rate			-0.019** (0.009)
% Protestant population			-0.005*** (0.002)
Municipal FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Canton x time trend	No	Yes	Yes
RMSE	0.198	0.192	0.203
Weak instrument test (F- stat)	31.071	24.085	16.878
N. Observations	11646	11646	11646
N. Municipalities	1689	1689	1689

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Log(total number of firms). Corporate tax rate is instrumented by the average values of the % of left votes on national election for all municipalities within a radius of 15 km of a given municipality. * p < 0.1, ** p < 0.05 and *** p < 0.01.

Table 3.6: The effect of a flat tax rate on the number of firms (sectorial risk)

	Baseline (1)	Std. Deviation Profit	
		Low (2)	High (3)
Flat tax dummy	-0.124*** (0.041)	-0.089* (0.053)	-0.138** (0.056)
Corporate tax rate	0.153** (0.061)	0.136* (0.081)	0.175** (0.087)
Corporate tax rate ²	-0.003** (0.001)	-0.003* (0.002)	-0.003* (0.002)
% Inactive and unemployed	-0.003 (0.003)	-0.002 (0.003)	0.000 (0.003)
Population in 1,000	0.036** (0.015)	0.024** (0.012)	0.041** (0.017)
% Young (≤ 15)	0.000 (0.002)	-0.001 (0.002)	-0.000 (0.002)
% Old (≥ 65)	-0.000 (0.002)	-0.006** (0.003)	0.001 (0.003)
% Foreigners	-0.001 (0.002)	-0.002 (0.002)	-0.002 (0.002)
% German speaking population	-0.007*** (0.003)	-0.006** (0.003)	-0.005* (0.003)
% Left votes in national ballots	0.002* (0.001)	0.001 (0.001)	0.001 (0.001)
Personal income tax rate	-0.019** (0.009)	-0.013 (0.012)	-0.026** (0.013)
% Protestant population	-0.005*** (0.002)	-0.001 (0.002)	-0.007*** (0.002)
Municipal FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Canton x time trend	Yes	Yes	Yes
RMSE	0.203	0.235	0.247
Weak instrument test (F- stat)	16.878	16.589	17.173
N. Observations	11646	11542	11536
N. Municipalities	1689	1684	1683

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Log(total number of firms) in column (1), Log (number of firms from low risk sectors) in column (2) and Log (number of firms from high risk sectors) in column (3). Corporate tax rate is instrumented by the average values of the % of left votes on national election for all municipalities within a radius of 15 km of a given municipality. * $p < 0.1$, ** $p < 0.05$ and *** $p < 0.01$.

3.6 Conclusion

This paper assesses the effect of both the level of corporate taxes (*tax level effect*) and of the introduction of a flat-tax reform (*flat-tax effect*) on firms' location choices by using a newly assembled database of nearly 1,700 Swiss municipalities for 8 years over the period 1985-2008.

Unlike most of previous empirical papers and traditional tax competition models that suggest a negative impact of tax rates, we find a positive, small (but statistically significant) and robust *tax level effect* on the number of firms. We are aware that this result could be controversial because it contradicts the common wisdom in tax competition literature suggesting a race to the bottom where competing jurisdictions would reduce local tax rates in order to attract firms. Nevertheless, we think that this is an interesting result from an economic point of view. Taking for granted that firms are profit maximizers, an entrepreneur could see taxes as a way of getting access to more and/or better infrastructure or human capital in a particular jurisdiction. If the marginal cost of an additional percentage point in taxes is more than offset by the marginal benefits received, for instance, by the public goods offered by a given municipality; the entrepreneur would be better off and, thus, would decide to settle in such a municipality. Interestingly, we find that the *tax level effect* is positive up to a certain threshold. Indeed, our results suggest that (on average) over 28.3%, the effect of increasing the tax rate turns negative. In other words, over this threshold increasing tax rates starts being unappealing for firms.

The second channel through which taxes affect firms' location decision, *the flat-tax effect*, is less straightforward than the former. The intuition behind this effect is mainly based on the characteristics of the tax law. Tax progressivity, for instance, should encourage risk-taking entrepreneurial activities i.e., *tax insurance effect*. Indeed, by keeping the expected after-tax profit constant, tax progressivity should act as an insurance device because it reduces the variance of profits by more than linear taxation. On the other hand, a simpler tax schedule (such as the flat-tax one) should have a positive impact on firms' location choices. Thus, the final effect of a flat-tax reform is an empirical matter and depends on which of these two opposite effects prevail. Our results show a negative overall impact of our *flat-tax dummy* confirming the presence of the *insurance effect*. Indeed, even if we are not able to estimate the magnitude of these two opposite effects individually, our results suggest that the *insurance effect* more than offsets the positive impact given by the simplicity of the flat-tax schedule. On average, switching from a progressive to a flat-tax schedule decreases the number of firms by roughly 12%. We also verify that this effect is larger (i.e., more negative) for firms belonging to riskier sectors. Finally, we are aware of the limitations of our identification strategy, mainly because of data constraints. Indeed, we believe that further research is required in order to draw stronger and more robust conclusions regarding the *insurance effect*.

3.A Appendix

Table 3.A.1: First stage regressions of Table 3.3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
% of left votes	-0.054***	-0.155***	-0.149***	-0.361***	-20.880***	-0.279***	-16.656***	-0.295***	-17.262***
neighbouring municipalities	(0.013)	(0.012)	(0.012)	(0.052)	(2.104)	(0.047)	(1.845)	(0.048)	(1.879)
% of left votes				0.007***	0.394***	0.003***	0.239***	0.004***	0.259***
neighbouring municipalities ²				(0.001)	(0.046)	(0.001)	(0.038)	(0.001)	(0.039)
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Canton x time trend	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Control variables	No	No	Yes	No	No	No	Yes	Yes	Yes
R-squared	0.163	0.599	0.626	0.169	0.147	0.600	0.544	0.627	0.574
N. Observations	11646	11646	11646	11646	11646	11646	11646	11646	11646
N. Municipalities	1689	1689	1689	1689	1689	1689	1689	1689	1689

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Corporate tax rate in columns 1, 2, 3, 4, 6, 8 and Corporate tax rate squared in column 5, 7 and 9. * p < 0.1, ** p < 0.05 and *** p < 0.01.

Table 3.A.2: First stage regressions of Table 3.4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
% of left votes	-0.295***	-17.262***	-0.297***	-17.260***	-0.295***	-17.303***	-0.299***	-17.591***	-0.294***	-17.249***
neighbouring municipalities	(0.048)	(1.879)	(0.048)	(1.877)	(0.048)	(1.888)	(0.049)	(1.914)	(0.048)	(1.880)
% of left votes	0.004***	0.259***	0.004***	0.259***	0.003***	0.259***	0.004***	0.266***	0.003***	0.259***
neighbouring municipalities ²	(0.001)	(0.039)	(0.001)	(0.039)	(0.001)	(0.039)	(0.001)	(0.040)	(0.001)	(0.039)
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Canton x time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.627	0.574	0.627	0.574	0.628	0.574	0.627	0.571	0.627	0.574
N. Observations	11646	11646	11443	11443	11575	11575	11250	11250	11624	11624
N. Municipalities	1689	1689	1682	1682	1687	1687	1658	1658	1688	1688

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Corporate tax rate in columns 1, 3, 5, 7 and 9, and Corporate tax rate squared in column 2, 4, 6, 8, 10. * p < 0.1, ** p < 0.05 and *** p < 0.01.

Table 3.A.3: First stage regressions of Table 3.5

	(1)	(2)	(3)	(4)	(5)	(6)
% of left votes	-0.616***	-27.862***	-0.350***	-18.654***	-0.363***	-19.162***
neighbouring municipalities	(0.060)	(2.375)	(0.050)	(1.947)	(0.050)	(1.954)
% of left votes	0.013***	0.532***	0.005***	0.294***	0.005***	0.312***
neighbouring municipalities ²	(0.001)	(0.051)	(0.001)	(0.040)	(0.001)	(0.041)
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Canton x time trend	No	Yes	Yes	No	Yes	Yes
Control variables	No	No	Yes	No	No	Yes
R-squared	0.313	0.248	0.614	0.554	0.640	0.583
N. Observations	11646	11646	11646	11646	11646	11646
N. Municipalities	1689	1689	1689	1689	1689	1689

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Corporate tax rate in columns 1, 3, and 5 and Corporate tax rate squared in column 2, 4 and 6. * p < 0.1, ** p < 0.05 and *** p < 0.01.

Table 3.A.4: First stage regressions of Table 3.6

	(1)	(2)	(3)	(4)	(5)	(6)
% of left votes	-0.363***	-19.162***	-0.361***	-19.108***	-0.363***	-19.159***
neighbouring municipalities	(0.050)	(1.954)	(0.050)	(1.959)	(0.050)	(1.958)
% of left votes	0.005***	0.312***	0.005***	0.313***	0.005***	0.311***
neighbouring municipalities ²	(0.001)	(0.041)	(0.001)	(0.041)	(0.001)	(0.041)
Municipal FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Canton x time trend	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.640	0.583	0.642	0.587	0.639	0.581
N. Observations	11646	11646	11542	11542	11536	11536
N. Municipalities	1689	1689	1684	1684	1683	1683

Notes: Standard error in parenthesis. In all columns standard errors are clustered at the municipality level. The dependent variable is Corporate tax rate in columns 1, 3, and 5 and Corporate tax rate squared in column 2, 4 and 6. * p < 0.1, ** p < 0.05 and *** p < 0.01.

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