Fiscal Federalism and Income Inequality: an Empirical Analysis for Switzerland

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Abstract

Recent research revealed significant differences in the development of income distribution among industrial countries. The aim of this paper is to assess how fiscal federalism as an institutional factor may influence inequality and redistribution. It is difficult to infer a theoretical prediction of the relationship. We rely on the ideal institutional environment in Switzerland to study this issue empirically. According to our findings revenue decentralization and fragmentation significantly reduce inequality in gross incomes and efficiently generate a more equal distribution of disposable income. It is, however, crucial to account for the interdependence of the two instruments of federalism. We find that the efficacy of redistribution systems is restrained by the combined effect of fiscal decentralization and fragmentation.

Keywords: Federalism, Decentralization, Inequality, Income Concentration, Redistribution, Top Incomes, Switzerland
JEL: D31, H23, H77

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1. Introduction

In this paper we examine the relationship between fiscal federalism and income inequality by exploiting institutional heterogeneity within Switzerland since 1945. Specifically, we employ panel fixed effects regressions for Swiss cantons. As variables for fiscal federalism we use decentralization of tax revenues as well as total expenditures within a canton and also assess the interaction with fragmentation of cantons into municipalities. As the dependent variable we use pre- as well as post-tax inequality measures based on data from the federal tax statistics, which are consistently estimated on a cantonal level (Frey and Schaltegger, 2016).

In an extensive study the Organisation for Economic Co-operation and Development (OECD, 2012) assesses the determinants of income inequality in industrialized countries. Important drivers are technological progress (skill biased technological change), globalization (global market for talents), demographic changes as well as changes in household structures (assortative matching and the increase of single-households with children). Further, policy variables like labor market regulation, the social-protection system and redistribution via taxes directly influence the distribution of income.

While the OECD focuses on the common trends, there is in fact significant heterogeneity in the development of income inequality among industrialized countries. While the income share of the top 1 percent in the United States fell from 11 percent in 1945 to around 8 percent in the 1970s and subsequently increased to 18.4 percent (according to the World Wealth and Income Database by Alvaredo et al. (2015)), the top 1 percent income share stayed remarkably stable in Switzerland at around 11 percent since 1945 until today. Besides fundamental factors like technology, globalization and demography, which affect many industrialized countries in a similar ways, institutional differences might explain the significant heterogeneity in the development of income inequality.

Acemoglu and Robinson (2015) take issue with the idea of a general law regarding the development of inequality in capitalist societies, not least because of

the great institutional diversity among those countries. They argue that the effects of economic shocks and opportunities on inequality depend on institutions and political factors as well as the endogenous evolution of those institutions. As a result Acemoglu and Robinson (2015) conclude that in order to explain income inequality institutional factors have to be included at center stage. In this paper we follow up on this idea by examining the influence of fiscal federalism on inequality. Specifically, we empirically assess the influence of fiscal decentralization on the distribution of gross incomes as well as on the distribution of post-tax incomes and redistribution.

The remainder of this paper is organized as follows. In section 2 we briefly discuss the theoretical literature as well as previous empirical studies on the influence of fiscal federalism on income distribution. Section 3 describes our data and the model we employ followed by the results in section 4. Finally we offer some concluding remarks in section 5.

2. Literature review

Traditionally, the theory of federalism assigns the responsibility for the (re-)distribution of income to the federal level (Oates, 1972; Musgrave, 1959). The basic argument is that due to the mobility of tax payers sub-federal jurisdictions are not able to implement effective redistribution policies. However, fiscal federalism affects the distribution of income via indirect channels as well. Decentralization of public finances affects basic socioeconomic parameters like growth, the size of the public sector, regional differences as well as the quality and efficiency of government institutions. Therefore, it is very difficult to theoretically derive a prediction regarding the direction of the influence of fiscal federalism on inequality. The effect of fiscal federalism remains an empirical question (Sepulveda and Martinez-Vazquez, 2011).

2.1. Empirical studies

So far only a few studies empirically assess the distributive effect of fiscal decentralization. Tselios et al. (2012) analyze the effect of fiscal decentralization

on inequality within regions in Western Europe from 1995 to 2000. They show that fiscal federalism, both measured by the share of subnational governments at total expenditures as well as at total revenues, is associated with less inequality, particularly in regions with lower average incomes. As average incomes in regions rise however, the effect of fiscal decentralization on inequality tends to diminish.

Sepulveda and Martinez-Vazquez (2011) estimate a fixed effects model based on a panel of 56 developing as well as developed countries covering the period between 1971 and 2000. They find a significant interaction effect between fiscal decentralization and the size of the public sector. If the size of government exceeds around 20 percent of gdp, inequality tends to decrease with fiscal decentralization measured by the share of subnational expenditures.

Based on a mainly cross-sectional sample of 37 countries Neyapti (2006) assess the effect of fiscal federalism in combination with the quality of governance. They find that revenue decentralization has a decreasing effect on inequality if combined with good governance in the form of control of corruption, the rule of law, political stability, governmental efficiency, voice and accountability and regulatory quality.

These results seem to suggest that if some necessary preconditions are satisfied (a minimal level regarding the size of government, the income level and institutional quality) fiscal federalism tends to favor distributional consequences. An explanation for the inequality mitigating effect of fiscal federalism might be found in a changed functional composition of public expenditures. del Granado et al. (2005) assess the effect of fiscal decentralization on public expenditures in a panel of 45 developing and developed countries. They find evidence that fiscal decentralization leads to an increases share of education and health expenditures. These publicly provided private goods might quite possibly have equalizing distributional consequences.

However, one recent study finds an inequality increasing effect of decentralization of taxation. Sacchi and Salotti (2014) note that most of the employed

measures of expenditure or revenue decentralization do not account for the real autonomy of sub-national governments. Local revenues might be locally determined, but they may also be based on a multiplier or a share of national taxes. Local expenditures may be mandated or spent on behalf of the national government. Sacchi and Salotti (2014) assess the effect of seven different indexes of fiscal decentralization constructed by Stegarescu (2005) which take into account the real autonomy of sub-national governments. Based on a panel of 23 industrial countries between 1971 and 2000 Sacchi and Salotti (2014) find that revenue decentralization increases income inequality and that this effect is strongest if only those decentralized taxes are taken into account over which local authorities have complete authority. The authors find however no significant effects of revenue decentralization.

In another related empirical study Feld et al. (2010b) investigate the effect of different instruments of fiscal federalism in Switzerland on the size of government revenues. Based on a panel of Swiss cantons between 1980 and 1998 they find that decentralization of revenues has a decreasing effect on the size of government. The effect mostly stems from tax competition and tax exporting. Further Feld et al. (2010b) also test the *fragmentation hypothesis* by Brennan and Buchanan (1977, 1980) according to which the impact of fiscal decentralization depends on the number of alternative jurisdictions for tax payers to choose from. However, the authors find no significant effects from fragmentation (measured by the number of municipalities in a canton) on the size of government revenue. Nonetheless the authors note that a certain level of fragmentation is certainly a precondition for fiscal decentralization to have an effect.

In this paper we add to the empirical literature in several ways. First, we assess the effect of fiscal federalism not only on a general level of inequality measured by the Gini coefficient but on income concentration at the top of the income scale as well. Additionally, besides market incomes we also look at the effect on inequality in after-tax incomes as well as redistribution of incomes due

to taxation. Further, as fragmentation is a precondition for decentralization to actually expert any effect, we model the interaction between fragmentation and fiscal decentralization. Finally, our analysis is based on a much longer time frame than previous studies, namely since 1945, as well as a very consistent data base on Swiss cantons.

3. Data and method

3.1. Data

The data on the distribution of income is based on the Swiss federal tax statistics. Dell et al. (2007) as well as Föllmi and Martínez (2016) employ this data source in order to determine the evolution of top income shares in Switzerland. Also Schaltegger and Gorgas (2011) used this data to estimate and compare income concentration on a cantonal level. Frey and Schaltegger (2016) build on this to determine the evolution of top income shares after taxes and also the redistributive effect of income taxes on the federal as well as the sub-federal level. Our analysis is based on this series by Frey and Schaltegger (2016).[1] We employ several income distribution measures before as well as after taxes, like the Gini coefficient and the incomes shares of the top 10, the top 5 and the top 1 percent on the income scale. Further, we employ the measure for the redistributive effect of income taxes as determined by Frey and Schaltegger (2016) which consists of the percentage reduction in inequality measures due to income taxes.

[1] The series includes so-called special cases ("Sonderfälle"), i.e. high-net-worth immigrants who enjoy special tax treatment. The income variable available in the tax statistics is gross income. It includes social security benefits, while social security contributions are deducted. Redistribution due to the social security system is thus already included. As the level of benefits is linked to contributions, this mainly constitutes within-household redistribution over the lifecycle. However, since benefits are capped while contributions are not, the social security system also implies income redistribution between households. Due to data restrictions, this kind of redistribution can not be neutralized and is thus included in the pre-tax income variable.

Decentralization of revenues (*dec_rev*) is measured by the share of municipalities at total cantonal and municipal tax revenues. By restricting our revenue decentralization measure to taxes, we include only revenues over which municipal governments have complete autonomy. For an overview of decentralization of revenue in cantons see figure 1.

Decentralization of expenditures (*dec_exp*) is measured by the share of municipalities at total cantonal and municipal expenditures. One problem with this measure is that municipal expenditures are not necessarily self-financed but instead might in part be financed by grants received from the cantonal government. Thus fiscal federalism might be overestimated by this decentralization measure based on expenditures. For an overview of decentralization of expenditure in cantons see figure 2.

Further, we also assess the fragmentation (*fragm*) of cantons, measured by the number of municipalities relative to the cantonal population . The variation in this variable results from mergers of municipalities in several cantons, as well as due to population growth. For an overview of decentralization in cantons see figure 3.

As measure for the tax burden in cantons we include the top marignal tax rate in our analysis (*topmtax*). In order to account for tax competition among Swiss cantons, we include a variable based on the top marginal tax rate in the neighbor cantons. To define this variable we rely on the literature on strategic tax competition and tax mimicking (see for example Feld and Reulier (2009)). We assume that the influence of tax competition depends on the average tax burden in geographically adjacent cantons (*topmtaxn*). Such a measure based on contiguity is also used in the tax mimicking literature (see Brueckner (2003) as well as Revelli (2003)).

Finally, with the fiscal equalization scheme we also include the cooperative element of federalism into our analysis. On the one hand, we determine the per-capita revenues of cantons due to shared federal taxes (*cant_share_pc*). On the other hand, we assess the per-capita revenues or equalization payments of cantons inherent in the fiscal equalization scheme introduced in 1959 and

significantly reformed in 2008 (*equal_pc*).

3.2. Method

We estimate the following model

$$(re)dist_{it} =$$

$$\beta_1\ dec_{i,t-1} + \beta_2\ fragm_{i,t-1} + \beta_3\ dec * frag_{i,t-1} + B(controls_{i,t}) + \alpha_i + \delta_t + \epsilon_{i,t}$$

where i denotes the canton and t the tax period, respectively. We regress the federal instruments on inequality before taxes (distribution of gross incomes), redistribution due to the progressive tax system and inequality after taxes (distribution of disposable income). For each of the three dependent variables there are four related specifications (columns 1 to 4 in Tables 1 to 3) based on different inequality measures (the Gini coefficient and three top income shares for the top 10%, the top 5% and the top 1% of the income distribution). The corresponding redistribution measure is based on the reduction of the inequality measure after taxes relative to the same inequality measure before taxes, i.e. the percentage reduction in inequality induced by the progressive tax system. The main instruments of federalism are fragmentation ($fragm$) and decentralization (dec) of either tax revenues (dec_rev) or expenditures (dec_exp). We also include an interaction term in order to combine the two federal instruments ($dec * fragm$). We assume this interaction effect to be non-negligible. For fiscal decentralization to constitute a meaningful concept in practice one requires some level of fragmentation in the local tier of government. Similarly, one may argue that the effect of fragmentation alone is probably quite limited if municipalities are of pure administrative nature but are not assigned any fiscal autonomy. In order to attenuate problems of endogeneity the main federal instruments including the interaction term are lagged for one period (following Sacchi and Salotti (2014)).

Besides fiscal decentralization and fragmentation the model includes variables to represent the competitive and cooperative components of federalism as explained above. Further we also include as control variables the unemployment

rate ($unempl$), the share of the population in working age (pop_act), the population density (pop_dens), the share of left parties in the last elections ($left$), the crime rate ($crime$), the share of the foreign population ($foreign$) as well as appartement construction ($apart$) (see table A.4 in the appendix for descriptive statistics). The top marginal tax rate is included when estimating the effect of federalism on inequality while we only control for the level of inequality (based on the top 10% income share) in the second estimation (redistribution).

For all specifications we include fixed effects for both cantons (α_i) and tax periods (δ_t) in order to capture unobservable, constant cantonal features as well as unobservable effects on all entities in tax periods. The calculated Newey-West standard errors are robust to heteroscedasticity and autocorrelation (up to three periods). Furthermore, a panel unit root test was conducted for all dependent variables in order to exclude non-stationarity. For our purposes Pesaran's (2007) t-test is suitable because it does not require cross-sectional independence. Given the competitive nature of the federal system in Switzerland independence between cantons with respect to distribution measures based on tax statistics would be a strong assumption. The test which we conduct for all (re-)distribution measures with up to three lags allows us to reject the null hypothesis for all but one time series.

4. Results

Tables 1-3 present the effects of revenue decentralization and fragmentation on the three dependent variables inequality before taxes, redistribution and inequality after taxes. As for the (re)distribution measures we include four specifications. Table 1 illustrates the effect of revenue decentralization and fragmentation on inequality before taxes. While the effect on the Gini coefficient remains insignificant (column 1) we detect an inequality diminishing impact of both revenue decentralization and fragmentation at the top of the income scale. However, to determine the actual effect of the two main federal instruments the interaction effect must be taken into account. The interaction of revenue

decentralization and fragmentation tends to increase inequality. Therefore, the net effect of decentralization depends on the level of fragmentation and vice versa.

This is best described by Figures 4 and 7. They illustrate the net effect of decentralization (fragementation) on the income share of the top 10 percent depending on the other instrument of federalism. According to Figure 4 revenue decentralization tends to decrease inquality if the average population size of municipalities in a canton is high (fragmentation low). If however, fragmentation is high (and the population size of the average municipality low) the effect runs the other way. According to Figure 7 fragmentation tends to decrease inquality if revenue decentralization is low. If however, decentralization is high the effect runs the other way.

We include the respective pivot values in Table 1. They illustrate at which level of fragmentation (decentralization) the diminishing effect of the other instrument of federalism is cancelled out. At higher levels of fragmentation (decentralization) the effect is reversed. According to our findings revenue decentralization diminishes inequality measured by the income share of the top 5% as long as the average population of a municipality is larger than 1075 (fragmentation value 0.93). Historically, this is very low and only the two most fragmented cantons (Grisons and Jura) approximately reach such a value today. Similarly, the model yields a relatively high value for the revenue decentralization (about 50%) where the inequality reducing effect of fragmentation cancels out. In as few as four cantons the share of local revenues exceeds the 50 percent threshold today.

Swiss Cantons have a large degree of autonomy regarding fiscal policy. Cantonal policy with regard to both budget appropriation as well as the level of taxation certainly influences local income inequality. Hence, in our model we include variables on taxation to take this into account. High marginal tax rates particularly distort occupational incentives of high income earners and reduce the amount of reported incomes, implying lower inequality. We find significant effects in this regard at the top of the income scale (see table 1 and 3).

By contrast, if neighbor canton set higher top marginal tax rates, we expect inequality to increase. Competitive cantons are likely to attract high income earners resulting in higher inequality measures. Our results confirm this, as we find significantly increasing effects of the tax burden in neighbor cantons on all tested inequality measures.

Higher cantonal revenues from shared federal taxes appear to coincide with higher inequality. At the same time higher revenues from fiscal equalization transfers are related to lower inequality. Both relationships are unlikely to be the result of a causal effect. Instead they result from the fact that cantons which are rich in economic resources (income, wealth and profits) tend to exhibit higher inequality while at the same time receiving higher revenues from shared federal taxes but lower revenues from the fiscal equalization scheme. Cantons with lower economic resources on the other hand tend to exhibit lower inequality. They receive lower revenues from shared federal taxes but higher revenues form the fiscal equalization scheme.

The results also yield interesting effects with regard to GDP per capita. Regarding the Gini coefficient our results are in line with Kuznets (1955) according to whom general inequality tends to follow an inverted U curve with progressing economic development. Regarding inequality at the top our findings confirm more recent studies stating a relationship that follows a U curve (Alvaredo et al., 2013).

Insert Table 1 here

Table 2 presents the effects of decentralization and fragmentation on redistribution. The results show a similar picture as the effects on inequality before taxes. Both instruments of federalism tend to reduce redistribution. Again, however, the interaction between decentralization and fragmentation has a counteracting effect. Figures 5 and 8 illustrate how the net effect of revenue decentralization (fragmentation) on redistribution depends on the other instrument of federalism. As the pivot values in table 2 show decentralization tends to increase

redistribution if the average municipality size is smaller than 1000 inhabitants (fragmentation value of 1). This is quite high compared to the mean fragmentation of the cantons in our dataset. Fragmentation on the other hand increases redistribution if the municipalities' revenue share exceeds about 75 percent. Such a high degree of decentralization is very rare.

Both instruments of federalism appear to restrict the redistributional effect of the tax system as long as revenue decentralization and fragmentation do not exceed a certain level. These findings are consistent with the previous results of the effects on inequality before taxes. As noted above the instrument of federalism were also found to reduce gross income inequality (particularly with regard to top incomes) as long as they do not increase significantly.

Evidently, if inequality before taxes is lower, the necessity of redistribution is lower as well. In order to control for the level of inequality - which according to Meltzer and Richard (1981) influences individuals' redistribution preferences - we additionally include two inequality variables into our model. The results are presented in table 2 as well. Contrary to our expectations a higher Gini coefficient leads to significantly less general redistribution measured by the change in the Gini coefficient due to taxation (column 1), whereas redistribution at the top of the income distribution is amplified (columns 2-4). A higher concentration of incomes at the top (measured by the top 10% income share), however, tends to diminish the progressive effect of the tax system (columns 1-4). This effect could be explained by an increased influence of high income earners in the political process due to the higher income concentration at the top.

As outlined above, tax competitiveness should not be omitted in our analysis. The findings show a positive effect of higher tax rates in the neighbor cantons on redistribution. Probably, higher tax rates in its neighborhood allows a canton to increase redistribution without negative effects on a cantons's tax competitiveness.

Insert Table 2 here

Table 3 presents our findings with regard to the effect of the instruments on federalism on inequality after taxes. This analysis tries to answer the question whether the diminishing effect of decentralization and fragmentation on the inequality of gross incomes outweighs the reducing effect of those instruments on redistribution or not.

In table 3 we observe significantly decreasing effects of decentralization and fragmentation on inequality. As before the interaction term plays an essential role again. Figures 6 and 9 illustrate how the effect of revenue decentralization (fragmentation) on inequality after taxes depends on the other instrument of federalism. For both instruments the negative effect is reversed if the other instrument exceeds a certain level. Revenue decentralization tends to increase inequality if the average municipality size falls short of 935 (fragmentation higher than 1.07). Fragmentation has an increasing effect if the revenue share of municipalities exceeds 57.9 percent. The competitive and cooperative instruments of federalism again show the effects as described above. If however the levels of decentralization and fragmentation fall below the pivot levels, both instruments of federalism tend to decrease inequality after taxes. Thus, the diminishing effect on inequality before taxes dominates the decreasing effect on redistribution.

Also in terms of efficiency these results are favorable for fiscal federalism. The more equal distribution of income results from a more even distribution of gross incomes and not from greater efforts to redistribute incomes via the tax system. As redistribution usually coincides with a loss of efficiency, a more equal distribution of income despite less redistribution is highly favorable with regards to efficiency.

Insert Table 3 here

Results for expenditure decentralization are presented in the appendix (tables B.5 to B.7). Generally, we do not find significant effects of the instruments of federalism. The lack of significant effects of decentralization on the expenditure side may be explained by the fact that local expenditure responsibilities are

not necessarily congruent with local autonomy regarding tax revenue. As fiscal equivalence between revenue and expenditure is rarely completely fulfilled, the competence of lower tiers' of government may to some extent been reduced to execute expenditure decisions determined by central government. Decentralization of tax revenue is more likely to reflect the actual degree of local autonomy. However, we should not conclude from the results that expenditure decentralization has no effect on (re-)distribution of incomes. Our variable is measured based on total cantonal and local expenditure, respectively. It is conceivable that a refined decentralization measure based on specific areas of expenditure would yield better results. Such a measure could for example capture education or social expenditure only. Both account for a substantial share of expenditures on a cantonal and local level and are directly related to the distribution of incomes. Consequently, amplified endogeneity problems would have to be considered thoroughly.

5. Conclusion

According to traditional theory of federalism distributional responsibilities lie with central government (Musgrave, 1959; Oates, 1972). The basic argument is that redistribution on a local level can be undermined by citizens' mobility, tax competition as well as migration into social security systems. However, federalism affects income (re-)distribution through a variety of channels. Besides direct effects on the structure of taxes and expenditures a federal system is likely to significantly impact income distribution by socio-economic factors such as growth, tax-to-GDP ratio, regional disparities and the quality of institutions. As it is not possible to predict the expected effect of federalism on inequality based on theory this mainly remains an empirical issue (Sepulveda and Martinez-Vazquez, 2011).

The federal system of Switzerland is characterized by both institutional variety as well as a federal harmonization. It is therefore an ideal environment to empirically assess the effect of institutions such as federalism on inequality.

Based on federal income tax statistics it is possible to assess income inequality on cantonal level very consistently over an extensive period of time.

We estimate the effect of decentralization of tax revenues as well as fragmentation on inequality before and after taxes as well as on redistribution via taxes. According to our results, both instruments of federalism generally tend to diminish the inequality of incomes before taxes. We find however, a counteracting interaction effect of the two instruments of federalism. If the decentralization of revenues is large, fragmentation tends to increase inequality. Also if fragmentation is high, decentralization of revenues tends to increase inequality. Small (in comparison to large) municipalities appear to lack the necessary skills and resources to specifically ascertain an equal distribution of incomes.

With regard to redistribution we find very similar results. As long as decentralization of revenues and fragmentation do not exceed a certain level, both instruments of federalism do not only diminish inequality before taxes but also redistribution. This is consistent in the sense that less inequality before taxes decreases the necessity of redistribution through the tax system. Our results also imply that cantons with a strongly fragmented municipality landscape will tend to redistribute more.

Finally, we also find a inequality decreasing "net effect" of revenue decentralization and fragmentation on inequality after taxes. Hence, the diminishing effect of the two instruments of federalism on inequality of income before taxes dominates the decreasing effect on redistribution. Overall, we may conclude, that revenue decentralization and fragmentation quite efficiently reduce inequality of disposable income since this result emerges from an even distribution of gross incomes as opposed to more redistribution via the tax system.

In addition, this paper contributes to the literature by emphasizing the interaction of different instruments of federalism. The combination of fiscal decentralization and fragmentation yields more refined results. Our findings also appear to confirm the propositions of the traditional theory of federalism and are in line with earlier studies (Feld et al., 2010a). The efficacy of redistribution systems is restrained by the combined effect of fiscal decentralization and

fragmentation. Given high fiscal autonomy small municipalities struggle to effectively address inequality. This finding could be due to a lack of resources or influential interest groups that are more successful at enforcing self-interests in small municipalities. This effect could be avoided if local institutions require politicians to be held accountable and there are effective control mechanisms. If fragmentation is limited and municipalities exhibit a certain size they appear to target more effectively than the canton. The efficacy of the redistribution system is even increased when municipalities enjoy more fiscal autonomy.

Figure 1: Decentralization of revenues (Percent)

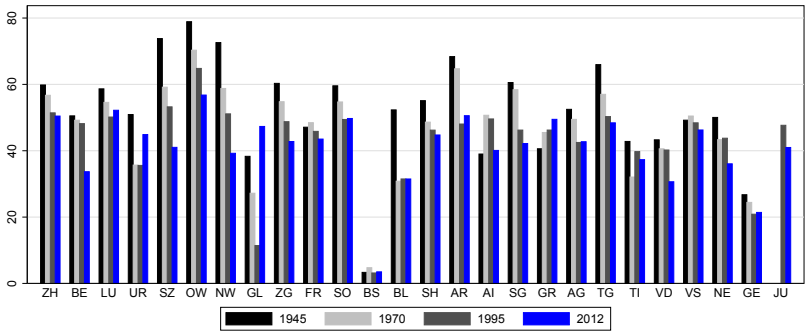


Figure 2: Decentralization of expenditures (Percent)

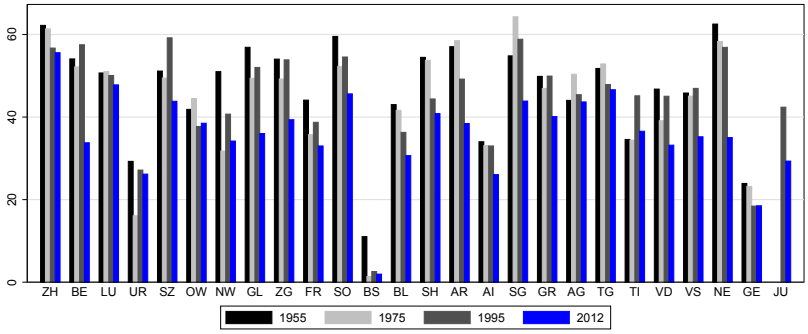


Figure 3: Fragmentation (number of municipalities per 1'000 inhabitants)

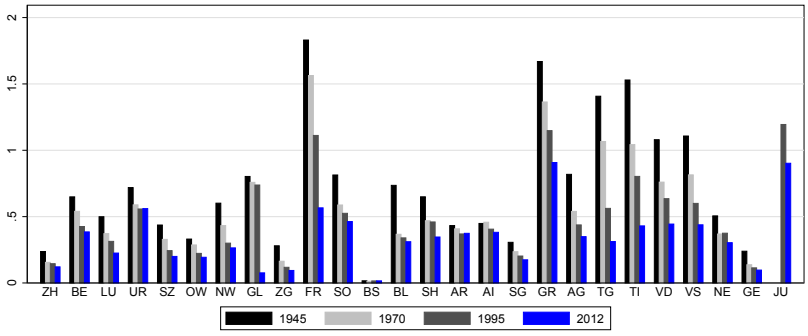


Table 1: Inequality before Taxes and Revenue Decentralization

	gini	top10	top5	top1
dec_rev_l1	-0.000	-0.246***	-0.168***	-0.073*
	(-0.31)	(-3.51)	(-3.45)	(-1.82)
fragm_l1	-0.056	-13.783***	-9.798***	-5.147**
	(-1.48)	(-3.40)	(-3.24)	(-2.23)
dec_rev_int_l1	0.001**	0.239***	0.180***	0.108***
	(2.34)	(3.82)	(3.65)	(2.73)
topmtax	-0.001*	-0.200***	-0.216***	-0.201***
	(-1.88)	(-3.96)	(-5.23)	(-5.28)
topmtaxn	0.002***	0.133**	0.129***	0.114***
	(3.27)	(2.49)	(3.12)	(3.32)
cant_share_pc	0.000	0.005***	0.004***	0.003***
	(1.57)	(4.66)	(3.95)	(2.63)
equal_pc	-0.000**	-0.006***	-0.006***	-0.005***
	(-2.53)	(-4.71)	(-5.48)	(-4.84)
gdppc	0.001	-0.595***	-0.437***	-0.246***
	(1.54)	(-8.49)	(-7.84)	(-5.33)
gdppc2	-0.000*	0.003***	0.002***	0.001***
	(-1.67)	(6.57)	(6.12)	(4.03)
controls	unempl pop_act pop_dens left crime foreign apart			
pivot dec_rev	0	970	1075	1470
pivot fragm	0	57.7	54.4	47.8
N	964.000	964.000	964.000	964.000
F	28.682	35.573	34.389	25.552

Newey-West corrected standard errors

t statistics in parentheses $^{*}p < 0.1,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Table 2: Redistribution and Revenue Decentralization

	ginire	top10re	top5re	top1re
dec_rev_l1	-0.032*	-0.116***	-0.094**	-0.069
	(-1.78)	(-3.19)	(-2.31)	(-1.22)
fragm_l1	-2.787**	-7.175***	-6.314**	-5.898*
	(-2.47)	(-2.91)	(-2.49)	(-1.87)
dec_rev_int_l1	0.037*	0.095**	0.070	0.043
	(1.75)	(2.02)	(1.43)	(0.69)
gini	-12.008***	14.442***	10.011***	1.152
	(-6.62)	(3.47)	(2.61)	(0.23)
top10	-0.035**	-0.421***	-0.379***	-0.385***
	(-2.20)	(-8.43)	(-9.51)	(-9.55)
topmtaxn	0.074***	0.065	0.098**	0.122**
	(3.76)	(1.61)	(2.24)	(2.11)
cant_share_pc	-0.001***	-0.001***	-0.002***	-0.002***
	(-3.31)	(-2.87)	(-3.53)	(-2.82)
equal_pc	-0.001***	-0.002**	-0.002**	-0.002*
	(-2.68)	(-2.34)	(-2.02)	(-1.66)
controls	gdppc unempl pop_act pop_dens left crime foreign apart			
pivot dec_rev	1060	820	745	625
pivot fragm	75.3	75.5	90.2	—
N	964.000	964.000	964.000	964.000
F	235.346	43.959	53.637	41.375

Newey-West corrected standard errors

t statistics in parentheses $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 3: Inequality after Taxes and Revenue Decentralization

	giniat	top10at	top5at	top1at
dec_rev_l1	-0.000	-0.229***	-0.151***	-0.062*
	(-0.10)	(-3.24)	(-3.24)	(-1.82)
fragm_l1	-0.040	-12.456***	-8.422***	-4.086**
	(-1.05)	(-3.16)	(-3.03)	(-2.08)
dec_rev_int_l1	0.001*	0.215***	0.155***	0.088***
	(1.93)	(3.52)	(3.41)	(2.58)
topmtax	-0.001**	-0.229***	-0.236***	-0.208***
	(-2.20)	(-4.49)	(-5.79)	(-5.83)
topmtaxn	0.002***	0.103**	0.101***	0.092***
	(2.89)	(2.01)	(2.65)	(3.23)
cant_share_pc	0.000*	0.005***	0.004***	0.002***
	(1.94)	(4.84)	(4.14)	(2.69)
equal_pc	-0.000**	-0.005***	-0.006***	-0.005***
	(-2.26)	(-4.38)	(-5.27)	(-4.81)
gdppc	0.001	-0.570***	-0.409***	-0.222***
	(1.16)	(-8.50)	(-8.00)	(-5.50)
gdppc2	-0.000	0.002***	0.002***	0.001***
	(-1.37)	(6.37)	(5.98)	(3.98)
controls	unempl pop_act pop_dens left crime foreign apart			
pivot dec_rev	0	935	1030	1430
pivot fragm	40	57.9	54.3	46.4
N	964.000	964.000	964.000	964.000
F	37.736	28.893	30.316	24.666

Newey-West corrected standard errors

t statistics in parentheses $^{*}p < 0.1,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Figure 4: Effect of revenue decentralization on the top 10 percent income share

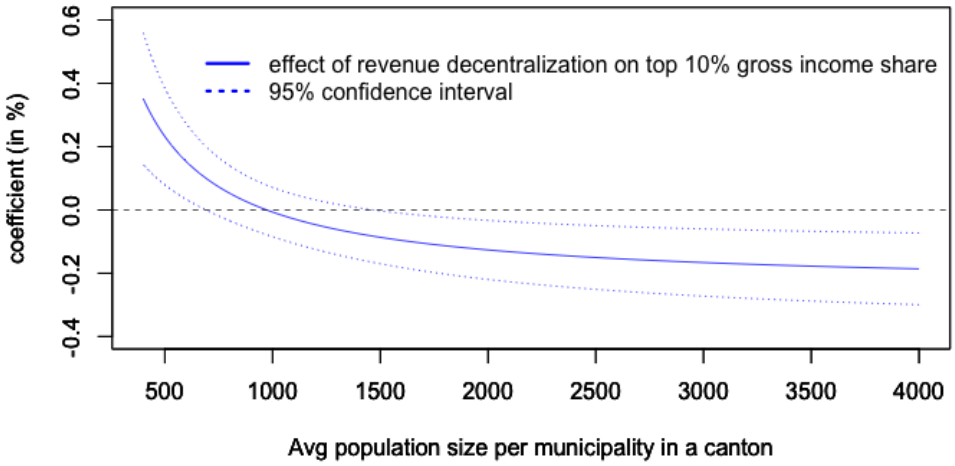


Figure 5: Effect of revenue decentralization on redistribution at the top 10 percent

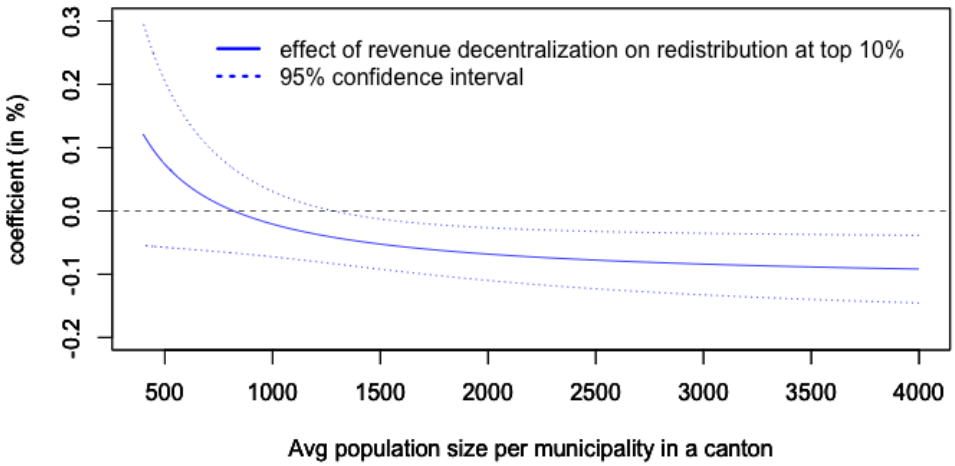


Figure 6: Effect of revenue decentralization on the top 10 percent income share after taxes

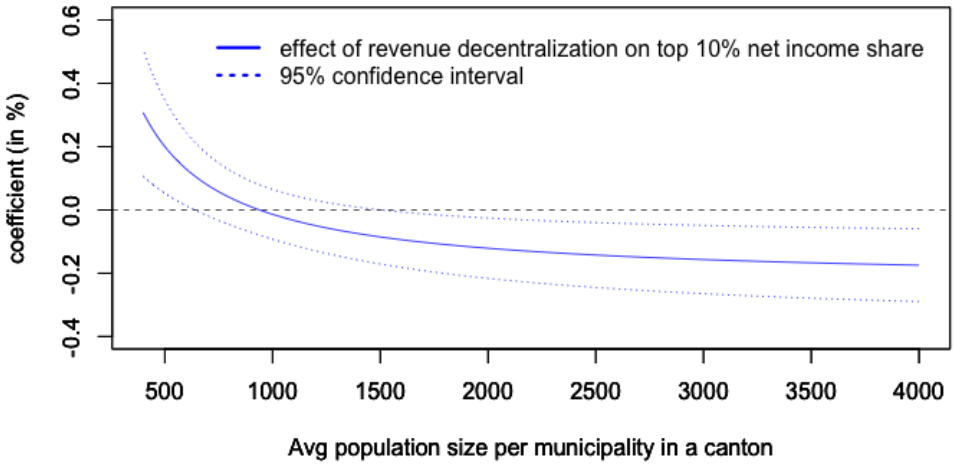


Figure 7: Effect of revenue decentralization on the top 10 percent income share

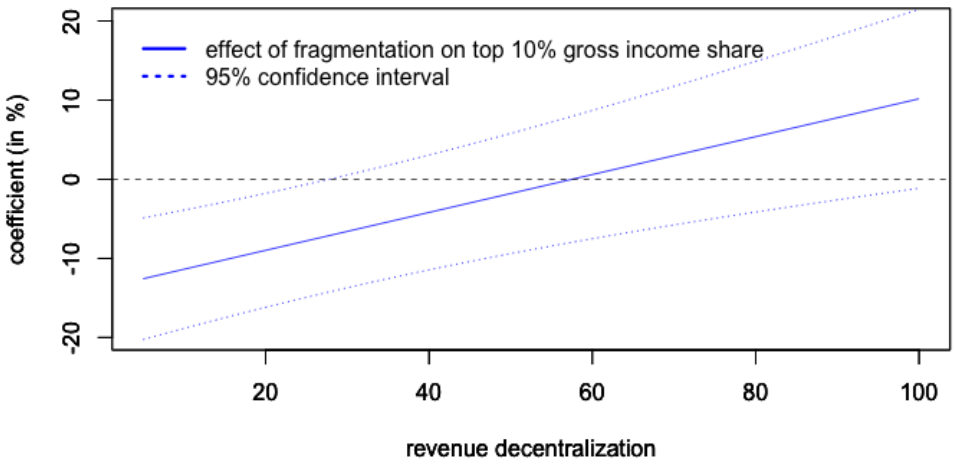


Figure 8: Effect of revenue decentralization on redistribution at the top 10 percent

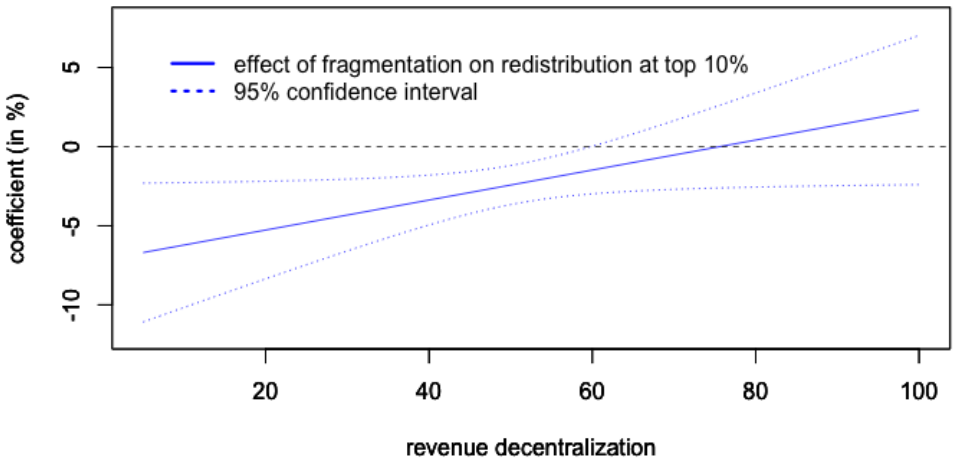
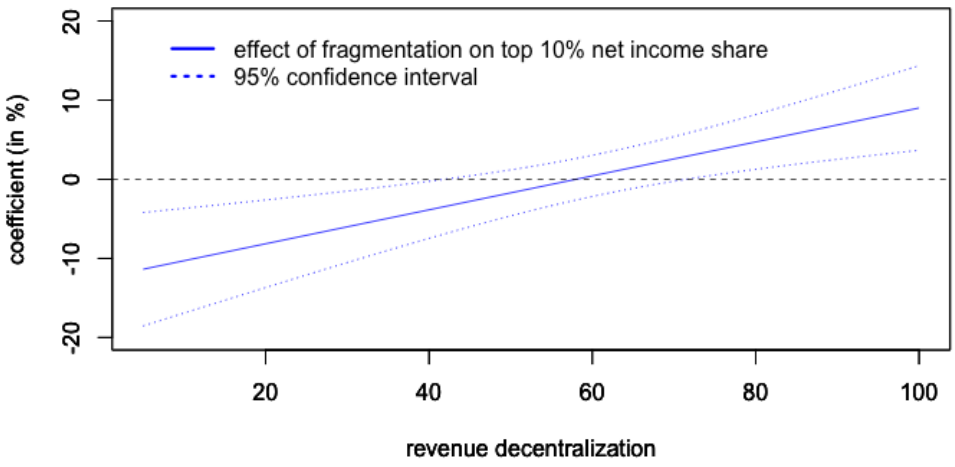


Figure 9: Effect of revenue decentralization on the top 10 percent income share after taxes



References

Acemoglu, D., Robinson, J.A., 2015. The rise and decline of general laws of capitalism. The Journal of Economic Perspectives 29, 3–28.

Alvaredo, F., Atkinson, A.B., Piketty, T., Saez, E., 2013. The top 1 percent in international and historical perspective. The Journal of Economic Perspectives 27, 3–20.

Alvaredo, F., Atkinson, A.B., Piketty, T., Saez, E., Zucman, G., 2015. The World Wealth and Income Database. http://www.wid.world, 18/12/2015 .

Brennan, G., Buchanan, J.M., 1977. Towards a tax constitution for Leviathan. Journal of Public Economics 8, 255–273.

Brennan, G., Buchanan, J.M., 1980. The Power to Tax: Analytic Foundations of a Fiscal Constitution. Cambridge University Press.

Brueckner, J.K., 2003. Strategic interaction among governments: An overview of empirical studies. International regional science review 26, 175–188.

Dell, F., Piketty, T., Saez, E., 2007. Income and Wealth Concentration in Switzerland over the Twentieth Century1, in: Atkinson, A.B., Piketty, T. (Eds.), Top Incomes Over the Twentieth Century: A Contrast Between Continental European and English-Speaking Countries, pp. 472–500.

Feld, L.P., Fischer, J.A., Kirchgässner, G., 2010a. The effect of direct democracy on income redistribution: evidence for Switzerland. Economic Inquiry 48, 817–840.

Feld, L.P., Kirchgässner, G., Schaltegger, C.A., 2010b. Decentralized taxation and the size of government: evidence from Swiss state and local governments. Southern Economic Journal 77, 27–48.

Feld, L.P., Reulier, E., 2009. Strategic tax competition in Switzerland: Evidence from a panel of the Swiss cantons. German Economic Review 10, 91–114.

Föllmi, R., Martínez, I.Z., 2016. Volatile Top Income Shares in Switzerland? Reassessing the Evolution Between 1981 and 2010. Review of Economics and Statistics .

Frey, C., Schaltegger, C.A., 2016. Progressive taxes and top income shares: A historical perspective on pre- and post-tax income concentration in Switzerland. Economics Letters 148, 5–9. doi:10.1016/j.econlet.2016.08.041.

del Granado, F.J.A., Martinez-Vazquez, J., McNab, R., others, 2005. Fiscal decentralization and the functional composition of public expenditures. Technical Report. International Center for Public Policy, Andrew Young School of Policy Studies, Georgia State University.

Kuznets, S., 1955. Economic growth and income inequality. The American economic review 45, 1–28.

Meltzer, A.H., Richard, S.F., 1981. A rational theory of the size of government. The Journal of Political Economy , 914–927.

Musgrave, R.A., 1959. The theory of public finance; a study in public economy. McGraw-Hill, New York. OCLC: 243503.

Neyapti, B., 2006. Revenue decentralization and income distribution. Economics letters 92, 409–416.

Oates, W.E., 1972. Fiscal Federalism. Harcourt Brace Jovanovich, New York.

OECD, 2012. Divided We Stand Why Inequality Keeps Rising: Why Inequality Keeps Rising. OECD Publishing.

Revelli, F., 2003. Reaction or interaction? Spatial process identification in multi-tiered government structures. Journal of Urban economics 53, 29–53.

Sacchi, A., Salotti, S., 2014. The effects of fiscal decentralization on household income inequality: some empirical evidence. Spatial Economic Analysis 9, 202–222.

Schaltegger, C.A., Gorgas, C., 2011. The evolution of top incomes in Switzerland over the 20th century. Swiss Journal of Economics and Statistics (SJES) 147, 479–519.

Sepulveda, C.F., Martinez-Vazquez, J., 2011. The consequences of fiscal decentralization on poverty and income equality. Environment and Planning C: Government and Policy 29, 321–343.

Stegarescu, D., 2005. Public Sector Decentralisation: Measurement Concepts and Recent International Trends*. Fiscal Studies 26, 301–333.

Tselios, V., Rodríguez-Pose, A., Pike, A., Tomaney, J., Torrisi, G., 2012. Income inequality, decentralisation, and regional development in Western Europe. Environment and Planning A 44, 1278–1301.

Appendix A. Descriptives

Table A.4: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
gini	990	0.43	0.05	0.27	0.63
top10	990	30.56	5.02	19.16	61.95
top5	990	21.14	4.38	13.38	50.34
top1	990	9.71	3.51	5.29	36.98
giniat	990	0.4	0.05	0.27	0.6
top10at	990	27.34	4.78	16.56	60.13
top5at	990	18.21	4.04	11.43	45.83
top1at	990	7.76	3.12	4.33	32.72
ginire	990	6.73	3.25	0	14.9
top10re	990	16.16	3.97	3.51	30.5
top5re	990	18.61	4.07	4.91	28.3
top1re	990	23.18	4.79	7.4	39.56
dec_rev	996	44.64	13.86	2.23	78.9
dec_exp	896	42.52	13.11	0	65.17
fragm	996	0.53	0.37	0.01	1.83
cant_share c	996	377.12	341.16	45.52	3336.46
equal_pc	996	20.53	248.53	-2052.37	801.08
topmtax	996	21.9	5.94	4.7	49.89
topmtaxn	996	22.3	4.21	8.4	49.56
gdppc	996	40.22	21.74	3.55	154.24
unempl	996	1.11	1.36	0	6.15
pop_act	996	59.06	3.67	49.5	68.26
pop_dens	996	445	1051	19	6333
left	996	22.84	15.07	0	85.7
crime	996	0.32	0.13	0.05	0.93
foreign	996	14.31	7.48	1.98	39.66
apart	996	0.59	0.32	0.01	2.27

Regarding the changing number of observations: for 3 cantons the variable on income distribution is not available due to missing information in the federal tax statistics; for 4 tax periods from 1945 to 1950 expenditure decentralization is not available for the 25 cantons at that time

Appendix B. Additional Results

Table B.5: Inequality before Taxes and Expenditure Decentralization

	gini	top10	top5	top1
dec_exp_l1	-0.000	0.014	0.024	0.021
	(-0.34)	(0.33)	(0.62)	(0.64)
fragm_l1	0.006	-0.890	-0.320	0.037
	(0.24)	(-0.29)	(-0.12)	(0.02)
dec_exp_int_l1	-0.000	0.016	0.006	-0.002
	(-0.41)	(0.27)	(0.13)	(-0.05)
topmtax	-0.002***	-0.205***	-0.246***	-0.256***
	(-3.16)	(-3.76)	(-5.01)	(-5.48)
topmtaxn	0.002***	0.105*	0.111**	0.107***
	(2.61)	(1.85)	(2.40)	(2.67)
cant_share_pc	0.000	0.004***	0.004***	0.002**
	(1.44)	(3.85)	(3.30)	(2.17)
equal_pc	-0.000***	-0.007***	-0.007***	-0.006***
	(-2.68)	(-6.11)	(-6.29)	(-5.16)
gdppc	0.001*	-0.550***	-0.405***	-0.229***
	(1.83)	(-7.97)	(-7.23)	(-4.91)
gdppc2	-0.000*	0.002***	0.002***	0.001***
	(-1.85)	(6.17)	(5.25)	(3.27)
controls	unempl pop_act pop_dens left crime foreign apart			
pivot dec_exp	0	1135	250	95
pivot fragm	0	55.6	53.3	18.5
N	864.000	864.000	864.000	864.000
F	2666.737	194.134	38.836	28.274

Newey-West corrected standard errors

t statistics in parentheses $^{*}p < 0.1,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Table B.6: Redistribution and Expenditure Decentralization

	ginire	top10re	top5re	top1re
dec_exp_l1	-0.010	-0.026	-0.048*	-0.078**
	(-0.79)	(-1.01)	(-1.78)	(-2.07)
fragm_l1	-3.095***	-5.452***	-6.953***	-8.725***
	(-3.18)	(-3.35)	(-4.17)	(-4.03)
dec_exp_int_l1	0.056***	0.087**	0.108***	0.120***
	(2.69)	(2.56)	(3.05)	(2.58)
gini	-13.360***	21.129***	13.547***	0.363
	(-6.70)	(5.09)	(3.31)	(0.06)
top10	-0.014	-0.493***	-0.420***	-0.384***
	(-0.77)	(-10.10)	(-9.38)	(-7.50)
topmtaxn	0.068***	0.042	0.067	0.075
	(2.87)	(0.90)	(1.36)	(1.19)
cant_share_pc	-0.001***	-0.001***	-0.002***	-0.002**
	(-3.05)	(-2.68)	(-3.18)	(-2.52)
equal_pc	-0.001**	-0.003***	-0.002***	-0.002**
	(-2.32)	(-3.40)	(-2.74)	(-2.11)
controls	gdppc unempl pop_act pop_dens left crime foreign apart			
pivot dec_exp	4760	3705	2500	1885
pivot fragm	56.9	59.7	61.2	66.0
N	864.000	864.000	864.000	864.000
F	2850.113	1125.081	2441.865	3603.938

Newey-West corrected standard errors

t statistics in parentheses $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.7: Inequality after Taxes and Expenditure Decentralization

	giniat	top10at	top5at	top1at
dec_exp_l1	-0.000	0.021	0.028	0.023
	(-0.34)	(0.52)	(0.80)	(0.80)
fragm_l1	0.017	0.214	0.681	0.693
	(0.71)	(0.08)	(0.29)	(0.41)
dec_exp_int_l1	-0.000	-0.007	-0.012	-0.013
	(-0.80)	(-0.12)	(-0.28)	(-0.42)
topmtax	-0.002***	-0.228***	-0.260***	-0.256***
	(-3.52)	(-4.24)	(-5.53)	(-5.99)
topmtaxn	0.002**	0.081	0.087**	0.088***
	(2.29)	(1.51)	(2.09)	(2.64)
cant_share_pc	0.000*	0.004***	0.003***	0.002**
	(1.77)	(3.95)	(3.40)	(2.16)
equal_pc	-0.000**	-0.007***	-0.007***	-0.005***
	(-2.42)	(-5.92)	(-6.19)	(-5.20)
gdppc	0.001	-0.524***	-0.377***	-0.206***
	(1.44)	(-7.99)	(-7.34)	(-5.05)
gdppc2	-0.000	0.002***	0.001***	0.001***
	(-1.51)	(6.04)	(5.15)	(3.20)
controls	unempl pop_act pop_dens left crime foreign apart			
pivot dec_exp	0	335	430	565
pivot fragm	0	30.6	56.8	53.3
N	864.000	864.000	864.000	864.000
F	2915.337	162.618	30.433	38.169

Newey-West corrected standard errors

t statistics in parentheses $^{*}p < 0.1,\ ^{**}p < 0.05,\ ^{***}p < 0.01$