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Tax Competition and Income Sorting: Evidence from the Zurich Metropolitan Area

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Tax Competition and Income Sorting: Evidence from the Zurich Metropolitan Area

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Abstract

In this paper, we provide empirical evidence for the influence of income taxes on the choice of residence of taxpayers at the local level. The fact that Swiss communities can individually set tax multipliers thereby shifting the progressive tax scheme which is fixed at the cantonal (state) level enables us to study the effect of differences in income taxation on individuals' choice of location within an economically and culturally homogeneous region. Using panel IV regressions covering the years 1991-2003 and 171 communities in the Swiss canton of Zurich and spatial error regressions for the 171 communities in 2003, we find substantial evidence for income sorting.

Keywords: tax competition, fiscal federalism, income segregation, income tax.

JEL classifications: H71, H73, R50

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1. Introduction

Since the seminal contribution of Tiebout (1956), a strong focus of the literature on fiscal federalism has been put on the analysis of market-like competition between jurisdictions. Tiebout showed that by voting with one's feet, there exists a mechanism that can reveal individual preferences for local public goods. Hence, fiscal decentralization appears to be efficiency enhancing, as it allows people with similar preferences concerning the provision of public goods to settle in communities that provide public goods at levels close to their preferences.[1]

Many of the results in this literature[2] rest on the assumption that households differ in their preference for public goods, but have equal incomes. The influence of income heterogeneity on households' locational decisions and the local provision of public goods were first studied by Ellickson (1971) and Westhoff (1977).[3] A core result of these models is the income segregation hypothesis. It postulates that if rich households esteem public goods less than poor households, fiscal federalism induces self sorting of the population by income. Following Schmidheiny (2006a), this clustering of rich and poor is even stronger in case of progressive tax schedules.

In this paper, we use community-level data from the Swiss canton of Zurich to study the influence of income taxes on the distribution of households according to their taxable income. The situation in Swiss cantons is quite unique, as the progressiveness of the tax schedule is set at the cantonal level, while the communities within the canton can set the effective tax burden by applying a tax multiplier to the cantonal tax schedule. This enables us to study the effects of tax differentials on the choice of residence within an economically and culturally homogeneous region. Using panel IV regressions covering the years 1991-2003 and 171 communities and spatial error regressions for the 171 communities in 2003, we find substantial evidence for the income segregation hypothesis in the canton of Zurich.

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[1] Similarly, Oates (1972) argues in his "decentralization theorem" that there are no advantages associated with a centralized provision of public goods since differences in public good at the local level reflect differences in preferences across these jurisdictions.

[2] See Oates (1999), Wilson (1999) and Wilson and Wildasin (2004) for surveys.

[3] See also Ross and Yinger (1999) for a survey.

The paper is organized as follows. The next section discusses previous theoretical and empirical findings. Section 3 gives an introduction to the tax system in Switzerland and in the Canton of Zurich. The fourth section presents the data. The results of the empirical analysis are discussed in section 5. Section 6 concludes.

2. Theoretical Foundations and Empirical Evidence

Tiebout's (1956) paper on the efficiency properties of fiscally induced migration has inspired many scholars in different fields of the public finance literature (see Oates, 2006 for an overview). The segregation hypothesis is one of the central propositions in multi-community models in the tradition of Tiebout. Endogenous segregation means that different people choose different locations in equilibrium. While the Tiebout model focuses on heterogeneity of preferences, Ellickson (1971) and Westhoff (1977) focus on income as the main cause of difference. Several mechanisms have been proposed that explain why rich households make different choices than poor households (see Ross and Yinger, 1999, for property tax models and Schmidheiny, 2002, for income tax models). Similar to the classic Tiebout model, one strand of the literature argues that rich and poor households differ in their preferences for public goods, which in turn will induce income sorting if tax rates, and hence levels of public goods provision, differ among jurisdictions. Another strand of the literature investigates the effect of the income elasticity for housing and the stylized fact that housing prices are typically higher in low tax communities (Epple et al., 1993, Stadelmann and Billon, 2009). If housing is a normal good, housing expenditure becomes less important with increasing income, which means that rich households will benefit more from low taxes than they will lose from high housing prices. These studies, however, have assumed that tax rates are flat. In two recent papers, Schmidheiny (2006a) and Schmidheiny and Hodler (2006) draw on the empirical fact that income taxes are progressive and that local jurisdictions can often only set tax levels within a given tax scheme. High income households are then more likely to choose low tax communities, as their tax burden is relatively higher due to the progressiveness of the tax schedule.

Except for the two latter papers, the studies discussed above suggest strict income sorting, which is not observed empirically. De Bartolome and Ross (2003, 2004) solve this issue by introducing commuters and commuting cost into a model of fiscal competition and derive multiple equilibria with both income sorting and income mixing. Schmidheiny (2006b) de-

rives imperfect income segregation in a model where households differ in both income and preferences for housing.

The segregation hypothesis of the Tiebout type models has been challenged by a number of empirical studies. A first strand of research investigates the equilibrium predictions of multi-community models using data on aggregate community characteristics.

Epple and Sieg (1999) and Epple et al. (2001) estimate the household preference parameters of a full equilibrium model where the local income distribution and local policy variables are simultaneously determined. They show that the differing income quantiles across 92 communities in the Boston area can be explained by the model predictions. Using data from US federal states, Bakija and Slemrod (2004) find that wealthy retirees change their state of residence to avoid high state taxes. However, Conway and Rork (2008) do not find this effect. They look at the relationship between tax benefits for the elderly in the US and find no effect of these benefits on the mobility of retirees. Feld and Kirchgässner (2001) regress the share of seven income classes in Swiss cantons and main cities on income tax rates. They find a strong negative relationship between the tax rate and the share of rich households.

Schmidheiny (2006a) studies the locational choice of households in the Swiss metropolitan region of Basel and finds that rich households are substantially more likely to move to low tax communities than poor households.

The study closest to ours is Schmidheiny and Hodler (2006) who simulate a model of locational choice with progressive taxes at the federal level and a local tax multiplier using income and tax data from the canton of Zurich. Schmidheiny and Hodler's study generates two main insights. First, their model, calibrated with real-life values from the canton of Zurich, produces income sorting effects, and second, they find that, due to income sorting, the resulting actual tax progressiveness is lower than intended by the cantonal tax scheme, as high income individuals are more likely to reside in low tax communities, while low income individuals tend to live in high tax communities, which flattens the effective progressiveness of the tax scheme relative to the intended progressiveness.

A different strand of the literature that is highly relevant for our study is the literature on the capitalization of local fiscal policy in property prices. Following the seminal paper of Oates

(1969), a large number of studies[4] have found that, among other variables, tax-expenditure packages do capitalize into property prizes. The findings on the extent of capitalization are however mixed. For example, Stadelmann (2009) finds that full capitalization is only possible if the elasticity of supply on the housing market is zero. In all other cases, capitalization will be imperfect, and zero, if supply of housing is perfectly elastic.

In this paper, we show that income sorting effects are not only an outcome of a theoretical model, but can also be observed empirically in the case of the Zurich metropolitan area. To our best knowledge, we are the first to study income sorting using panel data from a small[5] and culturally homogeneous region. Hence, we are not only able to make use of cross-sectional variation, as is the case in e.g. Feld and Kirchgässner (2001), but can also take account of variations in tax rates and income shares over time. We also include the house price channel discussed above, which is often ignored in the literature on tax competition and income sorting (an important exception is Feld and Kirchgässner (1997) with their analysis of the Tiebout-Hypothesis within Switzerland). Furthermore, by using data from one single canton we avoid having to take account of factors determining the decision to move that are hard to measure or even not measurable, such as differences in mentality, attachment to the local community, family ties, or differences in the school system.

3. Tax Competition in the Canton of Zurich

Switzerland has a federalist constitution granting tax autonomy to the sub-federal governments. The Swiss federation consists of 26 states, the so-called cantons. The cantons are divided into roughly 3,000 communities of varying size, population, culture and language. All three state levels finance their expenditures essentially by their own taxes and fees. While the federal government is mainly financed by indirect taxes such as VAT, customs duties and excise dues, the cantons and communities largely rely on direct taxes. Income taxes account for 60% of cantonal and 84% of communal tax revenue. However, in addition the federal government levies a highly progressive and profit-yielding income tax which – in return for 17% of the revenues – is administrated by the cantons and has an equalizing effect across

[4] See e.g Oates (1973), Pollakowski (1973), Yinger, et al. (1988), Stull and Stull (2001) and most recently Stadelmann and Billon (2010).

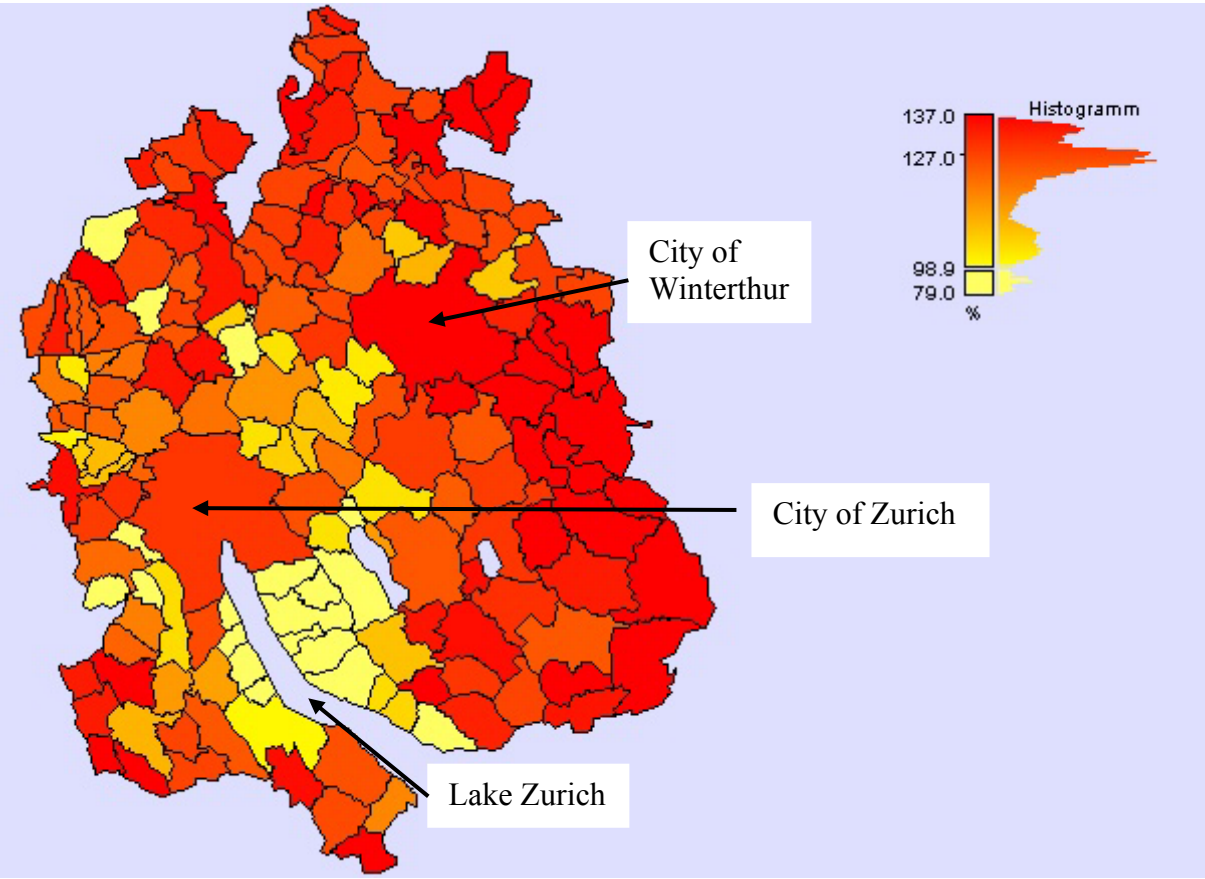
[5] The Canton of Zurich with its 171 communities is only slightly larger than London, UK.

cantons. Second, a withholding tax on capital income by 35% is levied and will be refunded in case of declaration in the income tax form (Feld, 2000).

The cantons organize their tax systems autonomously within the constitutional requirements and legal specifications by the federal harmonization law. For example, they decide upon the level of income and corporate taxes and the degree of tax progression as well as the level of tax exemptions (Feld, 2000).

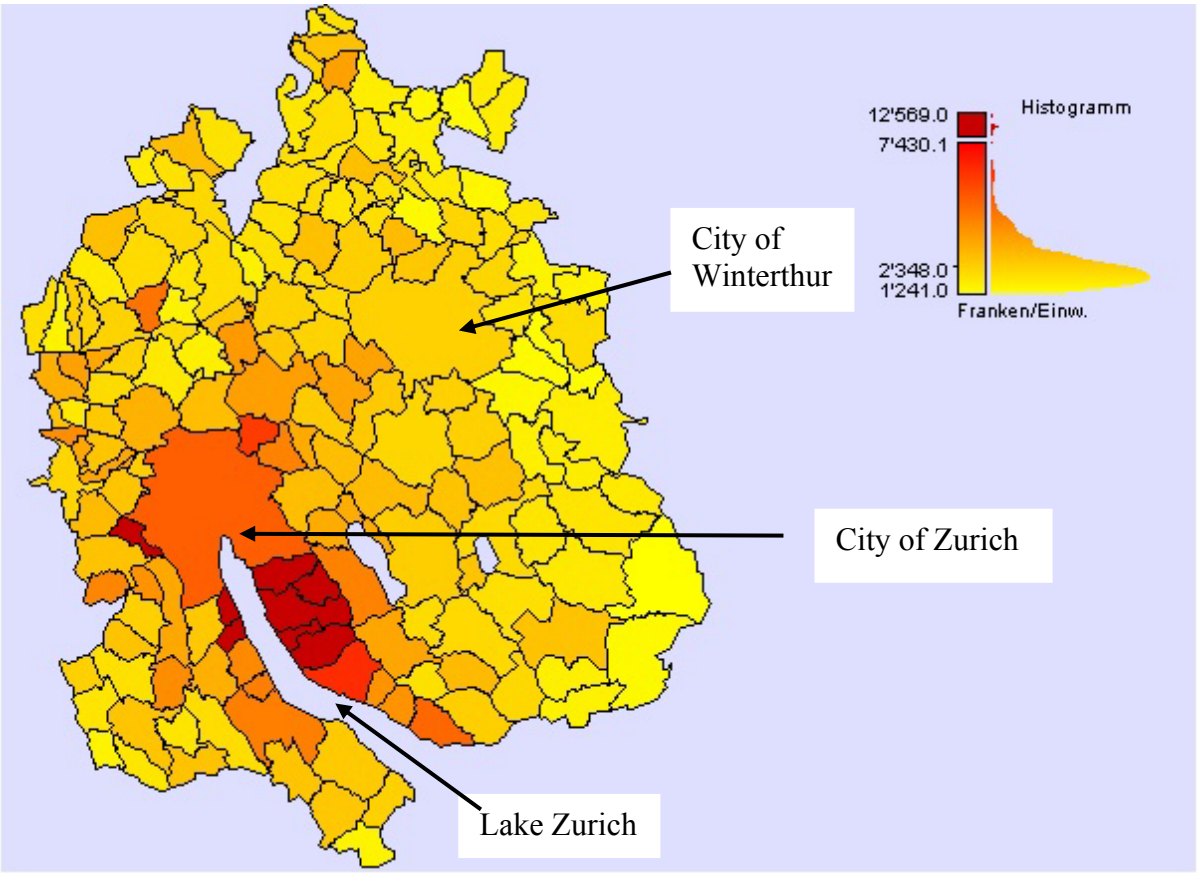
The individual communities in turn can set a tax multiplier for income and corporate taxes on the cantonal tax tariff. The communal income tax is then the cantonal tax rate multiplied by the communal tax multiplier. Income is taxed at the community of residence, which has led to the grouping of low tax suburban communities around large Swiss cities such as Basel and Zurich. Figure 1 displays the distribution of the local income tax multiplier among the 171 local communities of the canton Zurich for the fiscal year 2008 (Appendix B shows the tax progression of the cantonal tariff).

Figure 1: Local income tax burden in the Zurich metropolitan area



As Figure 1 reveals, the light-colored low-tax communities are sorted around the lake of Zurich, whereas the dark-colored high-tax communities are located near Winterthur (for a more detailed map of the canton Zurich see Appendix A). Compared to Figure 1, Figure 2 displays the corresponding local per capita tax revenues. The picture is very similar with a simple correlation coefficient of -0.77: the local communities around the shores of Lake Zurich, especially the districts of Meilen and Horgen generate high per capita tax revenues while the tax capacity of the region around the city of Winterthur is much weaker.

Figure 2: Local income tax revenues per capita in the Zurich metropolitan area



Tax competition in many countries is constrained by tax equalization programs. This is also the case in Switzerland on the federal as well as on the cantonal level (Schaltegger and Frey, 2003). In the canton of Zurich, for example, there are horizontal and vertical tax equalization programs that limit tax competition among communities: First, there is a program that redistributes tax revenues from the communities with the highest per capita tax bases to those with the lowest. Second, the canton of Zurich subsidizes the communities with the highest tax multipliers. Despite the existence of tax equalization schemes, differences in local taxation are still substantial. In the canton of Zurich, the tax multiplier for the fiscal year 2008 of communities with the highest tax multiplier (137 per cent) is almost 1.75 times higher than

that of the community with the lowest tax multiplier (79 per cent), with an arithmetic mean of 121.4 per cent and a median of 127 per cent.

4. Data and Empirical Strategy

In this study, we use community level data from all 171 communities, grouped in 12 different districts in the Swiss canton of Zurich (for summary statistics see Appendix C). We choose the canton of Zurich for our analysis, as the canton is the core economic region of Switzerland and attracts the largest share of immigration and intra-Swiss relocation; i.e. the number of locational choices to be done in the canton of Zurich can be assumed to be substantial. Data were collected from the Swiss Federal Office of Statistics, the Swiss Department of Finance, and the Zurich Cantonal Office of Statistics.

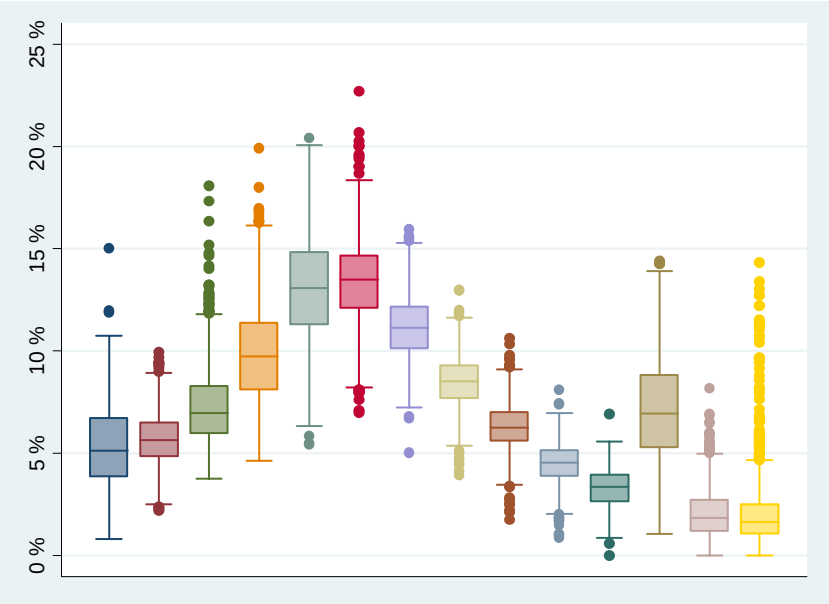
The dependent variables are the shares of different income groups in the population of a community. Since the income group ratios vary between zero and one and are therefore censored, they are transformed to log odds. If p is the share of an income group of a community, then $p/(1-p)$ is the corresponding odds, and the logit of the share is the natural logarithm of the odds.

In the original source, there exist 14 classes of individual taxable income, which have been set by the cantonal statistical office. Data on income classes are available for the years 1991, 1995, 1999 and 2003. The box plot in Figure 3 shows the average shares of the 14 income classes in the population among the 171 local communities in the Zurich metropolitan area over the whole period of observation.[6] From the box plot, we can also conclude that endogeneity in the form of rich people voting for low tax rates should not bias our empirical results, as the highest income group (>200'000 CHF p.a.) are never in the majority. This is even the case when we sum up the three top income groups (all citizens with incomes above 100'000 CHF p.a.). Hence, we concentrate on the classical Tiebout (1956) effect of voting with one's feet.

[6] At the time of writing, one Swiss Frank equalled 0.94 US$ and 0.70 EUR.

Figure 3: Boxplot: income shares for 14 income classes over 171 local communities

Income class	Swiss Francs p.a. and p.c. (in thousands)
1	0
2	0.0001-9999
3	10-19.9999
4	20-29.9999
5	30-39.9999
6	40-49.9999
7	50-59.9999
8	60-69.9999
9	70-79.9999
10	80-89.9999
11	90-99.9999
12	100-149.9999
13	150-199.9999
14	> 200.000



As our main explanatory variables, we use the local tax multiplier, the average tax multiplier of the other communities in the same district. If there exists inter-jurisdictional sorting according to the incentives given by tax competition with a progressive tax rate and varying tax multipliers, we expect a negative impact of the own tax multiplier on the share of high income residents and vice versa for low-income residents. For the average tax multiplier of the neighboring communities, the opposite should appear as long as there is tax competition: the share of high-income residents is positively associated with high tax burdens in neighboring communities and vice versa for low-income residents. An additional variable of main interest, as argued above, is the land price, as fiscal policies might at least partially capitalize into land or property prices. We hence expect land prices to be positively linked to income, as high income earners can afford the higher housing prices caused by partial capitalization of attractive tax schemes. Related to land prices are two of the control variables, airport noise and highway connection. Both variables might not fully capitalize into housing prices (Stadelmann, 2009) and hence need to be controlled for. We expect airport noise to have a negative effect on the share of high income earners. The effect of a highway connection within or close to the community is unclear ex ante, as this might either proxy another source of noise and pollution, implying a negative effect, or it might imply a positive effect, if high income earners esteem quick access to the highway system.

As further control variables, we use several socio-demographic variables and variables proxying public goods spending and the fiscal stance of the community.

Since the level of publicly provided goods may influence residential decisions (Oates, 1969) we include the following variables to proxy the level of public goods provision in a community: per capita payments to the cantonal public transport association (which are directly linked to the frequency of e.g. bus and train services), the share of pupils in the population visiting local public schools, and the share of locally practicing physicians.

The fiscal stance of a community is measured by public debt per capita, net wealth of the community and the revenue from (or need of) transfers from the cantonal fiscal equalization scheme. All three variables are expected to be negatively correlated with the shares of high income earners in a community, as a bad fiscal stance implies the risk of future tax increases (see Eichenberger and Stadelmann, 2009). A related variable is the unemployment rate. Ignoring the unemployment rate would bias the results of our analysis of income sorting, as a move from employment to unemployment is an exogenous and in most cases temporary move from a higher income group into the low income group, and not an endogenous change in the share of the low income group caused by the choice of a residential location. In addition, an increase in unemployment lowers the tax base of the community, as does a downturn in the business cycle, which the unemployment rate is a proxy for.

The socio-demographic variables used in this study are the total population and the share of elderly inhabitants (over age 65), the share of young inhabitants (under age 15), the share of net migration in total population and the share of foreigners. Total population is included as we suspect that different income groups might have different preferences concerning the size of the community they live in. The direction of this effect is however ambiguous ex ante, as e.g. wealthier individuals might favor the tranquility of the countryside or the cultural offerings and infrastructure of the city. The shares of elderly and young are included due to their effects on taxable income caused by tax exemptions for pension payments and child allowances. The share of foreigners needs to be controlled for, as a large part of the foreigners is taxed under a different scheme which imposes identical tax rates on the foreign residents of the canton, independent of the community they live in.

5. Empirical Analysis

5.1 Panel IV Estimations

In order to test the interjurisdictional sorting hypothesis, we regress the shares of 14 income classes in the local communities on the community's tax multiplier, the average neighboring tax multiplier in the district and the above mentioned control variables. The following 14 equations are estimated:

$$\ln [p_{git} /(1 - p_{git})] = \beta T_{it} + \delta T_{jt} + X_{it} + \varepsilon_{it}. \quad (1)$$

where the index i refers to the local communities within the territory of the canton of Zurich (i = 1,…, 171), j denotes the average local community of the 12 districts within the canton Zurich (j = 1,…, 12) and the index t refers to the fiscal year (t = 1991, 1995, 1999, 2003). ln $[p_{git} /(1 - p_{git})]$ represents the share of income class g (g= *1, ..., 14*) among all taxpayers in a community i in year t. β, δ and γ are unknown parameters and ε_{it} is an error term. X_{it} is a matrix of explanatory variables specific to community i in year t.

Testing for endogeneity clearly indicates endogeneity of the tax multipliers and the land prices.[7] To tackle the problem, we use an instrumental variables (IV) method. As instruments we use locational factors, namely the distance to the city of Zurich, a dummy variable if a community has a train station, and dummy variables if the community is situated at Lake Zurich or Lake Greifensee; and a political variable, the share of left wing parties in national elections, which took place in the years 1991, 1995, 1999 and 2003, which are exactly the years that the income shares data is available for. To take account of the panel structure of the data, we perform fixed effects regressions over the 12 districts (see Appendix A for the geopolitical fragmentation of the canton of Zurich). In line with the literature (see e.g. Allers et al., 2001) we expect the tax rate to be the larger, the larger the share of left wing voters is, while we expect political ideology to have no effect on the land price. Vice versa, we expect no effect of train stations on the tax rate, while we do expect an effect on land prices, though the effect is ambiguous ex-ante, as trains cause noise, while train stations and access to public transport may increase land prices. In addition, we expect a positive correlation with the view

[7] The test statistics correspond to income class 10 (taxable income 80-89.9999 p.a.). Test for other income classes reject exogeneity of tax multipliers and land prices as well.

on Lake Zurich and the Lake Greifensee in the suburban area of Zurich, and a negative correlation with distance to Zurich in the case of land prices, while we have no predictions for the effect of these locational factors on tax multipliers The first-stage results in Table 1[8] support the relevance of our instruments. We find that taxes are higher in left wing communities, while there is no effect of political ideology on land prices, and no effect of train stations on tax rates, as expected. Tax rates are also found to be lower in communities at Lake Zurich and at Lake Greifensee, while they are higher the further the community is away from the city of Zurich. Land prices are found to be significantly higher in communities situated at Lake Zurich, while they are lower in communities located at Lake Greifensee, and in communities that are further away from the city.

Table 1: Results of first stage regression (income class 10)

	(1) Tax multiplier	(2) Land price
Left wing vote share in national elections	0.300***	-0.001
	[4.03]	[0.92]
Lake Zurich	-6.358**	0.320***
	[2.24]	[6.26]
Distance to Zurich	0.894***	-0.010***
	[10.93]	[6.61]
Lake Greifensee	-8.618**	-0.251***
	[2.19]	[3.56]
Train station	0.029	0.033**
	[0.03]	[2.15]
Constant	91.183***	0.815***
	[32.35]	[16.08]
Observations	684	684
Number of Districts	12	12

Absolute value of z statistics in brackets
** significant at 10%; ** significant at 5%; *** significant at 1%*

Summary results for first stage regressions	Shea Partial R2	Partial R2	F(5, 663)	P-value
Tax multiplier	0.036	0.094	17.420	0.000
Land price	0.057	0.150	23.690	0.000

Relevance tests		
Anderson-Rubin Wald test	F(5,663)= 10.24	P-val=0.0000
Anderson-Rubin Wald test	Chi-sq(5)=52.84	P-val=0.0000
Stock-Wright LM S statistic	Chi-sq(5)=43.77	P-val=0.0000

Table 2C reports the results of the second stage regressions of our analysis: in line with the prediction of the theory, we find a significantly negative relationship between local tax multipliers and the share of high income earners (above 100'000 Swiss Franks p.a.) residing in a community, with an increasing coefficient towards the top end of the income distribution, and a significantly positive relationship with the share of low income earners (below 50'000 Swiss Franks p.a.). The effect of the tax multipliers of neighboring communities, defined as the average tax multiplier of all other communities in the same district, is even stronger. There, we find a positive and significant relationship between high income earners in community i and the tax rates of all other communities already for individuals with incomes

[8] First stage results for all 14 income classes are given in Tables 2A and 2B.

above CHF 60'000. Again, the absolute value of the coefficient increases with the income class. Consequently, we find also a negative relationship for incomes below CHF 50'000. Hence, we do not only find strong evidence for the income sorting hypothesis, as measured by the effect of the own tax multiplier, but we also find that the relative size of the tax multiplier of similar and nearby communities, measured by the average tax multiplier in the same district, exerts an even stronger effect on the choice of residence.

Concerning land prices, we also find our predictions about direction and significance of the effect confirmed. Unsurprisingly, high income earners tend to live in communities with high land prices (columns 9 to 14), while the opposite is the case for low income earners (columns 3 to 6). The fact that both land prices and tax rates exert a significant effect on the choice of residence leads us to the conclusion that the capitalization of tax rates in house prices is imperfect.

Turning to our controlling variables, we first have a look at socio-demographic variables. We find that the larger the share of foreigners in a community, the larger also the share of low income earners, and the smaller is the share of high income earners. This finding is in line with the stylized fact that foreigners tend to have less education than the locals and hence earn lower incomes.[9] For retirees, we also find that the share of people above the age of 65 increases the share of people with low taxable income. The reason for this effect is clear: pensions are lower than labor income, and they are only partially taxable. A similar reason explains the (less significant) positive effect of the share of young people below the age of 15 on the low income shares, and vice versa. Children reduce the taxable income (but not the disposable income) of their parents due to child allowances. Concerning the absolute size of the population, we find a slight tendency of rich people to prefer smaller communities, while poorer people tend to live in larger communities.

For the variables that proxy public goods provision, we find that high income individuals seem to esteem public transport more than low income earners, which is somewhat contrary to our theoretical considerations, but can be explained by the fact that high income earners are more likely to be commuters working in the city of Zurich, while low income earners are more likely to work in their community of residence and are hence not in need of public

[9] This is largely the effect of the Swiss migration policy until 2004. With the new law, this effect will probably turn insignificant or even change in sign in the future.

transportation. The share of pupils visiting local schools and the number of local physicians seem to have no significant effect on the income distribution.

The unemployment rate is found to increase the share of people with high taxable incomes, and to decrease the share of people with low taxable income. At first sight, this is counterintuitive. However, this can be easily explained, as unemployment moves people either into the zero taxable income group, which we consequently find to be positively related to the unemployment rate, or completely out of the statistic. As low income earners are more likely to be affected by unemployment than high income earners, an increase in unemployment decreases the share of low income earners in a community (except for the share of zero taxable income earners) and increases the share of high income earners. The variables measuring the fiscal stance of a community are found to have hardly any effect on the residential choice, or to be more precise, this effect does not seem to differ between the income classes, yielding no significant effect on the shares of different income classes in a community. Airport noise seems to decrease the share of high income earners and to increase the share of the medium income earners, who also seem to favor living close to a highway.

5.2 Parsimonious Model

As a robustness check, we leave out all variables concerning public finances except for the tax rates and public debt, all variables that proxy the amount of public goods provision including highway access, and all socio-demographic variables except for the unemployment rate, population size and the share of foreigners in the second stage estimation. As Table 3 shows, our main results (see Table 2) remain robust to this drastic change in the regression setup. Again, we find a community's own tax multiplier to be positively related to the shares of low income earners, and negatively related to the share of high income earners. The reverse result holds for the tax rates of the district neighbors: a higher average tax rate in neighboring communities is associated with lower share of low income earners in the community, and a higher share of high income earners. The effect of land prices on the choice of residence is also unaltered, as are the effects of the remaining controlling variables.

5.3 Spatial Correlation

In the estimations presented in the above section, we tackled the endogeneity problem arising from the fact that land prices and tax rates are endogenous to the income of a community's

inhabitants. In this section, we address two other issues. The first is the possibility that a community's income distribution is endogenous to the income distribution of neighboring communities, which may be the case because of clustering effects caused by e.g. an increased attractiveness of community A due to a positive socio-demographical change in the neighboring community B. A second related issue is spatial correlation of the error terms which is caused by omitted spatial variables.

For our analysis, we use two different spatial weighting matrices. First, we employ the inverse of the distance between the communities, and second, we use a matrix containing a 1 if the communities share a common border and 0 otherwise. When computing the weighting scheme, the matrices are row standardized.

Using the standard specification test as discussed in Anselin et al. (1996), we find that we can exclude a spatial lag model. The tests indicate however the existence of spatial correlation in the error term. This only holds when we apply the inverse distance matrix as spatial weights. Using the matrix considering only neighboring communities, we find no evidence for spatial correlation. A first conclusion is thus that individuals do not care about tax rates of directly neighboring communities in choosing their place of residence, but take the whole canton, or at least communities further away than the neighboring community, possibly within the same district, into account.

As the tests however suggest spatial dependency in the error terms, we estimate a spatial error model as described in Anselin (1988) and Anselin and Bera (1998). The equations are estimated using Maximum Likelihood take the following form

$$ln\,[p_{gi}/(1-p_{gi})] = \alpha + \beta T_i + \delta X_i + \varepsilon_{I,}$$

$$\text{with } \varepsilon = \lambda W \varepsilon + u$$

where ln $[p_{gi}/(1 - p_{gi})]$ are the log odds of the respective income share g, ε is a vector of spatially auto-correlated error terms, u is a vector of i.i.d. errors, T_i is the tax multiplier of community i and X_i is a vector of observations of the other explanatory variables and λ, β and δ are parameters.

The results are presented in Table 4. The evidence for the income sorting hypothesis is even stronger in this setup, as our main finding on the relationship between income tax multipliers and the shares of the income classes is not only robust to this change in the setup, but the significance of this effect increases considerably. We find the tax multiplier to have a negative

impact on the shares of people with incomes above 60'000 CHF. Furthermore, for the higher income classes the importance of the tax rate in the choice of location seems to increase, as indicated by the (absolute) increase of the coefficient from middle to high income classes. The effects of the average tax multipliers of the communities in the same district, as well as the effect of the land price, lose significance in this setup, as spatial correlation is now controlled for. The findings on the control variables remain also robust, except for the unemployment rate, which is now insignificant for most of the income classes.

6. Conclusion

In this paper, we have investigated the empirical validity of the inter-jurisdictional income sorting hypothesis, which is a core result of the theoretical tax competition literature. It states that in a system with fiscal federalism, individuals differing in income and preferences for public goods and/or housing will self-select into different communities, where communities differ in income tax rates. This self-selection process will then lead to substantial differences in the income distributions between the communities.

In our empirical analysis covering 171 communities over the share of 14 income classes on the whole population in the Swiss canton of Zurich, we have found ample evidence for the income segregation hypothesis. We provide empirical evidence that high income earners are more likely to reside in low tax communities especially if neighboring communities in the same district have higher taxes. The opposite holds for low-income earners: they are more likely to settle in high tax communities.

While the tax competition literature in the Tiebout tradition suggests that this kind of income sorting enhances overall efficiency in the economy, the literature on education highlights also the negative aspects of income sorting.[10] In general, advocates argue that fiscal federalism allows tailoring public goods towards the specific needs of local residents, enhances efficiency while reducing inefficiency in public administration due to the pressure created by systems competition. In addition, the more homogenous a local community, the more targeted fiscal equalization schemes across the canton can work and the more efficiently the redistributive capacity of such a transfer program will be. Critics argue on the other hand, that

[10] See e.g. Butler and Robson (2003) and Leventhal and Brooks-Gunn (2003).

with fiscal federalism it is found that the opportunities of an individual are highly correlated with his or her neighborhood and social background. An uneven distribution of high and low income individuals between communities is thus likely to reduce human capital accumulation and social mobility, and to produce persistent inequality and poverty traps. These social problems might be enforced by increasing worldwide economic integration, as the literature suggests that economic globalization leads to an increasing wage gap between low-skilled and high-skilled workers, and to an increasing taxation of the relatively more immobile factor of production, namely labor.

In combination with the results of the income sorting literature, increasing globalization can be expected to lead to an increase in income sorting in countries with income tax competition at the local level, yielding new challenges for both politicians and researchers.

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Table 2A, First stage panel regression, 1991-2003, 171 communities, dependent variable: tax multipliers

	(1) 0	(2) 0-9'999	(3) 10-19'999	(4) 20-29'999	(5) 30-39'999	(6) 40-49'999	(7) 50-59'999	(8) 60-69'999	(9) 70-79'999	(10) 80-89'999	(11) 90-99'999	(12) 100-149'999	(13) 150-199'999	(14) >200'000
Left wing vote share	0.300***	0.300***	0.300***	0.300***	0.300***	0.300***	0.300***	0.300***	0.300***	0.300***	0.303***	0.300***	0.303***	0.296***
	[4.03]	[4.03]	[4.03]	[4.03]	[4.03]	[4.03]	[4.03]	[4.03]	[4.03]	[4.03]	[4.06]	[4.03]	[4.06]	[3.95]
Lake Zurich	-6.358**	-6.358**	-6.358**	-6.358**	-6.358**	-6.358**	-6.358**	-6.358**	-6.358**	-6.358**	-6.360**	-6.358**	-6.342**	-6.313**
	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.24]	[2.23]	[2.22]
Distance to Zurich	0.894***	0.894***	0.894***	0.894***	0.894***	0.894***	0.894***	0.894***	0.894***	0.894***	0.895***	0.894***	0.897***	0.900***
	[10.93]	[10.93]	[10.93]	[10.93]	[10.93]	[10.93]	[10.93]	[10.93]	[10.93]	[10.93]	[10.94]	[10.93]	[10.89]	[10.95]
Lake Greifensee	-8.618**	-8.618**	-8.618**	-8.618**	-8.618**	-8.618**	-8.618**	-8.618**	-8.618**	-8.618**	-8.621**	-8.618**	-8.624**	-8.615**
	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]	[2.19]
Train Station	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.034	0.029	0.017	0.021
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]	[0.03]	[0.02]	[0.02]
Constant	91.183***	91.183***	91.183***	91.183***	91.183***	91.183***	91.183***	91.183***	91.183***	91.183***	91.068***	91.183***	91.030***	91.195***
	[32.35]	[32.35]	[32.35]	[32.35]	[32.35]	[32.35]	[32.35]	[32.35]	[32.35]	[32.35]	[32.24]	[32.35]	[32.16]	[32.24]
Number of Observations	684	684	684	684	684	684	684	684	684	684	683	684	680	681
Number of Districts	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Absolute value of z statistics in brackets ** significant at 10%; ** significant at 5%; *** significant at 1%*

Table 2B, First stage panel regression, 1991-2003, 171 communities, dependent variable: land price

	(1) 0	(2) 0-9'999	(3) 10-19'999	(4) 20-29'999	(5) 30-39'999	(6) 40-49'999	(7) 50-59'999	(8) 60-69'999	(9) 70-79'999	(10) 80-89'999	(11) 90-99'999	(12) 100-149'999	(13) 150-199'999	(14) >200'000
Left wing vote share	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	[0.92]	[0.92]	[0.92]	[0.92]	[0.92]	[0.92]	[0.92]	[0.92]	[0.92]	[0.92]	[0.94]	[0.92]	[0.94]	[0.78]
Lake Zurich	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.320***	0.317***	0.321***
	[6.26]	[6.26]	[6.26]	[6.26]	[6.26]	[6.26]	[6.26]	[6.26]	[6.26]	[6.26]	[6.27]	[6.26]	[6.17]	[6.30]
Distance to Zurich	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	[6.61]	[6.61]	[6.61]	[6.61]	[6.61]	[6.61]	[6.61]	[6.61]	[6.61]	[6.61]	[6.62]	[6.61]	[6.61]	[6.73]
Lake Greifensee	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.251***	-0.249***	-0.253***
	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.56]	[3.51]	[3.60]
Train Station	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.033**	0.034**	0.034**
	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.15]	[2.18]	[2.17]
Constant	0.815***	0.815***	0.815***	0.815***	0.815***	0.815***	0.815***	0.815***	0.815***	0.815***	0.816***	0.815***	0.817***	0.812***
	[16.08]	[16.08]	[16.08]	[16.08]	[16.08]	[16.08]	[16.08]	[16.08]	[16.08]	[16.08]	[16.06]	[16.08]	[15.98]	[16.02]
Number of Observations	684	684	684	684	684	684	684	684	684	684	683	684	680	681
Number of Districts	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Absolute value of z statistics in brackets ** significant at 10%; ** significant at 5%; *** significant at 1%*

Table 2C, Second stage Panel IV regression results, district fixed effects, 1991-2003, 171 communities, instrumented variables: tax multiplier and land price

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Income class, Swiss Franks p.a.	*0*	*0-9'999*	*10-19'999*	*20-29'999*	*30-39'999*	*40-49'999*	*50-59'999*	*60-69'999*	*70-79'999*	*80-89'999*	*90-99'999*	*100-149'999*	*150-199'999*	*>200'000*
Tax Multiplier	0.019**	0.013**	0.008	0.007	0.014***	0.009**	0.001	-0.003	0.005	0.001	-0.011	-0.018*	-0.040***	-0.070***
	[2.19]	[2.54]	[1.44]	[1.10]	[2.77]	[2.23]	[0.17]	[1.02]	[1.16]	[0.09]	[1.62]	[1.77]	[2.83]	[3.21]
Land price	0.505	0.174	-0.545***	-1.127***	-0.654***	-0.401***	-0.189	0.065	0.532***	0.672***	0.851***	1.474***	1.820***	2.286***
	[1.56]	[0.85]	[2.68]	[4.25]	[3.35]	[2.78]	[1.52]	[0.53]	[2.97]	[3.19]	[3.09]	[3.73]	[3.19]	[2.77]
Neighbor tax, district average	-0.001	-0.003	-0.012***	-0.019***	-0.015***	-0.009***	-0.001	0.003**	0.005**	0.006*	0.018***	0.029***	0.043***	0.066***
	[0.11]	[0.94]	[3.88]	[5.13]	[5.21]	[3.94]	[0.77]	[2.06]	[2.12]	[1.85]	[4.64]	[5.35]	[5.55]	[5.73]
Airport noise	-0.114**	-0.047	0.000	-0.002	0.043	0.092***	0.085***	0.067***	0.012	0.030	-0.036	-0.097*	-0.233***	-0.393***
	[1.99]	[1.45]	[0.01]	[0.05]	[1.31]	[3.76]	[4.37]	[3.69]	[0.35]	[1.09]	[0.92]	[1.65]	[2.70]	[3.23]
Highway Access	-0.154***	-0.039*	0.000	0.010	0.030	0.030*	0.043***	0.039***	0.008	0.017	-0.017	-0.032	-0.021	0.061
	[4.45]	[1.86]	[0.00]	[0.37]	[1.51]	[1.93]	[3.44]	[3.12]	[0.45]	[0.72]	[0.60]	[0.80]	[0.38]	[0.76]
Share of elderly	2.714***	1.095**	1.805***	1.821***	0.035	-1.031***	-1.124***	-1.124***	-1.762***	-2.115***	-2.248***	-2.298**	-1.493	1.445
	[3.12]	[2.22]	[3.45]	[2.70]	[0.07]	[2.76]	[3.75]	[3.84]	[4.04]	[3.95]	[3.17]	[2.32]	[0.98]	[0.69]
Share of young	-5.190***	-1.966***	1.193	1.803**	0.042	-0.434	0.811	0.459	-1.883***	-1.479*	-0.741	-2.008	-0.017	4.141
	[4.00]	[2.70]	[1.59]	[2.19]	[0.07]	[0.74]	[1.64]	[0.93]	[2.81]	[1.78]	[0.73]	[1.44]	[0.01]	[1.36]
Population	-0.004**	-0.001	0.004***	0.005**	0.003**	0.001	0.001	-0.001	-0.003***	-0.004***	-0.004**	-0.007**	-0.007*	-0.008
	[2.06]	[0.59]	[2.80]	[2.56]	[1.98]	[1.64]	[1.27]	[1.04]	[2.59]	[2.67]	[2.13]	[2.43]	[1.82]	[1.46]
Net migration, perc.	0.631	-0.101	-0.631	0.273	0.399	0.683*	0.138	-0.123	-0.015	-1.208*	0.093	0.211	-0.872	-1.954
	[0.62]	[0.16]	[1.06]	[0.43]	[0.75]	[1.66]	[0.34]	[0.26]	[0.03]	[1.75]	[0.12]	[0.20]	[0.57]	[0.89]
Share of foreigners	-0.002	-0.002	0.005**	0.007***	0.009***	0.005***	0.002	0.001	0.000	-0.006***	-0.009***	-0.015***	-0.021***	-0.027***
	[0.49]	[0.84]	[2.42]	[2.90]	[4.85]	[3.21]	[1.56]	[1.30]	[0.03]	[2.74]	[3.70]	[4.21]	[3.96]	[3.36]
Share of pupils	-2.033	-0.603	-0.764	-1.321	0.047	-0.169	2.085***	1.294	0.306	0.663	0.920	-1.059	0.953	1.359
	[0.96]	[0.49]	[0.64]	[0.99]	[0.04]	[0.18]	[2.61]	[1.45]	[0.31]	[0.56]	[0.53]	[0.52]	[0.26]	[0.25]
Contributions to public transport, p.c.	-3.103***	-1.561***	0.765	-0.618	-0.856**	-0.115	-0.191	-0.242	-1.086	-0.680	0.112	1.590*	3.397**	3.938**
	[3.52]	[2.75]	[1.44]	[1.09]	[2.06]	[0.33]	[0.55]	[0.48]	[1.64]	[0.92]	[0.16]	[1.78]	[2.46]	[2.54]
Physicians, p.c.	-48.357	-39.986**	-9.143	15.575	-0.547	1.202	9.112	14.316	-18.746	-0.800	7.014	7.807	-2.358	17.324
	[1.56]	[2.05]	[0.47]	[0.73]	[0.03]	[0.08]	[0.78]	[1.26]	[1.24]	[0.04]	[0.28]	[0.24]	[0.05]	[0.24]
Unemployment rate	0.109***	-0.029***	-0.094***	-0.111***	-0.081***	-0.023***	0.019***	0.024***	0.049***	0.067***	0.096***	0.131***	0.135***	0.128***
	[7.02]	[2.95]	[10.61]	[10.28]	[9.95]	[3.50]	[3.66]	[4.24]	[6.56]	[7.19]	[7.86]	[7.75]	[5.68]	[4.16]
Revenue from fiscal equalization, p.c.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000**	-0.000**	0.000	0.000	0.000
	[1.14]	[1.05]	[0.34]	[0.65]	[0.33]	[0.03]	[0.09]	[1.15]	[0.98]	[2.09]	[2.43]	[0.14]	[0.67]	[0.75]
Debt, p.c.	0.231	0.114	0.062	0.134	0.043	-0.039	-0.047	-0.177***	-0.088	-0.326***	-0.019	-0.229	-0.233	-0.272
	[1.42]	[1.28]	[0.60]	[1.06]	[0.47]	[0.57]	[0.89]	[2.65]	[1.03]	[3.62]	[0.15]	[1.34]	[0.90]	[0.73]
Community net wealth, p.c.	13.403	8.073	-9.883*	0.431	-2.757	0.078	1.163	2.907	4.891	11.795**	4.749	1.870	-5.786	-35.334
	[1.64]	[1.42]	[1.90]	[0.08]	[0.58]	[0.02]	[0.28]	[0.73]	[0.99]	[1.97]	[0.67]	[0.20]	[0.39]	[1.63]
Constant	-4.741***	-3.743***	-2.124***	-0.738	-1.425***	-1.441***	-2.031***	-2.484***	-3.661***	-3.617***	-4.380***	-4.111***	-5.110***	-5.702***
	[5.16]	[6.57]	[3.80]	[1.05]	[2.60]	[3.52]	[5.88]	[7.46]	[7.58]	[6.44]	[5.84]	[3.90]	[3.24]	[2.58]
Observations	684	684	684	684	684	684	684	684	684	684	683	684	680	681
Centered R-squared	0.044	-0.064	0.248	-0.011	0.172	0.146	0.218	0.172	-0.013	0.123	0.047	-0.010	-0.042	-0.151

Robust z statistics in brackets ** significant at 10%; ** significant at 5%; *** significant at 1%*

Table 3, Second stage Panel IV regression results, district fixed effects, 1991-2003, 171 communities, instrumented variables: tax multiplier and land price, parsimonious model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Income class, Swiss Franks p.a.	*0*	*0-9'999*	*10-19'999*	*20-29'999*	*30-39'999*	*40-49'999*	*50-59'999*	*60-69'999*	*70-79'999*	*80-89'999*	*90-99'999*	*100-149'999*	*150-199'999*	*>200'000*
Tax Multiplier	0.024**	0.010**	0.010**	0.007	0.009**	0.004	-0.001	-0.004	0.002	-0.004	-0.007	-0.014	-0.035***	-0.053***
	[2.33]	[2.26]	[2.15]	[1.18]	[2.09]	[1.07]	[0.17]	[1.37]	[0.44]	[0.84]	[1.07]	[1.56]	[3.04]	[3.26]
Land price	1.520***	0.340	-0.541**	-1.140***	-0.795***	-0.588***	-0.392***	-0.047	0.517**	0.561**	1.027***	1.679***	1.759***	2.333***
	[2.90]	[1.56]	[2.22]	[3.74]	[3.46]	[3.32]	[2.59]	[0.33]	[2.42]	[2.30]	[3.07]	[3.52]	[2.81]	[2.69]
Neighbor tax, district average	0.001	-0.001	-0.013***	-0.018***	-0.013***	-0.007***	-0.002	0.003*	0.006***	0.007***	0.018***	0.029***	0.040***	0.058***
	[0.23]	[0.29]	[4.60]	[5.45]	[4.99]	[3.31]	[0.90]	[1.88]	[2.80]	[2.61]	[4.56]	[5.46]	[5.82]	[6.11]
Airport noise	-0.120*	-0.050	-0.028	-0.030	0.052	0.111***	0.100***	0.084***	0.051	0.059**	-0.001	-0.067	-0.235***	-0.417***
	[1.66]	[1.57]	[0.89]	[0.77]	[1.59]	[4.41]	[4.91]	[4.88]	[1.63]	[2.31]	[0.03]	[1.15]	[2.93]	[3.87]
Share of foreigners	-0.003	-0.003	0.004**	0.005**	0.009***	0.005***	0.003**	0.003**	0.001	-0.005***	-0.007***	-0.014***	-0.020***	-0.025***
	[0.82]	[1.61]	[2.36]	[2.46]	[5.60]	[3.70]	[2.45]	[2.31]	[0.90]	[2.64]	[3.28]	[4.10]	[4.25]	[3.82]
Population	-0.007**	-0.001	0.004***	0.006***	0.003**	0.002*	0.001	-0.001	-0.003***	-0.004***	-0.005**	-0.008**	-0.007*	-0.008
	[1.97]	[0.77]	[2.99]	[2.76]	[2.17]	[1.80]	[1.29]	[0.83]	[2.81]	[2.81]	[2.57]	[2.55]	[1.96]	[1.56]
Unemployment rate	0.166***	-0.009	-0.093***	-0.105***	-0.081***	-0.029***	0.007	0.017***	0.051***	0.066***	0.090***	0.126***	0.114***	0.102***
	[8.11]	[0.96]	[9.84]	[8.99]	[9.09]	[3.93]	[1.17]	[3.01]	[6.13]	[7.10]	[6.82]	[6.68]	[4.52]	[3.28]
Debt, p.c.	0.045	0.040	0.233**	0.155	-0.031	-0.094	-0.113**	-0.253***	-0.259***	-0.474***	-0.172	-0.222	-0.021	0.146
	[0.24]	[0.49]	[2.53]	[1.51]	[0.38]	[1.49]	[2.02]	[4.03]	[3.20]	[5.33]	[1.35]	[1.42]	[0.11]	[0.48]
Constant	-6.976***	-4.036***	-1.899***	-0.231	-0.955	-1.112**	-1.615***	-2.289***	-3.931***	-3.656***	-5.215***	-5.218***	-5.513***	-5.753**
	[4.92]	[6.73]	[2.90]	[0.30]	[1.57]	[2.31]	[3.98]	[6.13]	[7.22]	[5.87]	[5.94]	[4.26]	[3.31]	[2.54]
Observations	684	684	684	684	684	684	684	684	684	684	683	684	680	681
Centered R-squared	-0.694	-0.133	0.186	-0.068	0.119	-0.018	-0.017	0.105	-0.023	0.096	-0.058	-0.127	0.010	-0.005

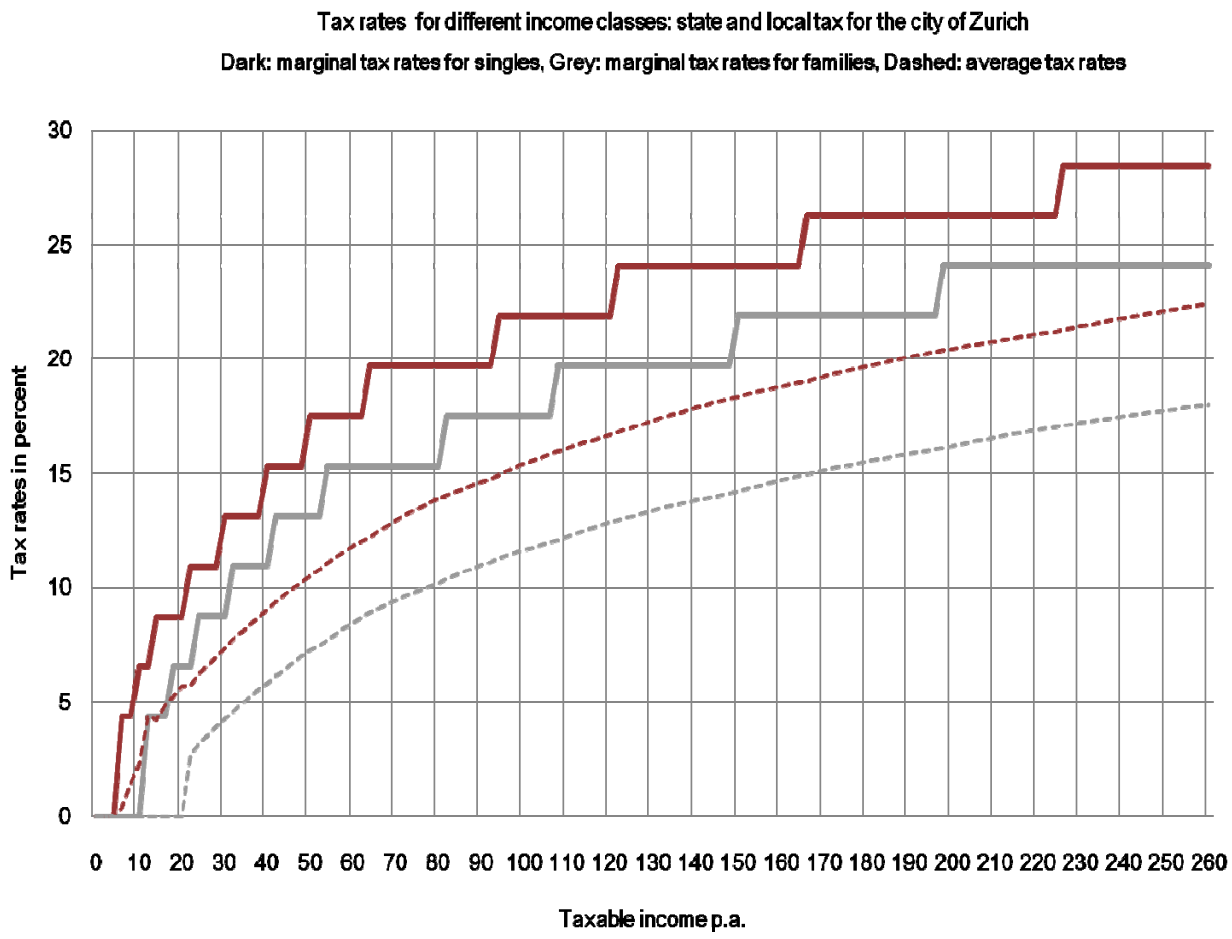
Robust z statistics in brackets * *significant at 10%; ** significant at 5%; *** significant at 1%*

Table 4: Spatial error regressions for interjurisdictional income sorting among 14 income class shares, 2003, 171 communities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Income class, Swiss Francs p.a.	*0*	*0-9'999*	*10-19'999*	*20-29'999*	*30-39'999*	*40-49'999*	*50-59'999*	*60-69'999*	*70-79'999*	*80-89'999*	*90-99'999*	*100-149'999*	*150-199'999*	*>200'000*
Tax Multiplier	0.002	0.002	0.009***	0.011***	0.009***	0.007***	0.002**	-0.002*	-0.004***	-0.007***	-0.008***	-0.013***	-0.021***	-0.022***
	[0.89]	[0.92]	[6.24]	[7.62]	[6.99]	[6.45]	[2.34]	[1.94]	[3.47]	[4.65]	[5.94]	[7.99]	[7.56]	[4.62]
Land price	0.201*	0.044	-0.042	-0.062	-0.175***	-0.153***	-0.068	-0.074	-0.061	-0.003	0.048	0.086	0.171	0.382**
	[1.80]	[0.60]	[0.52]	[0.63]	[2.79]	[2.63]	[1.20]	[1.38]	[0.77]	[0.05]	[0.54]	[0.83]	[1.10]	[2.07]
Neighbor tax, district average	0.001	-0.003	-0.003	0.000	0.001	0.000	-0.001	0.001	0.000	0.001	0.002	0.002	-0.003	-0.002
	[0.34]	[1.45]	[1.43]	[0.03]	[0.38]	[0.06]	[0.86]	[0.74]	[0.00]	[0.63]	[0.92]	[0.54]	[0.87]	[0.44]
Left wing vote share in national elections	0.001	0.000	-0.002	-0.007**	-0.004	-0.005**	0.002	0.005**	0.009***	0.009*	0.003	0.010**	0.006	-0.001
	[0.17]	[0.04]	[0.65]	[2.24]	[1.29]	[2.45]	[1.21]	[2.08]	[3.00]	[1.94]	[0.89]	[2.18]	[0.88]	[0.10]
Airport noise	-0.12	-0.101	-0.023	0.046	0.073*	0.128***	0.084**	0.070**	0.036	-0.039	0.010	-0.090	-0.265**	-0.440***
	[1.47]	[1.42]	[0.53]	[0.98]	[1.69]	[3.87]	[2.41]	[1.97]	[0.98]	[0.97]	[0.19]	[1.44]	[2.54]	[4.16]
Highway Access	-0.149***	0.022	0.035	0.009	0.066**	0.009	0.019	0.014	-0.007	0.067*	-0.058	-0.001	-0.057	-0.058
	[3.18]	[0.49]	[1.02]	[0.26]	[2.18]	[0.31]	[0.82]	[0.58]	[0.25]	[1.86]	[1.43]	[0.02]	[0.67]	[0.58]
Lake Zurich	-0.137	-0.024	0.040	0.048	0.122**	0.011	-0.081	-0.044	-0.041	0.037	-0.004	0.099	0.158	-0.045
	[1.39]	[0.31]	[0.40]	[0.77]	[1.98]	[0.16]	[1.35]	[0.94]	[0.66]	[0.48]	[0.04]	[1.01]	[1.00]	[0.20]
Distance to Zurich	0.004	0.006*	-0.002	0.008**	0.007***	0.005	0.001	-0.001	-0.002	-0.004	-0.005	-0.013***	-0.026***	-0.045***
	[0.94]	[1.74]	[0.44]	[2.51]	[2.87]	[1.41]	[0.25]	[0.39]	[0.59]	[1.31]	[1.25]	[3.00]	[2.75]	[3.63]
Lake Greifensee	0.06	0.066	-0.002	0.025	-0.132**	-0.015	0.055	-0.025	0.050	-0.050	0.047	0.004	0.073	0.310
	[0.53]	[0.74]	[0.02]	[0.33]	[2.02]	[0.22]	[0.97]	[0.51]	[0.72]	[0.62]	[0.47]	[0.04]	[0.46]	[1.24]
Train station	0.005	0.035	0.000	0.031	0.033	0.029	-0.017	-0.011	0.020	0.001	-0.024	-0.081*	-0.107	-0.163*
	[0.09]	[0.88]	[0.00]	[0.94]	[1.41]	[1.11]	[0.76]	[0.45]	[0.62]	[0.02]	[0.55]	[1.78]	[1.62]	[1.91]
Share of elderly	0.239	-0.795	1.937**	1.885**	0.122	-0.871	-0.403	-0.690	-0.775	-1.461	-2.162*	-1.571	-0.956	5.009
	[0.21]	[0.75]	[2.10]	[2.06]	[0.18]	[1.28]	[0.62]	[1.25]	[1.05]	[1.53]	[1.91]	[1.30]	[0.55]	[1.31]
Share of young	-1.373	0.417	1.546	-1.382	-0.533	-2.507**	-1.150	0.843	-0.419	0.804	-1.270	0.864	4.239	4.147
	[0.83]	[0.28]	[1.17]	[0.97]	[0.47]	[2.30]	[1.43]	[0.71]	[0.36]	[0.57]	[0.84]	[0.44]	[1.13]	[1.29]
Population	0.000	0.000	0.000***	0.000**	0.000	0.000	0.000	0.000	0.000	-0.000***	-0.000*	-0.000***	-0.000***	-0.000*
	[0.04]	[0.08]	[2.94]	[2.40]	[0.15]	[0.47]	[0.84]	[0.28]	[0.99]	[3.23]	[1.80]	[3.25]	[3.35]	[1.70]
Net migration, perc.	0.252	-0.900	-0.409	-1.572	0.599	0.057	-0.123	-0.252	0.128	-0.600	0.196	1.598	1.726	7.602***
	[0.16]	[0.69]	[0.35]	[1.39]	[0.75]	[0.08]	[0.18]	[0.35]	[0.14]	[0.46]	[0.15]	[1.25]	[1.02]	[2.60]
Share of foreigners	0.009	0.005	-0.001	0.004	0.008**	0.003	0.000	-0.001	0.001	0.002	-0.004	-0.013**	-0.013	-0.012
	[1.63]	[0.94]	[0.14]	[0.98]	[2.31]	[0.98]	[0.07]	[0.22]	[0.26]	[0.44]	[0.93]	[2.42]	[1.27]	[1.09]
Share of pupils	-6.423	-7.000	-0.810	3.111	-0.386	6.619	8.932**	-0.945	5.705	4.851	5.696	-8.614	-25.675**	4.477
	[0.99]	[1.11]	[0.14]	[0.66]	[0.11]	[1.46]	[2.57]	[0.24]	[1.08]	[0.72]	[1.03]	[1.27]	[2.28]	[0.20]
Contributions to public transport, p.c.	-0.271	-0.314	-0.574	-1.638**	0.008	-0.068	0.252	-2.024***	-0.713	0.944	0.686	0.803	4.192***	3.800**
	[0.28]	[0.28]	[0.72]	[2.23]	[0.01]	[0.11]	[0.57]	[2.98]	[0.98]	[1.28]	[0.60]	[0.64]	[2.67]	[2.02]
Physicians, p.c.	27.006	-7.961	-29.932	-33.942*	-17.737	1.300	-0.987	8.148	-8.910	11.453	29.315	16.643	49.911	44.465
	[0.95]	[0.34]	[1.46]	[1.86]	[1.07]	[0.09]	[0.08]	[0.54]	[0.55]	[0.63]	[1.18]	[0.59]	[1.12]	[0.76]
Unemployment rate	-0.043	-0.067**	0.005	-0.015	-0.006	0.011	0.030*	0.017	-0.015	-0.038	-0.016	0.007	0.011	-0.061
	[1.12]	[1.98]	[0.16]	[0.61]	[0.27]	[0.73]	[1.80]	[0.81]	[0.69]	[1.45]	[0.54]	[0.21]	[0.22]	[1.01]
Revenue from fiscal equalization, p.c.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000*	-0.000***	0.000	0.000	-0.000*
	[0.67]	[0.81]	[1.60]	[0.75]	[1.47]	[0.22]	[0.35]	[0.21]	[0.04]	[1.74]	[3.76]	[0.56]	[1.60]	[1.94]
Debt, p.c.	-0.008	-0.153	0.273*	0.123	-0.057	-0.047	-0.032	0.046	-0.061	-0.329***	-0.143	-0.175	-0.568***	-0.330
	[0.04]	[0.99]	[1.74]	[1.09]	[0.46]	[0.45]	[0.35]	[0.46]	[0.52]	[2.64]	[0.95]	[1.19]	[2.62]	[0.96]
Community net wealth, p.c.	1.143	-1.634	-4.434	-1.412	-5.618	-0.805	-5.099	-3.488	3.141	4.200	12.034**	12.600**	5.445	-14.304
	[0.18]	[0.29]	[0.88]	[0.29]	[1.54]	[0.22]	[1.57]	[0.90]	[0.66]	[0.82]	[1.99]	[2.10]	[0.44]	[0.85]
Constant	-2.711***	-2.394***	-3.945***	-3.550***	-3.054***	-2.228***	-2.312***	-2.422***	-2.338***	-2.424***	-2.205***	-0.892*	-0.746	-1.672
	[5.56]	[5.22]	[10.19]	[9.91]	[10.89]	[7.36]	[9.98]	[7.59]	[8.44]	[6.40]	[6.00]	[1.82]	[0.94]	[1.41]
Observations	171	171	171	171	171	171	171	171	171	171	171	171	171	171
Robust z statistics in brackets	** significant at 10%; ** significant at 5%; *** significant at 1%*													

Appendix A: The Canton of Zurich: 171 local communities in 12 districts

Appendix B: Progressiveness of the Tax Scheme in the Canton of Zurich, 2008.[11]



[11] Family is defined as a married couple with two children; family tariff includes tax allowance for two children. There is no married couples tax splitting in Switzerland.

Appendix C: Summary statistics

	Obs.	Mean	Std. Dev.	Min.	Max.
Taxable Income					
0	684	0.053	0.020	0.008	0.150
0-9'999	684	0.057	0.013	0.022	0.099
10-19'999	684	0.074	0.021	0.037	0.181
20-29'999	684	0.100	0.025	0.046	0.199
30-39'999	684	0.130	0.026	0.054	0.204
40-49'999	684	0.134	0.022	0.070	0.227
50-59'999	684	0.111	0.016	0.050	0.159
60-69'999	684	0.085	0.013	0.039	0.130
70-79'999	684	0.063	0.012	0.017	0.106
80-89'999	684	0.045	0.010	0.009	0.081
90-99'999	684	0.033	0.009	0.000	0.069
100-149'999	684	0.072	0.026	0.011	0.144
150-199'999	684	0.021	0.013	0.000	0.082
>200'000	684	0.023	0.022	0.000	0.143
Tax Multiplier	684	113.867	13.332	69.000	131.000
Land price	684	0.615	0.256	0.148	3.272
Neighbor tax, district average	684	113.840	8.284	88.450	130.000
Left wing vote share in national elections	684	29.092	5.956	14.300	50.000
Airport noise	684	0.105	0.307	0.000	1.000
Highway access	684	0.368	0.483	0.000	1.000
Lake Zurich	684	0.099	0.299	0.000	1.000
Distance to Zurich	684	17.801	7.659	0.000	36.000
Lake Grefiensee	684	0.041	0.198	0.000	1.000
Train station	684	0.509	0.500	0.000	1.000
Share of elderly	684	0.121	0.032	0.040	0.240
Share of young	684	0.187	0.030	0.109	0.306
Net migration, perc.	684	0.007	0.018	-0.042	0.100
Share of foreigners	684	12.944	7.425	1.000	42.100
Population	684	6.986	26.910	0.232	350.815
Share of pupils	684	0.025	0.009	0.000	0.082
Contributions to public transport, p.c.	684	0.027	0.029	0.001	0.215
Physicians, p.c.	684	0.001	0.001	0.000	0.004
Unemployment rate	684	1.905	1.357	0.000	7.500
Revenue from fiscal equalization, p.c.	684	597.141	2227.930	0.000	34939.420
Debt, p.c.	684	0.385	0.152	-0.561	1.237
Community net wealth, p.c.	684	0.001	0.003	-0.021	0.018

Appendix D: Data sources and Definitions

Variable	*Description*	*Source*
Taxable Income Class	Percentage share of taxpayers in an income class (taxable income)	Zürcher Staatssteuerstatistik 1991, 1995, 1999, 2003.
Tax Multiplier	Tax multiplier determining local tax rates, percentage of cantonal tax rate	Statistisches Amt des Kantons Zürich (2010)
Land price	Mean price per square meter in Swiss Francs	Statistisches Amt des Kantons Zürich (2010)
Neighbor tax, district average	Average of tax multipliers of all other communities in the district	Statistisches Amt des Kantons Zürich (2010)
Left wing vote share in national elections	Sum of vote shares of left wing parties (SP, GP, EVP) in national elections	Bundesamt für Statistik (2010)
Airport noise	Dummy for communities that need extra noise protection as determined by the Zurich airport authority	http://www.programm2010.ch/wissen/wissen_o2.html, Noise Level ES II
Highway access	Dummy for highway access within 5km	http://www.gis.zh.ch
Lake Zurich	Location at Lake Zurich	http://www.gis.zh.ch
Lake Greifensee	Location at Lake Greifensee	http://www.gis.zh.ch
Distance to Zurich	Distance to the city of Zurich, linear distance	Own calculations
Train station	Dummy for train station in the community	Zurich transport authority, ZVV
Share of elderly	Share of inhabitants over 65 years of age	Statistisches Amt des Kantons Zürich (2010)
Share of young	Share of inhabitants below age 15	Statistisches Amt des Kantons Zürich (2010)
Net migration, perc.	Net migration into a community	Statistisches Amt des Kantons Zürich (2010)
Share of foreigners	Share of foreigners in total population	Statistisches Amt des Kantons Zürich (2010)
Population	Absolute number of population	Statistisches Amt des Kantons Zürich (2010)
Share of pupils	Share of pupils pre-school, elementary school, high school and vocational education) in total population	Statistisches Amt des Kantons Zürich (2010)
Contributions to public transport, p.c.	Per capita transfers to the Zurich public transport authority (ZVV)	Statistisches Amt des Kantons Zürich (2010)
Physicians, p.c.	Number of physicians per capita in a community	Statistisches Amt des Kantons Zürich (2010)
Unemployment rate	Unemployment rate, percentage	Bundesamt für Statistik (2010)
Revenue from fiscal equalization, p.c.	Per capita transfers received from the cantonal fiscal equalization scheme	Statistisches Amt des Kantons Zürich (2010)
Debt, p.c.	Public debt per capita, Swiss Francs	Statistisches Amt des Kantons Zürich (2010)
Community net wealth, p.c.	Public net wealth per capita, Swiss Francs	Statistisches Amt des Kantons Zürich (2010)