

Fiscal Equalization and the Local Tax Structure

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Abstract: This paper studies the effect of redistributive “fiscal equalization” transfers on recipient governments’ choices between distortive and non-distortive taxation. We develop a majority voting model in which an elected local government may levy separate tax rates on mobile capital and a fixed factor, land. Fiscal equalization grants are inversely related to the tax base so that adverse tax base effects from increased tax effort are partly compensated. Hence, a higher degree of fiscal equalization lowers the marginal cost of funds related to capital taxation while the marginal cost of funds from the lump-sum tax on land is unaffected. As a consequence the mix between land and capital taxation is distorted towards the latter. This prediction is tested against data from German municipalities. In order to identify the incentive effect the analysis exploits a quasi-experiment resulting from a Supreme Court ruling for the largest German state. The empirical results support the hypothesis that a higher degree of fiscal equalization raises capital relative to land taxation.

Keywords: Fiscal Equalization; Tax Competition; Tax Structure; Quasi-Experiment

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1 Introduction

Incentive effects of inter-governmental transfers on local tax policy have been studied extensively in recent literature. In particular, it has been argued both theoretically (Dahlby, 2002) and empirically (Büttner, 2006 and Egger et al., 2007) that if grants are inversely related to the tax base, revenue sharing may induce recipient governments to raise distortive taxation. While these studies rely on the assumption that local governments are restricted to a source-based tax on a mobile factor, in many federal countries subnational governments may use several tax instruments.² However, if the incentive effects of transfers differ across these instruments revenue sharing might not only change the overall tax effort but also the tax structure in the economy. Hence, accounting for the choice *between* different revenue sources may strongly enhance our understanding of tax incentives faced by sub-national governments. This paper analyzes the impact of a particular transfer scheme, referred to as fiscal equalization, on local governments' choices between capital and land taxation. We find that an increase in the marginal contribution rate, *i.e.* the rate at which a decrease in the tax base afflicts in higher grants, raises capital relative to land tax effort.

While our analysis applies to a broad set of problems relating the composition of local revenue to inter-governmental transfers we choose to narrow our focus to this specific setup for three reasons. First, fiscal equalization is a widely used form of revenue sharing with similar institutional characteristics across countries.³ Hence, studying this particular transfer scheme is of immediate interest for public policy. Second, comparing capital and land taxation allows us to expose the theoretical argument most clearly: fiscal equalization changes tax incentives because it lowers the marginal excess burden of taxation perceived by governments. Thus, the higher the excess burden of a particular tax instrument, the stronger is the incentive effect. Changes in the tax structure then occur if the marginal excess burden differs between

²For information on selected countries see CESifo DICE report, Spring 2008 Vol. 6 No. 1. and Bird, 2002.

³For an overview see Boadway, 2004.

taxes. Of course, differences are most pronounced when the tax instrument set consists of a tax on a freely mobile factor and a tax on a fixed factor, as assumed in the present analysis.

A third reason for choosing this setup is that it allows us to learn from an interesting case study: municipal finance in Germany, at first sight, seems to expose a puzzling gap between theoretical predictions concerning tax policy and actual behavior by governments. The German constitution entitles municipal governments to use a local business tax (*Gewerbesteuer*) and a tax on land (*Grundsteuer*). While the former displays a strong tax elasticity (see Büttner, 2003) the latter should be rather inelastic since the tax base is essentially a constant fraction of the total land area of a municipality. Theory suggests it to be optimal from a local perspective to finance public consumption with non-distortive taxes and to only tax mobile factors so as to internalize potential crowding externalities (see Wildasin, 1986). However, in Germany the lion's share of municipal tax revenue is generated through the local business tax whereas local land tax revenues play a lesser role for municipal budgets. For example, in North-Rhine Westphalia, Germany's most populous state, revenue from the local business tax was on average 3.1 times higher than revenue from the local land tax in 2005.⁴ Leaving aside the interpretation that this composition of municipal revenue simply reflects an extremely high level of crowding effects, it clearly seems to contradict theoretical predictions. We argue that it is a consequence of an exceptionally high marginal contribution rate leading to a redistribution of more than 85 cents of an additional Euro of own tax revenue by the fiscal equalization scheme.⁵

The analysis proceeds in two steps. Section 2 combines the traditional tax competition framework (e.g. Wilson, 1986; Zodrow and Mieszkowski, 1986) with a political economy model by Persson and Tabellini (2000) to study tax structure. Elected local governments may use a distortive tax on perfectly mobile capital and a non-distortive tax on land to finance a local public good. The burden of capital taxation is borne by labor since the

⁴Source: own calculations and Statistical Office of North Rhine-Westphalia. For further information concerning the composition of municipal funds see table 1 in subsection 3.1.

⁵Source: own calculations. See table 2 in subsection 3.1.

adverse tax base effect depresses wages. By contrast, land taxation simply lowers the net-return to land. Households differ with respect to labor and land endowments.⁶ Thus, the loss of private consumption associated with an increase in the respective tax rate differs across households, as well. In optimum, governments choose a tax structure that distributes the tax burden so as to maximize the decisive voter's utility. Moreover, the optimal tax structure equates the marginal cost of funds from the two tax instruments. As is well-established in the literature (Wildasin, 1989; Smart, 1998; Büttner, 2006) fiscal equalization may lower the marginal cost of funds from capital taxation thus raising capital relative to land tax effort.

Section 3 tests this prediction using a panel dataset of North-Rhine Westphalian municipalities over a period of 18 years. In order to identify the incentive effect we exploit a quasi-experiment resulting from a Supreme Court ruling for the state of North-Rhine Westphalia. Due to a special provision in the North-Rhine Westphalian fiscal constitution, until the mid-1990's, municipalities with a population of 150,000 or below faced a lower marginal contribution rate than municipalities with a population above 150,000. In 1993 the State Constitutional Court ruled that this provision be abolished, unless an independent panel of experts finds it to be justified for "economic reasons".⁷ The expert report was published in 1995 concluding that both groups should face the marginal contribution rate hitherto applied to the group of large municipalities.⁸ Hence, only small municipalities were affected by the subsequent adjustment allowing us to split the sample into treatment and control group. The empirical results support the hypothesis that an increase in the marginal contribution rate raises capital relative to land taxation. Section 4 concludes.

⁶For a similar setup see Fuest and Huber, 2001 and Borck, 2003.

⁷Verfassungsgerichtshof für das Land Nordrhein-Westfalen, 1993, Urteil vom 6. Juli – VerfGH 9/92, 22/92.

⁸See Parsche et al.

2 Theoretical Analysis

Consider an economy with an exogenously given number of regions, $i = 1, 2, \dots, N$. The budget constraint of a local government is given by

$$z_i = \tau_i^k k_i + \tau_i^b b_i + g_i \quad (1)$$

where z_i denotes local public spending per capita, k_i is the capital stock per capita, and b_i is the per capita land endowment in jurisdiction i ; τ_i^k and τ_i^b denote local tax rates on capital and land, respectively. Consistent with institutional practice, regions receive fiscal equalization transfers, g_i , which negatively depend on local fiscal capacity. To be specific, we work with a stylized account of a typical fiscal equalization scheme in which transfers are determined according to

$$g_i = y_i - \vartheta_i^k k_i - \vartheta_i^b b_i \quad (2)$$

where y_i defines the level of transfers that a jurisdiction would receive if its tax base were zero; ϑ_i^k and ϑ_i^b may be referred to as the marginal contribution rate, *i.e.* the rate at which an increase in the capital and land tax base leads to lower grants.⁹

In each jurisdiction firms produce a homogenous private good combining land, labor, and capital according to a constant returns to scale technology. Production per unit of labor is given by $x_i = f_i(k_i, b_i)$. The production function is twice continuously differentiable and strictly concave in both its arguments, *i.e.* $f_{ik} > 0 > f_{ikk}$ and $f_{ib} > 0 > f_{ibb}$. Capital is paid its marginal product, the rate of return on land is exogenously fixed by its opportunity cost (ρ),¹⁰ and labor receives residual output after the other factors have been remunerated.

⁹Nomenclature and notation are borrowed from Büttner (2006) as well as Baretto, Huber and Lichtblau (2002).

¹⁰We implicitly assume that there is an alternative use to land such as agricultural production and that transformation of land between industrial and agricultural use is costless.

Capital is perfectly mobile so that net rates of return are equated across regions at a common rate, r . Equilibrium in the capital market thus requires that $r = f_{ik} - \tau_i^k$, which implies a negative tax base elasticity.

In order to simplify notation we assume absentee capital ownership. Labor and land employed by firms in jurisdiction i are owned by residents where $(1 - e_i^j)$ and $(1 + e_i^j)b_i$ specify household j 's respective endowments.¹¹ Initial endowments are exogenously given and differ across households. We characterize the distribution of e_i^j by mean zero and median e_i^m . Households fully spend their disposable income, *i.e.* the sum of wage income and land income net of land taxes, on a consumption good x_i . We may thus write household j 's budget constraint as

$$x_i^j = (1 - e_i^j)[f_i(k_i, b_i) - (r + \tau_i^k)k_i - \rho b_i] + (1 + e_i^j)b_i(\rho - \tau_i^b). \quad (3)$$

Households derive utility from private and public consumption according to a quasi-linear utility function $u_i^j = v_i(z_i) + x_i^j$. Aggregation of preferences takes place via simple majority voting. These two assumptions ensure that a unique median voter equilibrium for fiscal policy exists although the decision problem has two dimensions, *i.e.* the level and the composition of public funds.¹² Solving the local government's budget constraint for τ_i^g and substituting into the private budget constraint we obtain the decision problem of a representative local government

$$\begin{aligned} u_i^m &= v_i(z_i) + (1 - e_i^m)[f_i(k_i, b_i) - (r + \tau_i^k)k_i - \rho b_i] \\ &+ (1 + e_i^m) [b_i(\rho - \vartheta_i^b) - (z_i - y_i - (\tau_i^k - \vartheta_i^k)k_i)]. \end{aligned} \quad (4)$$

¹¹This specification closely follows the setup by Persson and Tabellini (2000), p. 318. While a perfectly negative correlation of different endowments bears little empirical appeal, it serves to expose the impact of distributional concerns on the choice of tax structure most clearly. Allowing for independent distributions of labor and land endowments would not alter the analysis fundamentally but require additional assumptions concerning exogenous parameters.

¹²The combination of quasi-linear preferences and unidimensional heterogeneity of endowments is a sufficient condition for the existence of a Condorcet winner. For a proof see Persson and Tabellini (2000), p. 27.

Optimization with respect to public consumption and capital taxation yields the following first-order conditions:

$$v_{iz} = 1 + e_i^m \quad (5)$$

$$1 + e_i^m = \frac{(1 - e_i^m)k_i}{k_i + (\tau_i^k - \vartheta_i^k) \frac{dk_i}{d\tau_i^k}}. \quad (6)$$

According to equation (5), in optimum, the marginal benefit of an increase in public consumption equals the marginal cost of a corresponding decrease in private consumption from the median voter's perspective. Furthermore, as indicated by equation 6, optimum requires the marginal cost of funds to be equated across tax instruments.

Based on these first-order conditions we may study comparative static effects of changes in exogenous parameters on the optimal choice of tax structure. First, consider the composition of endowments: an increase in e_i^m raises the left-hand side (*LHS*) and lowers the right-hand side (*RHS*) of equation (6). Intuitively, an increase in e_i^m at given tax rates implies a larger capital tax burden and a lower land tax burden from the median voter's perspective. In order to restore optimality, the local government thus raises τ_i^k . At the same time, according to equation (5) the median voter's preferred level of spending falls, thus reducing the land tax rate. Second, consider an increase in the marginal contribution rate: a rise in ϑ_i^k lowers the *RHS* of equation (6) while the *LHS* remains unchanged. Optimality hence requires an increase in capital taxation such that $\frac{\partial \tau_i^k}{\partial \vartheta_i^k} = 1$. Therefore the decrease in g_i associated with an increase in ϑ_i^k (see equation 2) is fully offset by the induced increase in capital taxation whereas land taxation is unaffected by changes in ϑ_i^k .

To summarize, the theoretical analysis yields the following testable implications:

1. An increase in ϑ_i^k raises τ_i^k relative to τ_i^b

2. An increase in e_i^m raises τ_i^k relative to τ_i^b

3 Empirical Analysis

This section studies whether our theoretical predictions are consistent with actual tax policy, using data on North-Rhine Westphalian municipalities. To this end, we wish to estimate the relationship

$$ts_{it} = ts(y_{it}, \vartheta_{it}^k, e_{it}^m) + u_{it} \quad (7)$$

where ts_{it} denotes jurisdiction i 's capital relative to land tax rate at time t (*i.e.* $\frac{\tau_{it}^k}{\tau_{it}^b}$), and u_{it} is a random error term. Note that using a quasi-linear utility function allows us to study the pure substitution effect of changes in ϑ_i^k on local tax structure. In the data however, a change of ϑ_i^k should be expected to go along with both a substitution *and* an income effect which we have to control for in our estimation. Following Büttner 2005, we will do so by interpreting y_i as the intercept of the local government's budget constraint. In order to relate the variables from the model to its empirical counterparts the following subsection provides some institutional background concerning municipal finance in Germany. In subsection 3.2 we will use this background to highlight sources of identification as well as potential problems with endogeneity arising from the specific institutional design of fiscal equalization in North-Rhine Westphalia.

3.1 Institutional Background and Data

Besides user fees, income from private sector activity, and debt, municipal governments in Germany obtain funds from three sources: first, federal revenue from the income tax and the value added tax is shifted to the municipal level. These funds are distributed

among all German municipalities based on specific criteria, such as the share of overall revenue from these taxes generated in the respective location. Second, local municipalities raise own revenue from a local business tax and from a land tax. The tax base of the business tax are revenues generated by local firms. Each municipality is confined to choosing one unique local business tax rate. By contrast, with respect to the local land tax rate, jurisdictions may discriminate between different types of land. In particular, one tax rate may be determined by the municipal government for land devoted to agricultural use and a separate tax rate on other land. The tax bases, both of the local business tax and the land tax, are defined uniformly across the country. A third source of municipal funds are grants from state governments. Most notably, all German states (except for the three city states Berlin, Bremen, and Hamburg) engage in a system of fiscal transfers from the state to the municipal level. While a part of these vertical transfers are paid as matching grants, the lion's share of grants is unconditional, in that recipients may freely decide upon their use.

Table 1 displays summary statistics on the composition of revenue for the universe of North-Rhine Westphalian municipalities in 2005. The first two lines highlight the relative importance of business and land taxation: the fraction of overall revenue generated by the local business tax is 2.8 times higher than the share of the local land tax. Moreover, the composition of revenue strongly varies between municipalities. For example, the maximum share of revenue from business taxation exceeds three fourth of overall revenue whereas for some municipalities local business taxation is almost negligible. Another striking finding is that on average more than half of municipal revenue is composed of federal and state transfers. Note also that the share of overall revenue generated by fiscal equalization transfers displays strong inter-jurisdictional variation ranging between zero and more than one half.

While the last subsection already worked with a stylized account of a typical fiscal equalization scheme, for the sake of econometric implementation, we have to be more specific about the institutional details of fiscal equalization in North-Rhine Westphalia: grants to each jurisdiction are determined by indicators of *fiscal need* (fn_i) and *fiscal capacity* (fc_i). The

Table 1: Composition of main sources of municipal funds in North Rhine-Westphalia, 2005

in %	Observations	Mean	Minimum	Maximum
Local Business Tax	396	34.7	3.3	78.0
Local Land Tax	396	12.3	0.05	27.0
Fiscal Equalization Transfers	396	22.4	0	55.4
Other Federal Transfers	396	30.6	17.2	50.9

Source: Own calculations and Statistical Office of North Rhine-Westphalia.

former is basically the conceded budget per-capita; the latter is a measure of tax revenue at standardized tax rates. If a jurisdiction displays a fiscal capacity above fiscal need it will not receive equalization grants; if its capacity falls short of fiscal need the jurisdiction obtains grants which partly compensate for the gap between fiscal need and fiscal capacity. Formally, grants g_i are determined according to

$$g_i = \alpha_i \left[fn_i - \underbrace{(\tau^k B_i^k + \tau^b B_i^b + R_i^{other})}_{fc_i} \right] \quad (8)$$

where α_i denotes the equalization rate, B_i^k and B_i^b are tax bases for local business and local land tax, and τ^k and τ^b are the respective standardized tax rates. R_i^{other} is revenue from sources other than taxes and fiscal equalization transfers.

This institutional framework has a number of convenient features for our analysis. First, since local tax autonomy is restricted to the choice of tax rates they provide a direct measure of local tax policy. Second, the marginal contribution rate may be computed from the parameters specified in the North-Rhine Westphalian fiscal constitution by simply multiplying the equalization rate with the standardized tax rate:¹³ as equation (8) indicates an

¹³See Gemeindefinanzierungsgesetz (GFG) Nordrhein-Westfalen.

increase in the local business tax base (land tax base) of one unit is associated with a reduction in fiscal equalization grants of $\vartheta_i^k = \alpha_i \tau^k$ ($\vartheta_i^b = \alpha_i \tau^b$) units.¹⁴ Third, we may derive y_i as the level of grants a jurisdiction receives independent of its tax base which allows us to control for income effects as described in section 2.¹⁵

The empirical counterpart for the median voter’s composition of endowments (e_i^m) is more difficult to obtain. In order to compute the the distribution of e_i we need data on the composition of endowments at the household level which is unavailable. In the model however, the distribution of endowments serves to capture the broader concept of relative political influence of landowners and workers in a municipality rather than specific household-level heterogeneity. Hence, we use the fraction of overall housing in the jurisdiction that is owned by the local electorate as a proxy for e_i . Data on these ownership shares are available at the municipal level for the year 1987 and at the county level for the years 1993, 1998, 2003 and 2006.¹⁶ Using that information we impute ownership shares at the municipal level for all years except for 1987.¹⁷

The basic dataset consists of all 396 municipalities in North-Rhine Westphalia for the period from 1986 to 2002. As we will discuss in more detail in the next subsection, our identification approach relies on exogenous variation in the marginal contribution rate faced by jurisdictions with a population of 150,000 or below.¹⁸ Since tax incentives of municipalities which are ineligible for fiscal equalization transfers are unaffected by changes in the marginal contribution rate they are not considered in the analysis. Moreover, we drop one municipality from the panel which switches groups in the time period studied. The sample size thus

¹⁴Note that fiscal equalization in North-Rhine Westphalia comprises additional features such as contributions to counties and local authorities. However, since these institutional details are irrelevant for the ensuing analysis they are not explicitly included in equation (8).

¹⁵For a more detailed account of how we computed y_i see the Appendix.

¹⁶Source: empirica-Regionaldatenbank and Statistical Office of North Rhine-Westphalia.

¹⁷A detailed description of the imputation of ownership shares may be found in the Appendix.

¹⁸This group will be henceforth referred to as “small municipalities” whereas municipalities with a population above 150,000 will be referred to as “large municipalities”.

consists of 7,066 observations, 6,690 of which belong to the group of small municipalities and 376 to the group of large municipalities.

Table 2 shows descriptive statistics for the variables relevant to our empirical analysis. The upper graph in figure 1 plots marginal contribution rates faced by the two groups of municipalities against time. Variations derive from changes in both, the equalization rate and standardized tax rates: in 1988 the equalization rate was lowered for all municipalities from 100% to 95% and in 1997 from 95% to 90%.¹⁹ As the lower graph reveals, in 1996, 1997, and 1998, standardized tax rates have been raised for small municipalities, exclusively, whereas in 2001 standardized tax rates have been raised for all municipalities.²⁰ We will argue in the next subsection that only the differential change in standardized tax rates faced by small municipalities in 1996, 1997 and 1998 may be interpreted as being exogenous.

3.2 Identification Strategy and Results

While in the last subsection we derived all the parameters necessary to test our theoretical predictions, simple estimation of equation (7) would face problems of endogeneity. In particular, the parameters of fiscal equalization are determined by state legislature which in turn can not be suspected to be independent of the fiscal situation on the municipal level. With respect to the marginal contribution rate, as our key variable of interest, there are two reasons for concern. First, reductions in the equalization rate have explicitly been motivated by an improvement of the general fiscal situation of “poorer” municipalities which rendered redistributive objectives less important.²¹ Since these developments might very well have had an impact on tax policy which is not captured in the theory we want to test, estimations might be subject to omitted variable bias.

¹⁹Note that in the graph changes are indicated as continuous functions. More correctly, these changes should be thought of as a step function. However, Stata has not done me that favor, yet.

²⁰See equation 8.

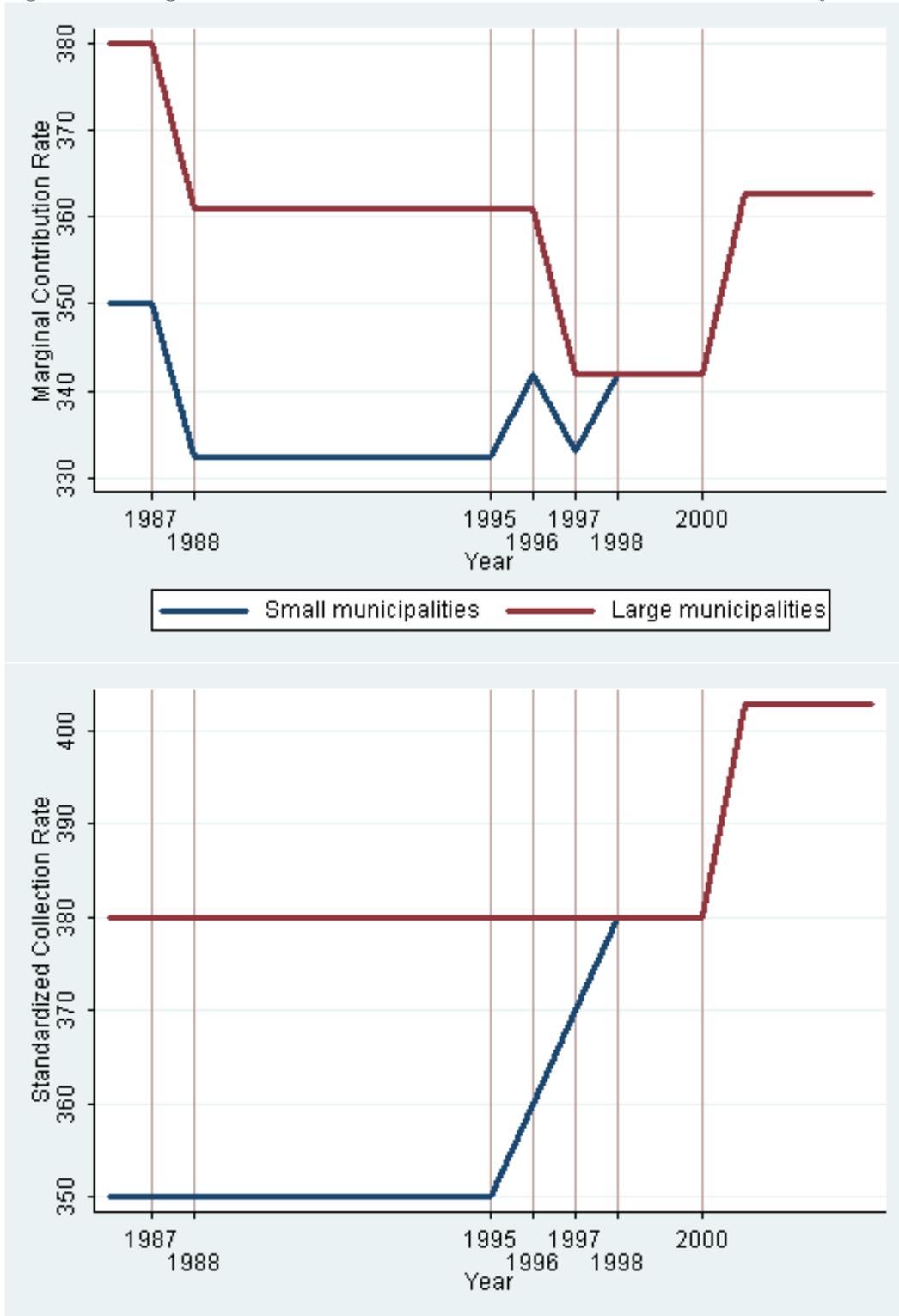
²¹Cite Parsche et al. Bataille.

Table 2: Summary statistics 1986 – 2004

in %	Observations	Mean	Minimum	Maximum
Tax Structure				
all municipalities	7,066	1.24	.83	1.75
large municipalities	376	1.06	.83	1.38
small municipalities	6,690	1.25	.88	1.75
Implicit MCR				
all municipalities	7,066	.92	.71	1.41
large municipalities	376	.82	.73	1.15
small municipalities	6,690	.93	.71	1.41
Lump-Sum Revenue (per capita in 1,000 €)				
all municipalities	7,066	.41	.17	1.19
large municipalities	376	.70	.35	.92
small municipalities	6,690	.39	.17	1.19
log Population				
all municipalities	7,066	4.37	3.58	5.99
large municipalities	376	5.47	5.19	5.99
small municipalities	6,690	4.31	3.58	5.15

Source: Own calculations and Statistical Office of North Rhine-Westphalia. The group “small municipalities” consists of all municipalities with a population of 150,000 or below. All other municipalities belong to the group of “large municipalities”. Municipalities which are ineligible for fiscal equalization transfers are not considered in the empirical analysis.

Figure 1: Marginal Contribution Rates and Standardized Tax Rates by Group



Sample includes all North Rhine-Westphalian municipalities eligible for fiscal equalization grants in each of the years from 1986 to 2004. Source: own calculations.

A second problem relates to the change of the standardized tax rate in 2001 because it was an explicit reaction to actual taxing behavior: according to legislative intent standardized tax rates should give an “appropriate account of actual taxing capacity”.²² Thus, every 5 to 10 years the legislative is obliged to examine whether average tax rates strongly differ from standardized tax rates and, as case may be, to adjust the latter accordingly. This examination was first performed in 2000 and standardized tax rates were adjusted upwards in the subsequent year to level average tax rates. Hence, while we aim at testing the impact of standardized tax rates (as a component of the marginal contribution rate) on actual tax rates, the causality in this case runs the opposite direction.

We solve these problems by exploiting a quasi-experiment resulting from a Supreme Court ruling for the state of North-Rhine Westphalia to identify the incentive effect of fiscal equalization. Due to a special provision in the North-Rhine Westphalian fiscal constitution, until the mid-1990’s, municipalities with a population of 150,000 or below faced a lower marginal contribution rate than municipalities with a population above 150,000. In 1993 the State Constitutional Court ruled that this provision be abolished, unless an independent panel of experts finds it to be justified for “economic reasons”.²³ The expert report was published in 1995 concluding that both groups should face the marginal contribution rate hitherto applied to the group of large municipalities.²⁴ Hence, only small municipalities were affected by the subsequent adjustment allowing us to split the sample into treatment and control group.

We use difference-in-difference to estimate the treatment effect. Our basic estimation is given by

$$ts_{it} = \beta_0 + \beta_1 LSR_{it} + \beta_2 OWN_{it} + \beta_3 POP_{it}$$

²²Bataille

²³Verfassungsgerichtshof für das Land Nordrhein-Westfalen, 1993, Urteil vom 6. Juli – VerfGH 9/92, 22/92.

²⁴See Parsche et al.

$$+ \beta_4 TREAT_i + \gamma_t POST_t + \delta_t (TREAT_i \cdot POST_t) + u_{it}$$

where

- LSR_{it} captures lump-sum revenues (*i.e.* the empirical counterpart to y_i)
- OWN_{it} captures the local land ownership shares (*i.e.* the empirical counterpart to e_i^m)
- $TREAT_i$ is a dummy variable which equals 1 if population $\leq 150,000$, 0 otherwise
- $POST_t = 1$ is a dummy variable which equals 1 in the post-treatment period, 0 otherwise
- $(TREAT_i \cdot POST_t)$ is an interaction terms which equal 1 for the treatment group in the post-treatment period, 0 otherwise.

As regards the timing of events, we face a certain degree of ambiguity: to ensure a smooth implementation if the reform the legislative adjusted the standardized tax rate for small municipalities in three steps, *i.e.* from 350 in 1995 to 360 in 1996, to 370 in 1997, and to 380 in 1998. We do not have a theoretical prior to whether municipalities would react to this (pre-announced) adjustment path immediately, *i.e.* in 1996, or adapt gradually over the three years. Of course, the most parsimonious solution would be to drop the two intermediate reform periods 1996 and 1997 from the estimations and to only discriminate between pre-1996 and post-1997 periods. However, for robustness checks we also include specifications in which 1996 and 1997 are considered as post-treatment periods.

Table 3 displays results for the difference in difference estimation. Columns (1)-(3) refer to regressions which include all variables included in equation 9. In order to capture additional heterogeneity between municipalities belonging to treatment and control group we repeat the estimation and include municipality-fixed effects. The corresponding results are shown in columns (4)-(6) in table 3.

Table 3: Regression Results (Dependent Variable: business tax rate relative to land tax rate)

Specifications	(1)	(2)	(3)	(4)	(5)	(6)
Virtual Grants	-10.40*** (-7.30)	-6.29*** (-4.27)	-4.66*** (-2.95)	-9.92*** (-6.82)	-4.49*** (-3.04)	-2.46 (-1.57)
Ownership Shares	18.99*** (16.34)	19.98*** (16.88)	21.32*** (17.19)	28.05 (1.43)	36.87*** (6.48)	46.95*** (7.93)
Population (in ten thousands)	-0.16*** (-6.27)	-0.17*** (-6.22)	-0.17*** (-6.14)	-3.08*** (-4.94)	-2.63*** (-4.27)	-2.71*** (-4.32)
Treatment Group	3.63*** (3.37)	4.51*** (4.17)	4.44*** (3.97)	-4.44 (-0.64)	-4.49 (-0.67)	-4.66 (-0.70)
Dummy 1996	-16.94*** (-15.36)			-17.32*** (-20.68)		
Treat. Group \times Dummy 1996	6.12*** (5.41)			6.98*** (8.02)		
Dummy 1997		-17.91*** (-15.46)			-19.19*** (-21.92)	
Treat. Group \times Dummy 1997		5.54*** (4.66)			6.97*** (7.65)	
Dummy 1998			-18.23*** (-14.17)			-20.13*** (-20.77)
Treat. Group \times Dummy 1998			5.17*** (3.92)			7.00*** (6.96)
Observations	5148	4752	4356	5148	4752	4356
R^2	0.42	0.45	0.44	0.39	0.45	0.45

Column (1), (2), and (3) refer to basic regression results; columns (4), (5), and (6) refer to regressions including municipality-specific fixed effects. Robust standard errors in parentheses. Two stars indicate significance at the 5% level; three stars indicate significance at the 10% level.

Our main interest lies in the interaction terms. These are highly significant and show the expected positive sign, indicating that an increase in the marginal contribution rate for the local business tax leads to an increase of capital relative to land tax rates. The results show very little variation across specifications. Likewise, ownership shares are significant at the 1% level except for specification (4) where they are not significant. The coefficients all show the expected positive sign. The quantitative variation is substantially larger across specifications. However, we do not pursue the path further since ownership shares are not the policy parameter we intend to study.

4 Concluding Remarks

This paper investigated the impact of intergovernmental transfers on governments' choices between distortive and non-distortive taxation. A simple political economy model predicts a positive relationship between the degree to which adverse tax base effects are compensated by the grant scheme and the use of distortive relative to non-distortive taxation. For a panel of German municipalities we confirm this theoretical prediction using a quasi-experiment obtained from a Supreme Court ruling for identification.

Our analysis bears an important normative implication: recent literature has emphasized the positive efficiency properties of fiscal capacity dependent grant schemes. In particular, it has been argued that they may serve to counteract incentives for sub-national governments to engage in inefficient tax competition. However, as the above analysis suggests, this positive effect does not come without cost: if the grant scheme skews the local tax structure towards distortive taxation and the overall supply of the mobile factor to the economy is elastic, policy-makers face a trade-off. A higher marginal contribution rate mitigates tax competition thus raising the efficiency of interregional allocation of mobile factors within the federation. At the same time, it induces a more distortive tax structure thus decreasing the overall supply of mobile tax bases to the economy.

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Appendix

Imputation of ownership shares

We first compute for each municipality a relation of its ownership share to the overall county ownership share in 1987. In a second step we multiply the county level data for 1993, 1998, 2003 and 2006 with this municipality-level variable. Finally, we impute ownership shares for the years in which no data are available as the relative distance between the years in which no data are available. Formally, let os_i^t denote the ownership share of municipality i and os_j^t denote the ownership share of municipality i 's county j in year t . The municipal ownership share in 1990 for example would thus be imputed as

$$os_i^{90} = os_i^{87} + (os_j^{93} \times \frac{os_i^{87}}{os_j^{87}} - os_i^{87}) \times \frac{(1990 - 1987)}{(1993 - 1987)}. \quad (9)$$

In order for this imputation to yield an adequate measure of actual ownership shares each municipality's ownership relative to its county's ownership share has to be constant over time and changes in county ownership shares have to be a linear function of time between the years in which data are available.

Definition of Lump-Sum Grants

We compute y_i as $g_i + \vartheta_i^k k_i$ where k_i denotes the tax base of the local business tax. In addition we could include Other Federal Transfers in y_i . While this would generate additional variation between municipalities it might also be a source of endogeneity since the allocation of these transfers based on local revenue from the income tax is likely to be correlated with the local business tax base.