

Krause, Manuela; Büttner, Thiess

**Conference Paper**

## Does Fiscal Equalization Lead to Higher Tax Rates? Empirical Evidence from Germany

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2017: Alternative Geld- und Finanzarchitekturen - Session: Taxation I, No. A18-V1

**Provided in Cooperation with:**

Verein für Socialpolitik / German Economic Association

*Suggested Citation:* Krause, Manuela; Büttner, Thiess (2017) : Does Fiscal Equalization Lead to Higher Tax Rates? Empirical Evidence from Germany, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2017: Alternative Geld- und Finanzarchitekturen - Session: Taxation I, No. A18-V1, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/168214>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# Does Fiscal Equalization Lead to Higher Tax Rates? Empirical Evidence from Germany

Thiess Buettner, FAU and CESifo<sup>‡</sup>; Manuela Krause, ifo<sup>§¶</sup>

February 2017

## Abstract

This paper exploits a recent federal reform to explore the role of fiscal equalization as a driver of states' tax policy in Germany. Based on an analysis of the equalization system, we argue that the associated strong fiscal redistribution of tax revenues provides an incentive for states to increase rather than to lower their tax rates. The empirical analysis exploits differences in the degree of fiscal redistribution among the states over time. More specifically, we use simulation analysis to precisely compute the fiscal incentive faced by each state and explore the empirical effects on tax policy. The results support the existence of a significant effect on tax policy. According to the estimates, with full equalization of revenues from the real estate transfer tax the tax rate is about one percentage point higher than without.

**Key Words:** Real estate transfer tax; Fiscal equalization; Marginal contribution rate

**JEL Classification:** H20; H26; R38

---

<sup>‡</sup>University of Erlangen-Nuremberg, Lange Gasse 20, 90403 Nuremberg, Germany, thiess.buettner@fau.de

<sup>§</sup>ifo Institute Munich, Poschingerstr. 5, 81679 Munich, Germany, krause@ifo.de

<sup>¶</sup>The authors would like to thank Tobias Goerbert for excellent research assistance.

# 1 Introduction

A key characteristic of federal public finance is the fiscal autonomy of subnational governments. This includes the discretion to imposing local taxes and to determining the tax rates. In many federations this autonomy is combined with fiscal redistribution that aims at equalizing the funds available for subnational governments. Depending on how fiscal redistribution is implemented, this combination may exert incentives with regard to the tax effort of subnational governments. In particular, since there are alternative sources of revenues, the efforts to raise own source revenues might decline.

In a recent reform, the German federation has strengthened the autonomy of subnational governments by allowing the states to vary the tax rate of the real-estate transfer tax. Before the reform, states had no discretion to determine the tax rate of any tax. To introduce tax discretion proved difficult since German states are subject to a far-reaching equalization of tax revenues between the states and tax autonomy is widely feared to cause revenue losses for the majority of states where own tax revenues are relatively small.

The political compromise left the system of fiscal equalization basically unchanged and, with the real estate transfer tax, assigned a rather unimportant source of tax revenue to the discretion of the states. However, the reform in 2006 had strong effects on tax policy. In the time period from 2007 to 2015 among the 16 German states, no less than 25 increases of the real estate transfer tax occurred. No state has lowered its tax rate. Initially, the tax

rate was 3.5% on the sales price. As a consequence of the reform, the median statutory tax rate has moved up and reached a level of 5% in 2013. In 2016, the mean tax rate is 5.3%.

The fact, that the states have utilized this tax instrument so heavily, may indicate that they are under substantial revenue stress. As we argue in this paper an alternative explanation is that, rather than simply depressing efforts to raise own source revenues, the combination of tax autonomy and fiscal equalization in Germany actually provides an incentive to raise the local tax rates. More specifically, we argue that a state that raises its tax rate receives more rather than less equalization grants.

The incentives of subnational governments for tax policy are subject to a large body of economic literature. Most of the literature is concerned with the effects of interjurisdictional competition on tax policy (for a recent survey see Keen and Konrad, 2013). This literature has emphasized in particular that tax policy of individual governments exerts horizontal fiscal externalities on other jurisdictions. If the set of tax instruments is restricted, the resulting tax competition equilibrium is typically characterized with inefficiently low tax rates. However, the literature has also noted that federal countries are characterized by institutions that work in the opposite direction. One strand of the literature emphasizes the role of vertical externalities that stem from co-occupancy of tax bases (*e.g.*, Dahlby, Mintz, and Wilson, 2000, Keen and Kotsogiannis, 2002). Another strand of the literature

emphasizes the role of fiscal redistribution (*e.g.*, Smart, 1998, 2007, Koethenbueger, 2002, Bucovetsky and Smart, 2006). These papers typically discuss a specific type of fiscal redistribution implemented by the Australian, the Canadian, the German as well as the Swiss federations. These countries feature systems of fiscal equalization where fiscal transfers are a function of fiscal capacity. The latter is typically defined as a sum of own source revenues, where tax revenues with local discretion are counted only at some representative tax rate. With this definition of tax capacity, the adverse impact of a high tax rate on the tax base, which reflects the deadweight loss from taxation, depresses the fiscal capacity of the state. As this results in higher equalization transfers, states are subject to an incentive to increase the local tax rate and tend to disregard the economic cost of taxation.

A small empirical literature has explored the implications for local tax policy and supported the view that fiscal equalization exerts a significant incentive to increase local tax rates (*e.g.*, Dahlby and Warren, 2003, Buettner, 2006, Egger, Koethenbueger and Smart, 2010). Despite the strong fiscal redistribution present in the German federation, there are almost no papers providing evidence on incentive effects exerted on the German states. This is, of course, partly the consequence of the lack of tax autonomy that characterizes German states before the recent reform. Barette, Huber and Lichtblau (2002) as well as Boenke, Jochimsen and Schroeder (2015) explore effects of fiscal redistribution on tax collection efforts. The recent move towards tax autonomy has led to a number of recent papers discussing the economic consequences of the real estate transfer tax in Germany (Fritzsche

and Vandrei, 2016, Petkova and Weichenrieder, 2016, and Buettner, 2017). The political economy behind the states' real estate transfer tax policy is discussed by Krause and Potrafke (2016) pointing to the role of government ideology.

This paper contributes to the empirical literature on incentive effects of fiscal equalization by exploring the tax policy of German states after the recent federal reform. Based on an analysis of the fiscal incentive provided by this system, this paper is the first paper computing the fiscal incentive with regard to the real estate transfer tax and providing empirical evidence on its effects on tax policy. The identification strategy exploits differences in the degree of fiscal redistribution among the states over time. More specifically, we use a simulation analysis of the system of fiscal equalization to precisely compute the incentive faced by each state and test whether differences in the strength of the incentive show up in the tax policy. The results support a significant effect on tax policy. According to the estimates, with full equalization of revenues from the real estate transfer tax the tax rate is about 1 percentage point higher than without.

The following section 2 provides an analysis of tax policy under fiscal equalization. Subsequently, in section 3 the data is described and in section 4 the methodology is discussed. Section 5 presents the results. Section 6 concludes.

## 2 Incentive Effect of Fiscal Redistribution

This section gives a stylized analysis of fiscal redistribution in a setting with tax autonomy and derives the tax-policy incentive using the marginal cost of funds. The analysis aims at capturing those institutional features of fiscal equalization in Germany that are essential for tax policy.

Consider the revenues  $R_i$  of a state  $i$

$$R_i = T_i + \tau_i B_i + Z_i.$$

For simplicity, three components of state revenues are distinguished. One component is revenue from shared taxes  $T_i$ , the second component is revenue from the own tax, and the third component is fiscal transfers.

The equalization grant scheme implemented in the German federation can be characterized by the following function determining the fiscal transfers

$$Z_i = Z(S_i), \quad \text{where} \quad \left\{ \begin{array}{l} Z_i > 0 \text{ and } Z'_i < 0 \text{ if } S_i < 1 \\ Z_i = 0 \text{ if } S_i = 1 \\ Z_i < 0 \text{ and } Z'_i < 0 \text{ if } S_i > 1. \end{array} \right.$$

The argument  $S_i$  is the fiscal position of state  $i$ , defined as

$$S_i = \frac{C_i}{N_i},$$

where  $N_i$  is an indicator of fiscal need and  $C_i$  is an indicator of fiscal capacity. Function  $Z_i$  is non-linear and strictly decreasing in  $\frac{C_i}{N_i}$  and has zero value at  $\frac{C_i}{N_i} = 1$ . However, the derivative of the function is discontinuous, *i.e.* there exist threshold levels  $\sigma$  such that  $\lim_{S_i \rightarrow \sigma^-} Z'(S_i) \neq \lim_{S_i \rightarrow \sigma^+} Z'(S_i)$ .

The definition of fiscal capacity is

$$C_i = T_i + \bar{\tau}B_i,$$

where  $T_i$  is revenue from shared taxes, and  $\bar{\tau}B_i$  is standardized revenue from the own source tax with  $B_i$  denoting the taxable base and  $\bar{\tau}$  denoting the weighted average of tax rates

$$\bar{\tau} = \frac{\sum \tau_i B_i}{\sum B_i}.$$

Fiscal need is a share of total tax revenues

$$N_i = \left( \sum T_j + \bar{\tau} \sum B_j \right) \frac{P_i}{\sum P_j},$$



where  $P_i$  is the population size.<sup>1</sup>

Consider the effect of an increase in the tax rate on total revenues

$$\frac{\partial R_i}{\partial \tau_i} = B_i + \tau_i \frac{\partial B_i}{\partial \tau_i} + Z'(S_i) \frac{\partial S_i}{\partial B_i} \frac{\partial B_i}{\partial \tau_i} \quad S_i \neq \sigma.$$

Denoting the tax-rate elasticity of the taxable base with  $\eta_i$  this term can be simplified to

$$\frac{\partial R_i}{\partial \tau_i} = B_i - B_i \eta_i (1 - \vartheta_i),$$

where

$$\vartheta_i = - \left( Z'(S_i) \frac{\partial S_i}{\partial B_i} / \tau_i \right) \quad (1)$$

captures the degree of fiscal redistribution.<sup>2</sup> The numerator of the term in brackets captures the loss in transfers given an increase in the tax base. The denominator captures the increase in own-source revenue due to an increase in the tax base. If  $\vartheta_i$  is close to zero, a higher tax base has little impact on transfers and the revenue gain from an increase in the tax base is mainly kept by the state. If  $\vartheta_i$  is close to unity, a higher tax base results in a strong decline in fiscal transfers. In this case, the net revenue impact of an increase in the

---

<sup>1</sup>A special feature of fiscal equalization in Germany is that for some states and certain types of taxes the equalization system uses virtual rather than actual population figures. This is the case in particular for the city states, where the population numbers used are 1.35 times actual population figures.

<sup>2</sup>Buettner (2006) refers to  $\vartheta$  as the marginal contribution rate.

tax base is small.

Assuming that the state government considering the tax rate acknowledges the marginal loss to the tax payer, the (perceived) marginal cost of funds is

$$MCF_i = B_i \left( \frac{\partial R_i}{\partial \tau_i} \right)^{-1} = \frac{1}{1 - \eta_i (1 - \vartheta_i)} \quad S_i \neq \sigma.$$

In the absence of fiscal redistribution,  $\vartheta_i = 0$ , the marginal cost of funds is simply an increasing function of the elasticity of the base. With fiscal redistribution,  $\vartheta_i > 0$  the marginal cost of funds is reduced. With  $\vartheta_i = 1$  the marginal cost of funds would be unity. In this case, the tax would effectively be perceived like a lump-sum tax.<sup>3</sup> If  $\vartheta_i > 1$  the marginal cost of funds may even be smaller than unity. However, note that the marginal cost of funds is only reduced from the perspective of the individual state. From a federal perspective, the cost are higher since the tax policy of the individual government exerts a negative fiscal externality on the other states.<sup>4</sup>

The reduction in the marginal cost of funds provides a fiscal incentive to the state's tax policy. Intuitively, it is caused by the compensation for the revenue implications of a lower base. If a state increases its tax rate, the tax base will decline ( $\eta_i > 0$ ). In a system with fiscal equalization the local government is compensated by means of higher transfers.

---

<sup>3</sup>Bucovetsky and Smart (2004) show that with full equalization  $\vartheta_i = 1$ , the incentive to engage in tax competition is eliminated.

<sup>4</sup>For the notion of perceived deadweight loss of taxation *cf.* Wildasin (1989).

Hence, the cost of taxation is perceived to be lower, as some part of the adverse affect on economic activities is shifted to the other states in the federation.

### 3 Data

The empirical analysis examines real estate transfer tax policy under fiscal redistribution. In particular, it aims to testing whether and to what extent actual tax policy responds to the incentive effect of fiscal equalization. To identify differences in fiscal redistribution we exploit the institutional details of fiscal equalization among German states.

The German system of fiscal equalization consists of different stages of vertical and horizontal distribution of funds. The first stage involves the distribution of VAT revenue shared between the federal and the state governments. The states' share is distributed mainly according to population size but a fraction is used to provide funds to states with low state tax capacity, *i.e.* states with own tax revenues below the average. The second stage consists of a horizontal redistribution scheme with transfers paid to states with fiscal capacity below fiscal need and contributions made by states with fiscal capacity above fiscal need. Fiscal capacity is basically defined as available revenues inclusive of the state's own tax revenues, the VAT share and municipal tax revenues. Fiscal need is the population weighted average of fiscal capacity across states. The third stage provides further vertical grants by the federal government to states with fiscal capacity below fiscal need.

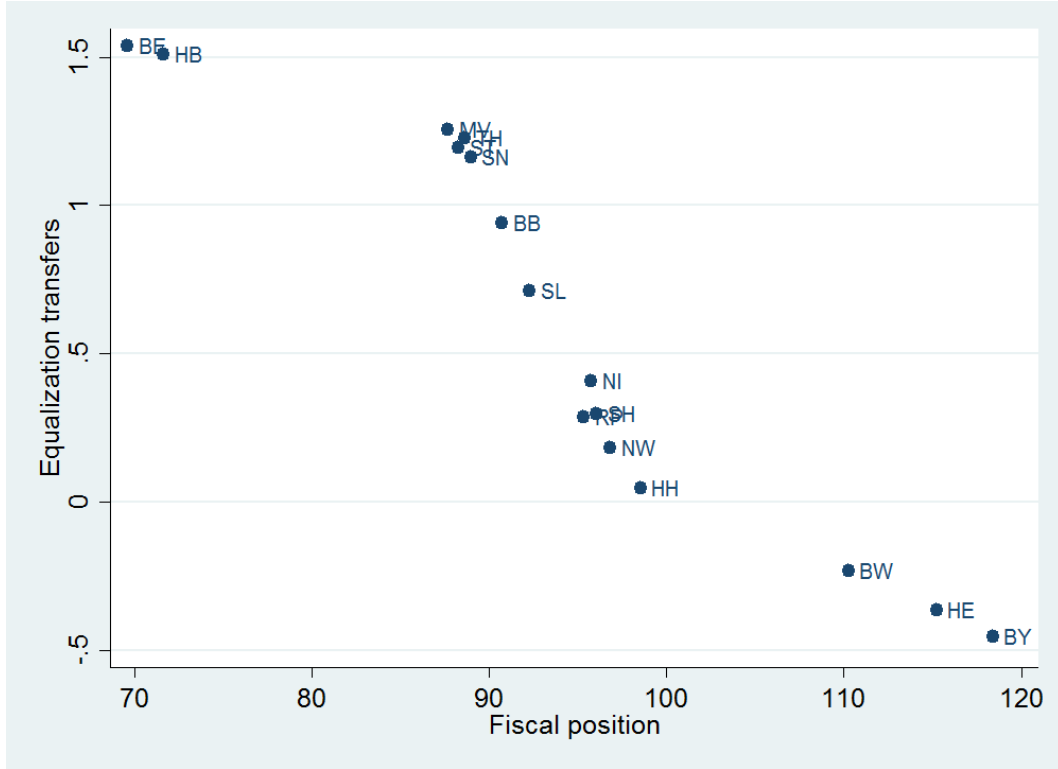
At all stages, real-estate transfer taxes are accounted for. But, rather than using the revenues directly, the equalization system includes standardized tax revenues to its definition of tax or fiscal capacity. The standardization involves applying the average tax rate to the tax base of the real-estate transfer tax.

Using the data for 2016, Figure 1 reports the indicator of fiscal capacity relative to fiscal need ( $S_i$ ) and the associated level of transfers. The latter is standardized in per-capita terms. As the figure shows, transfers are a decreasing function of relative fiscal capacity. Three segments can be distinguished. A first segment with high transfers and a limited degree of fiscal redistribution, an intermediate segment with a stronger degree of redistribution and medium level of grants, and a third segment with net-contributions.

To compute the degree of fiscal redistribution we simulate the fiscal equalization scheme. To this end we consider the effects of a uniform shock to the tax base on the transfers received by each state. In terms of the above stylized model of fiscal equalization, the simulations provide us with the quantitative effect of a shock to the tax base  $\Delta B_i$ , on relative fiscal capacity  $\Delta S_i$  and on transfers received  $\Delta Z_i$ . Dividing by the state's tax rate yields the degree of fiscal redistribution as defined in equation (1).

Table 1 provides the degree of fiscal redistribution by state in 2006 and 2016. Columns (1) and (2) depict the population shares, and the relative fiscal capacity. Columns (3) and (4) show the tax rates in 2006 and 2016 of the respective state. Column (5) shows the degree of

Figure 1: Fiscal Transfers



Equalization transfers are net fiscal transfers in 1000 Euro per capita. This includes the distribution of the VAT share according to low state tax capacity (*Ergaenzungsanteile*) as the first stage, the horizontal transfer (*Ausgleichszuweisungen/Ausgleichsbeitraege*) as the second stage, as well as the federal grants (*Allgemeine Bundesergaenzungszuweisungen*) as the third stage of fiscal equalization in Germany. Relative fiscal capacity is the fiscal capacity in % of fiscal need according to the second stage of the fiscal equalization system. Own computations based on data for 2016. BW = Baden-Wuerttemberg, BY = Bavaria, BE = Berlin, BB = Brandenburg, HB = Bremen, HH = Hamburg, HE = Hesse, MV = Mecklenburg-Vorpommern, NI = Lower Saxony, NW = North Rhine-Westphalia, RP = Rhineland-Palatinate, SL = Saarland, SN = Saxony, ST = Saxony-Anhalt, SH = Schleswig-Holstein, TH = Thuringia

Table 1: Degree of Fiscal Redistribution by State in 2006 and 2016

State	Popul.	Rel.fiscal	Tax rate		Fiscal	
	share (in 2016)	capacity (in 2016)	(in 2006)	(in 2016)	(in 2006)	(in 2016)
	(1)	(2)	(3)	(4)	(6)	(7)
Baden-Wuerttemberg	13.24	110.25	3.5	5.0	0.63	0.63
Bremen	0.82	71.65	3.5	5.0	0.93	1.02
Hamburg	2.18	98.54	3.5	4.5	0.72	0.98
Mecklenburg-Vorpommern	1.96	87.67	3.5	5.0	0.98	1.01
Lower Saxony	9.65	95.75	3.5	5.0	0.89	0.93
Rhineland-Palatinate	4.93	95.33	3.5	5.0	0.95	0.98
Saxony-Anhalt	2.73	88.26	3.5	5.0	0.95	1.00
Bavaria	15.63	118.39	3.5	3.5	0.61	0.82
Berlin	4.28	69.62	3.5	6.0	0.94	0.82
Brandenburg	3.02	90.74	3.5	6.5	0.97	0.78
Hesse	7.52	115.21	3.5	6.0	0.68	0.57
North Rhine-Westphalia	21.74	96.81	3.5	6.5	0.42	0.65
Saxony	4.97	88.95	3.5	3.5	0.95	1.38
Schleswig-Holstein	3.48	96.05	3.5	6.5	0.96	0.77
Saarland	1.21	92.29	3.5	6.5	0.98	0.78
Thuringia	2.64	88.64	3.5	5.0	0.97	1.00

Population share and relative fiscal capacity in % obtained from the announcement of the (preliminary) fiscal equalization account of the Federal Ministry of Finance. Tax rates obtained from state announcements. Degree of fiscal redistribution  $\vartheta$  for a state-specific shock in the tax base of the real-estate transfer tax (see equation 1) obtained by own simulation analysis.

fiscal redistribution based on the tax revenues in 2006 before the federal reform. It displays marked variation in several dimensions. The majority of states (Mecklenburg-Vorpommern, Rhineland-Palatinate, Saxony-Anhalt, Berlin, Brandenburg, Saxony, Schleswig-Holstein, Saarland, Thuringia) is small and has low fiscal capacity. For these states the degree of fiscal redistribution is quite high in 2006. In all cases, it shows figures above 0.9. This indicates that a shock in the tax base of the real-estate transfer tax generating a Euro of additional tax-revenue results in an increase of funds net of redistribution below 10 cents. 90 cents are compensated by a reduction in equalization transfers. A second group of states is relatively large and shows high-levels of fiscal capacity (Baden-Wuerttemberg, Bavaria, Hesse). For these states the degree of fiscal redistribution is much lower showing figures below 0.7. A last group of states either is relatively large or has large fiscal capacity (North Rhine-Westphalia, Lower Saxony, Hamburg). Here the degree of fiscal redistribution varies but is lower than for the first group.

The figures for 2016 look much different. This is mainly the consequence of changes in tax rates. States that have increased their tax rate most, such as Berlin, Brandenburg and Saarland, experience a decline in fiscal redistribution relative to 2006. The two states that have not increased their tax rate experience an increase in the degree of fiscal redistribution (Saxony and Bavaria). Most notably in Saxony the degree of fiscal redistribution is above 1 in 2016. With a degree of fiscal redistribution of about 1.38 the state loses transfers for each Euro of additional tax revenues in an amount of 1.38 Euro. Hence, at the margin the

state's revenues decline by 38 cents with every additional Euro of revenues from the real estate transfer tax. This almost paradoxical treatment of own revenues is not observed for other states in 2016. However, Bremen and Mecklenburg-Vorpommern also show degrees of fiscal redistribution above 1.

## 4 Methodology

In the empirical analysis, we consider the states' tax policies after a federal reform that granted the states the right to set the tax rate of the real estate transfer tax. The analysis exploits the fact that the degree of fiscal redistribution differs among the states and over time. The identification utilizes the fact that the equalization grants are formula based and are determined by a smooth function of relative fiscal capacity. Controlling for a polynomial of relative fiscal capacity we can make sure that variation in the degree of fiscal redistribution is not just capturing differences in available resources or differences in the amount of equalization grants or transfers.

Based on the above stylized description of the equalization system, the empirical analysis rests on an exact indicator of relative fiscal capacity  $S_i$  and on the degree of fiscal redistri-



bution. A basic specification aims at exploring tax policy using a regression equation

$$\tau_{i,t} = \alpha_i + \beta_1 \mathbf{E} [\vartheta_{i,t}] + \sum_{j=1}^p \beta_{2,j} \mathbf{E} [S_{i,t}]^j + \gamma_t + \varepsilon_{i,t}, \quad (2)$$

where  $\alpha_i$  is a fixed state effect and  $\gamma_t$  is a fixed time effect.  $\beta_1$  captures the effect of fiscal redistribution. In the light of the above analysis, a positive coefficient is expected. By allowing for arbitrary non-linear effects of the assignment variable  $\mathbf{E} [S_{i,t}]^j$ , the estimation approach ensures that only differences in the degree of fiscal redistribution that do not result in differences in equalization grants are used to identify the effect of fiscal equalization. Since the tax policy is required to set the tax rate in advance, the state governments need to form expectations regarding the degree of fiscal redistribution and the relative fiscal capacity. Both indicators are functions of revenues in all states and reliable information is only available at the end of the period.<sup>5</sup> For this reason the analysis below employs lagged indicators of the degree of fiscal redistribution  $\vartheta_{i,t}$  and of relative fiscal capacity  $S_{i,t}$ . Since the degree of fiscal redistribution is inversely related to the local tax rate, we also include a polynomial of the local tax rate.

$$\tau_{i,t} = \alpha_i + \beta_1 \vartheta_{i,t-1} + \sum_{j=1}^p \beta_{2,j} S_{i,t-1}^j + \sum_{j=1}^p \beta_{3,j} \tau_{i,t-1}^j + \gamma_t + \varepsilon_{i,t} \quad (3)$$

A further specification that is included to check for robustness includes a polynomial for

---

<sup>5</sup>The first preliminary account of equalization for a budget year is typically published by the Federal Ministry of Finance in January of the next year. Detailed revenues forecasts are available not before the official November forecast of tax revenues in the budget year.

the state tax capacity per capita of each state, which drives fiscal redistribution at the first stage of the equalization system.

Note that the basic specification focuses on the tax rate as dependent variable. Since our analysis focuses on the period immediately after the federal reform, where states first obtained the right to set their own tax rate, it might be more adequate to consider only the adjustments in the tax rate rather than the level. As an alternative specification, we, therefore, use the tax rate change as dependent variable.

Tables 2 and 3 provide descriptive statistics for the tax rate and the three control variables. The latter includes the degree of fiscal redistribution, the indicator of relative fiscal capacity and the indicator of state tax capacity per capita. Note that the tax rate is uniformly at 3.5% in 2006 prior to the federal reform that granted tax autonomy. In subsequent years, there is a strong increase in the tax rate up to a mean of 5.3% in 2016. The degree of fiscal redistribution is strictly below unity in 2006 before the reform. After some states have increased their tax rates, the maximum degree of redistribution increased above unity in 2008.

Table 3 has descriptive statistics for the relative fiscal capacity in %. Note that the mean is always below 100% reflecting the fact that the majority of states display fiscal capacity below need and hence are states that receive net-transfers. The lower panel of Table 3 reports statistics for the relative state tax capacity which is used to determine the VAT

Table 2: Descriptive Statistics

Year	Obs.	Mean	Std.Dev.	Min	Max
Tax rate					
2006	16	3.5	0	3.5	3.5
2007	16	3.563	.25	3.5	4.5
2008	16	3.563	.25	3.5	4.5
2009	16	3.625	.3416	3.5	4.5
2010	16	3.677	.3823	3.5	4.5
2011	16	4.016	.5456	3.5	5.0
2012	16	4.518	.5588	3.5	5.0
2013	16	4.75	.5477	3.5	5.5
2014	16	4.995	.7494	3.5	6.5
2015	16	5.234	.9375	3.5	6.5
2016	16	5.281	.9827	3.5	6.5
Degree of fiscal redistribution					
2006	16	.8456	.1740	.4194	.9834
2007	16	.8456	.1818	.4078	.9979
2008	16	.8447	.1844	.4034	1.001
2009	16	.8291	.2041	.4141	1.002
2010	16	.8458	.1857	.4218	1.014
2011	16	.8207	.1661	.4412	1.033
2012	16	.8427	.1904	.4362	1.150
2013	16	.8539	.1423	.5710	1.210
2014	16	.8279	.1771	.4956	1.255
2015	16	.8569	.1999	.5595	1.348
2016	16	.8813	.1969	.5695	1.376

Upper panel: tax rate of the real estate transfer tax across the 16 German states in %. Lower panel: degree of fiscal redistribution obtained for an equal shock to the tax base across German states. The shock is scaled such as to generate a tax revenue increase by 1 Million Euro at the average tax rate.

Table 3: Descriptive Statistics (continued)

Year	Obs.	Mean	Std.Dev.	Min	Max
Relative fiscal capacity					
2006	16	94.10	15.24	67.13	122.4
2007	16	93.92	14.87	68.09	124.3
2008	16	93.85	14.56	67.23	120.3
2009	16	93.94	13.19	67.70	117.0
2010	16	94.37	13.01	68.14	116.0
2011	16	94.18	12.93	69.31	115.1
2012	16	94.12	12.65	68.87	114.6
2013	16	93.91	12.94	69.12	115.9
2014	16	94.12	13.01	69.22	117.2
2015	16	94.21	12.81	69.99	118.2
2016	16	94.01	13.12	69.62	118.4
Relative tax capacity					
2006	16	1.135	.5247	.4986	2.349
2007	16	1.246	.5282	.5690	2.356
2008	16	1.312	.5411	.6486	2.571
2009	16	1.160	.4364	.6114	2.043
2010	16	1.170	.4283	.6332	2.062
2011	16	1.301	.4596	.7343	2.278
2012	16	1.398	.4747	.8036	2.385
2013	16	1.492	.4828	.8894	2.463
2014	16	1.575	.5301	.9232	2.733
2015	16	1.671	.5436	1.012	2.885
2016	16	1.768	.5775	1.072	2.955

Upper panel: relative fiscal capacity defined as fiscal capacity (*Finanzkraftmesszahl*) relative to fiscal need (*Ausgleichsmesszahl*) in %. Lower panel: state tax capacity in 1000 Euro per capita used to determine the VAT distribution.

distribution in the first stage of fiscal equalization.

## 5 Results

Results from a basic set of regressions are provided in Table 4. The first specification only reports the effect of the degree of fiscal redistribution. The next three specifications include indicators of the assignment variable. In these specifications, however, the degree of fiscal redistribution is found to exert an insignificant effect on the tax policy. However, since the degree of fiscal redistribution faced by each state is inversely related to the tax rate, specifications (5) to (7) include indicators of the tax rate. With these controls added, the degree of fiscal redistribution exerts a significant positive effect. According to specifications (8) to (10) this proves significant also when controls for the relative tax capacity are added.

Table 5 provides results for changes in the tax rate. This has the advantage that the correlation between the lag of the dependent variable and the degree of fiscal redistribution is reduced or absent. The results show significant positive incentive effects in all specifications, regardless of whether polynomials of tax rates, of relative fiscal capacity or relative tax capacity are included.

With regard to the magnitude of the empirical estimates, specifications that include polynomials of relative fiscal and tax capacity provide a point estimate of about 1. This indicates

Table 4: Regression Results for Tax Rate Levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Degree of fiscal redistribution	-1.963 (1.258)	-1.893 (1.207)	-1.873 (1.225)	-1.870 (1.244)	1.030** (0.350)	1.042** (0.440)	1.043** (0.471)	1.084*** (0.319)	1.099** (0.405)	1.045** (0.461)
Relative fiscal capacity		-0.025 (0.038)	0.073 (0.343)	-0.727 (1.291)	-0.011 (0.020)	0.192 (0.169)	-0.973 (0.826)	-0.021 (0.025)	0.182 (0.182)	-1.181 (1.123)
Relative fiscal capacity (squared)			-0.000 (0.002)	0.008 (0.014)		-0.001 (0.001)	0.011 (0.008)		-0.001 (0.001)	0.013 (0.011)
Relative fiscal capacity (cubed)				-0.000 (0.000)			-0.000 (0.000)			-0.000 (0.000)
Tax rate					0.871*** (0.074)	0.511 (0.436)	-1.531 (4.205)	0.891*** (0.082)	0.597 (0.473)	2.639 (4.563)
Tax rate (squared)						0.038 (0.041)	0.458 (0.871)		0.031 (0.044)	-0.397 (0.939)
Tax rate (cubed)							-0.028 (0.059)			0.028 (0.063)
Relative tax capacity								0.516 (0.544)	0.412 (1.268)	-1.278 (1.738)
Relative tax capacity (squared)									0.004 (0.180)	1.488* (0.797)
Relative tax capacity (cubed)										-0.323* (0.166)
Constant	5.222*** (1.109)	7.556* (3.701)	2.520 (18.218)	28.257 (38.713)	0.694 (2.013)	-8.904 (9.296)	32.111 (30.753)	0.952 (2.171)	-8.775 (9.852)	31.362 (38.652)
Observations	160	160	160	160	160	160	160	160	160	160
R-squared	0.729	0.733	0.734	0.735	0.839	0.843	0.845	0.841	0.843	0.850

Dependent variable: tax rate of the real estate transfer tax in %. All specifications include state- and year-fixed effects. Robust standard errors (in parentheses) are clustered by state in all specifications. Asterisks denote significance at the 1% (\*\*\*), 5% (\*\*), and 10% (\*) levels.

Table 5: Regression Results for Changes of the Tax Rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Degree of fiscal redistribution	1.439*** (0.417)	1.464*** (0.405)	1.511*** (0.464)	1.515*** (0.475)	1.030** (0.350)	1.042** (0.440)	1.043** (0.471)	1.084*** (0.319)	1.099** (0.405)	1.045** (0.461)
Relative fiscal capacity		-0.009 (0.018)	0.215 (0.151)	-0.868 (0.695)	-0.011 (0.020)	0.192 (0.169)	-0.973 (0.826)	-0.021 (0.025)	0.182 (0.182)	-1.181 (1.123)
Relative fiscal capacity (squared)			-0.001 (0.001)	0.010 (0.007)		-0.001 (0.001)	0.011 (0.008)		-0.001 (0.001)	0.013 (0.011)
Relative fiscal capacity (cubed)				-0.000 (0.000)			-0.000 (0.000)			-0.000 (0.000)
Tax rate					-0.129* (0.074)	-0.489 (0.436)	-2.531 (4.205)	-0.109 (0.082)	-0.403 (0.473)	1.639 (4.563)
Tax rate (squared)						0.038 (0.041)	0.458 (0.871)		0.031 (0.044)	-0.397 (0.939)
Tax rate (cubed)							-0.028 (0.059)			0.028 (0.063)
Relative tax capacity								0.516 (0.544)	0.412 (1.268)	-1.278 (1.738)
Relative tax capacity (squared)									0.004 (0.180)	1.488* (0.797)
Relative tax capacity (cubed)										-0.323* (0.166)
Constant	-1.155*** (0.359)	-0.326 (1.741)	-11.832 (8.343)	23.050 (22.395)	0.694 (2.013)	-8.904 (9.296)	32.111 (30.753)	0.952 (2.171)	-8.775 (9.852)	31.362 (38.652)
Observations	160	160	160	160	160	160	160	160	160	160
R-squared	0.252	0.255	0.268	0.277	0.265	0.280	0.290	0.270	0.283	0.311

Dependent variable: change in the tax rate of the real estate transfer tax in %. All specifications include state- and year-fixed effects. Robust standard errors (in parentheses) are clustered by state in all specifications. Asterisks denote significance at the 1% (\*\*\*), 5% (\*\*), and 10% (\*) levels.

that with a degree of fiscal redistribution of about 100%, the tax rate is about 1 percentage point higher than with a degree of fiscal redistribution of 0%. Since the degree of fiscal redistribution is not below 40% for any state, however, this should be considered a lower bound estimate of the impact of fiscal equalization on tax policy.

## 6 Conclusions

This paper has explored the German experience after a federal reform that granted the states the right to set the tax rate of the real estate transfer tax. This reform resulted in an unprecedented wave of tax increases. In the time period from 2007 to 2015 among the 16 German states, no less than 25 tax increases occurred. No state has lowered its tax rate. Initially, the tax rate was 3.5% on the sales price. As a consequence of the reform, the median statutory tax rate has moved up and reached a level of 5% in 2013. In 2016, the mean tax rate is 5.3%.

Since the German states are subject to a system of equalization which heavily distributes tax revenues across states, we have explored whether the race towards increasing the tax rate might be explained by an incentive effect that arises from the fiscal equalization system. The German system of fiscal equalization redistributes tax revenues from states with high to states with low tax-capacity. Given the way fiscal capacity is defined, the adverse impact of a high tax rate on the tax base, which reflects the deadweight loss from taxation,



depresses the fiscal capacity of the state. Hence, a state that raises the tax rate receives more rather than less equalization grants or needs to make lower contributions to other states. This may have led the states to increase their tax rate so much in the recent years after the federal reform, despite the economic cost of this tax.

Based on an analysis of the fiscal incentives provided by the system of fiscal equalization, we provide empirical evidence on the effect on tax policy. The identification strategy exploits differences in the degree of fiscal redistribution among the states over time. We use a simulation analysis of the system of fiscal equalization to precisely compute the incentives faced by each state. The results support a robust significant effect on tax policy. According to the estimates, with full equalization of tax revenues from the real estate transfer tax the tax rate is about 1 percentage point higher than without.

## References

- Baretti, C., Huber, B., Lichtblau, K. (2002). A tax on tax revenue: The incentive effects of equalizing transfers: Evidence from Germany. *International Tax and Public Finance*, 9(6), 631-649.
- Boenke, T., Joachimsen, B., Schroeder, C. (2015). Fiscal federalism and tax enforcement. Discussion Paper 15, *School of Business & Economics: Economics*, Free University of Berlin.
- Bucovetsky, S., Smart, M. (2006). The Efficiency Consequences of Local Revenue Equalization: Tax Competition and Tax Distortions. *Journal of Public Economic Theory*, 8(1), 119-144.
- Buettner, T. (2006). The incentive effect of fiscal equalization transfers on tax policy. *Journal of Public Economics*, 90(3), 477-497.
- Buettner, T. (2017). Welfare Cost of the Real Estate Transfer Tax. *CESifo Working Paper*, 6321.
- Buettner, T., Schwager, R. (2003). Laenderautonomie in der Einkommensteuer: Konsequenzen eines Zuschlagsmodells. *Jahrbuecher fuer Nationaloekonomie und Statistik*, 223(5), 532-555.
- Dahlby, B., Ferede, E. (2012). The effects of tax rate changes on tax bases and the marginal cost of public funds for Canadian provincial governments. *International Tax and Public Finance*, 19(6), 844-883.
- Dahlby, B., Warren, N. (2003). Fiscal Incentive Effects of the Australian Equalisation System. *Economic Record*, 79, 434-445.
- Dahlby, B., Mintz, J., Wilson, S. (2000). The deductibility of provincial business taxes in a federation with vertical fiscal externalities. *Canadian Journal of Economics*, 33(3), 677-694.
- Egger, P., Koethenbueger, M., Smart, M. (2010). Do fiscal transfers alleviate business tax competition? Evidence from Germany. *Journal of Public Economics*, 94(3), 235-246.
- Ferede, E. (2016). The Incentive Effects of Equalization Grants on Tax Policy Evidence from Canadian Provinces. *Public Finance Review*, forthcoming.
- Fritzsche, C., Vandrei, L. (2016). The German Real Estate Transfer Tax: Evidence for Single-Family Home Transactions, *Ifo Working Paper*, 232.

- Keen, M., Konrad, K. A. (2013). The Theory of International Tax Competition and Coordination. *Handbook of Public Economics*, 5, 257-297.
- Keen, M. J., Kotsogiannis, C. (2002). Does federalism lead to excessively high taxes?. *American Economic Review*, 92(1), 363-370.
- Koethenbueger, M. (2002). Tax competition and fiscal equalization. *International Tax and Public Finance*, 9(4), 391-408.
- Krause, M., Potrafke, N. (2016). The real estate transfer tax and government ideology: Evidence from the German states, manuscript, ifo Institut.
- Petkova, K., Weichenrieder, A. J. (2016). Price and Quantity Effects of the German Real Estate Transfer Tax, manuscript, Frankfurt University.
- Smart, M. (1998). Taxation and deadweight loss in a system of intergovernmental transfers. *Canadian Journal of Economics*, 189-206.
- Smart, M. (2007). Raising taxes through equalization. *Canadian Journal of Economics*, 40(4), 1188-1212.
- Wildasin, D. E. (1989). Interjurisdictional capital mobility: Fiscal externality and a corrective subsidy. *Journal of Urban Economics* 25, 193–212.