

Economic Integration and Local Tax Mimicking

Carolin Holzmann[†]

Axel von Schwerin[‡]

April 2015

Very preliminary.

Please do not cite without permission of the authors.

Abstract

This paper provides empirical evidence for tax mimicking among municipalities by exploiting a quasi-experiment in the German local fiscal equalization scheme. We show for the metropolitan area *FrankfurtRheinMain* that, besides neighborhood, the degree of economic integration of municipalities determines the interdependency among their tax policies. As the metropolitan area spreads across municipalities located in the two German federal states, Hesse and Rhineland-Palatinate, we can show that Rhineland-Palatinate municipalities statistically significantly respond in their local tax rates to an exogenous change in the Hessian local fiscal equalization scheme. However, we find tax rate interdependency only for Rhineland-Palatinate metropolitan municipalities which are arguably strongly economically integrated with Hessian metropolitan municipalities. The results suggest that regional economic integration is a key determinant for tax mimicking.

Keywords: tax mimicking; local business tax; tax competition; fiscal equalization schemes

JEL classification: H20; H71; H77

[†] Address: University Erlangen-Nuremberg
Lange Gasse 20
D-90403 Nuremberg
Germany

Phone: +49 911 5302 201
Fax: +49 911 5302 396
E-mail: carolin.holzmann@fau.de

[‡] Address: University Erlangen-Nuremberg
Lange Gasse 20
D-90403 Nuremberg
Germany

Phone: +49 911 5302 204
Fax: +49 911 5302 396
E-mail: axel.schwerin@fau.de

1 Introduction

Although a vast body of literature has established various theoretical explanations for local tax mimicking, recent empirical quasi-experimental studies struggled with providing evidence for the phenomenon. This is remarkable for two reasons. First, the zero result is in contrast to the early empirical literature on tax mimicking that estimates spatial models of reaction functions and finds strong empirical evidence for fiscal interaction among local governments (e. g. Buettner (2001)). Second, theoretical literature provides reasonable explanations why there should be fiscal interaction between fiscally autonomous jurisdictions (see Wilson (1999) for an overview). The fact that recent papers using natural experiments as source for identification find no evidence for fiscal interdependencies, is, therefore, rather puzzling.

In this paper, we revisit the question of local tax mimicking. We study the case of tax mimicking in the German metropolitan area *FrankfurtRheinMain*. The metropolitan area is an institutional framework founded by the region's chambers of commerce in the late 1980's and formally defined as *European Metropolitan Area (EMR)* in 1995. The metropolitan area incorporates administrative districts (*Landkreise*) in the larger region of Frankfurt on the Main. The metropolitan area is characterized by a high level of policy cooperation in the fields of culture, infrastructure, environment, and economic development. It is the location of various national and international firms' and banks' head quarters. Due to the well-built public transport system and road network, large commuter streams flow between the urban economic centers and the suburban and rural areas of the metropolitan area. Located in the center of Germany, the metropolitan area spreads across three German federal states: Bavaria, Hesse, and Rhineland-Palatinate. We argue that due to the high level of economic integration in the metropolitan area, the federal state borders are to a certain extent arbitrary and, therefore, are not a barrier preventing tax policy interactions. Thus, we exploit an exogenous change in the Hessian fiscal

equalization scheme between 1997 and 2000 that lead to an increase in Hessian municipalities local business tax rates to analyze neighboring Rhineland-Palatine municipalities' tax mimicking. Our results show that municipalities' economic integration measured by their location in the metropolitan area is a key determinant for tax mimicking. We find statistically significant effects of the change in the Hessian fiscal equalization scheme on Rhineland-Palatine municipalities that are affiliated to the metropolitan area. In contrast, the effect on the tax rates of Rhineland-Palatine municipalities neighboring the Hessian border but not located in the metropolitan area, is statistically insignificant.

The paper proceeds as follows. Section 2 gives the theoretical background and summarizes previous empirical findings on local interdependencies of fiscal policies. Section 3 describes the German local fiscal equalization scheme. Section 4 explains the empirical strategy. Section 5 presents the data and empirical results. Section 6 concludes.

2 Theoretical background

Political and fiscal autonomy of sub-national jurisdictions has inspired a wide body of theoretic research throughout the decades (see Wilson (1999) for an overview of theories of tax competition). The focus on spatial heterogeneity and interdependence has subsequently increased the amount of related empirical studies (Brueckner, 2003). Tax competition and the question, to what extent local governments react to signals from their neighbors has recently spurred some quasi-experimental papers (Lyytikäinen, 2012; Isen, 2014; Baskaran, 2014).

In the literature, benefit spillovers, mobility of capital and yardstick competition are the most frequently proposed arguments for tax competition and tax mimicking. Case et al. (1993) argue that benefit spillovers account for budgetary adjustments of state governments in the US, after neighboring states increased spending. They also point to the fact that assigning *who*

is a neighbor, is key to identifying reasonable effects. Attracting mobile capital in a Tiebout (1956) kind of setting has been argued to cause severe tax competition resulting in low tax rates (Oates, 1972), which has later been formalized by Wilson (1986) and Zodrow and Mieszkowski (1986). Dhillon et al. (2007) however show, that this tax competition setting can also result in other outcomes, like efficient Nash equilibria.

Finally, it has been argued that decentralization does not only give rise to economic incentives for local policy, but may also enable citizens to compare the performance of local politicians. Using comparative performance information (Meyer and Vickers, 1997), has therefore been incremental to the literature on yardstick competition. Besley and Case (1995) argue that yardstick competition is the link between the tax-setting behavior of state governments and their urge to be re-elected.

While most of the empirical studies engage in spatial lag models (Anselin, 1988), more recent studies have expanded identification strategies using natural experiments to apply quasi-experimental techniques. Lyytikäinen (2012) investigates local tax mimicking among Finnish municipalities, Isen (2014) studies fiscal interdependencies among municipalities in the US state of Ohio. Both authors do not find empirical evidence for fiscal interaction. Most similar to ours is a study by Baskaran (2014) who uses German data to analyze communities in Lower Saxony, bordering North Rhine-Westphalia, and their reaction to an exogenous shock, causing communities in North Rhine-Westphalia to substantially increase business tax rates. He shows that using a spatial lag technique, one finds an effect comparable to previous studies. However when using a difference-in-difference approach, he gets no significant effect and therefore argues that spatial lag models overestimate the significance of tax mimicking.

This paper contributes to the empirical literature by shedding light on the circumstances, under which fiscal interdependencies may arise. Related to the idea of Brueckner and Saavedra

(2001), who study school districts in the Boston metropolitan area, we argue that economic integration among jurisdictions is a necessary precondition for tax policy interactions. We analyze the wider *FrankfurtRheinMain* region, which, as a so-called *European Metropolitan Area*, is an economically powerful, highly developed and integrated network of cities, towns and communities. While the metropolitan area is largely located within the federal state of Hesse, it also expands to Eastern parts of neighboring Rhineland-Palatinate. We argue that due to the high level of economic integration of the metropolitan area, federal state borders cutting through are rather arbitrary as compared to other German regions. Thus, the Rhineland-Palatinate-Hesse state border should not mean a barrier for fiscal cross-border interaction among municipalities. As all fiscal policy reforms at the federal state level directly affect only a part of the metropolitan area, the *FrankfurtRheinMain* area provides optimal testing ground to analyze the interdependency of tax policies.

3 Institutional setting and the policy intervention

The German constitution provides municipalities with considerable autonomy in setting local tax rates (Art. 28 Abs.2 GG). The most important local tax is the local business tax which has substantial impact on municipalities' budgets.¹ The local business tax accounts on average for approx. 40% of a municipality's budget and is therefore a crucial part of local policy-making. Municipalities annually decide on the actual business tax collection rate, which then determines the statutory local business tax rate. In the following we will use the terms *collection rate* and *tax rate* synonymously.

All German federal states maintain large systems of revenue sharing, so called local fiscal equalization schemes, that redistribute revenues among municipalities. While the systems'

¹ Further but minor important local taxes are for instance the local property tax and local dog tax.

precise conditions vary across states², they share various common features, for instance the concept of what we will call in the following a *local business tax reference rate*. In order not to undermine municipalities' tax effort, revenue-sharing grants are related not directly to a municipality's local tax revenue but to some measure of potential revenue, *i.e.* tax capacity. Roughly speaking, the tax capacity is calculated by dividing a municipality's last year's tax revenue by the actual local business tax rate and multiplying it by the respective reference rate³. From a single municipality's perspective this reference rate is set exogenously⁴. Occasionally federal states adjust their reference rates. Usually this happens if the reference rate deviates systematically from the (weighted) average of local business tax rates (Lenk and Rudolph, 2004).

In Hesse, the federal state government increased the business tax reference rate in four steps from 280 in 1996 to, eventually, 310 in 2000⁵. The increase of the reference rate is a common measure that federal state governments use to provide incentives for municipalities to exploit local tax bases and not to rely on the federal state's local fiscal equalization scheme. By increasing the reference rate, those municipalities with business tax rates under the reference rate realize *ceteris paribus* a reduction in payments they receive from the local fiscal equalization scheme. In contrast, municipalities with local business tax rates exceeding the reference rate do *ceteris paribus* not face a reduction in the payments they receive from the local fiscal equalization scheme. Therefore, the increase in the reference rate should make predominately those municipalities with relatively low business tax rates raise their business tax rates. Figure 1 describes the distribution of local business tax rates for the 265 Hessian metropolitan municipalities before and after the increase in the reference rate. The solid yellow line shows the distribution of business tax rates referring to the pre-increase reference rate of 280 in 1996, the

² The German constitution leaves it to the states to structure the details (Art. 106 Abs.7 GG).

³ Scherf (2000) provides in detail information on the function of the reference rate.

⁴ A year's applicable reference rate is determined by the federal state's policy makers and written in the annual state law for the fiscal equalization scheme. In the case of Hesse: Gesetz zur Regelung des Finanzausgleichs.

⁵ The four steps of the reference rate increase: 280 (1996), 287 (1997), 295 (1998), 302 (1999), 310 (2000).

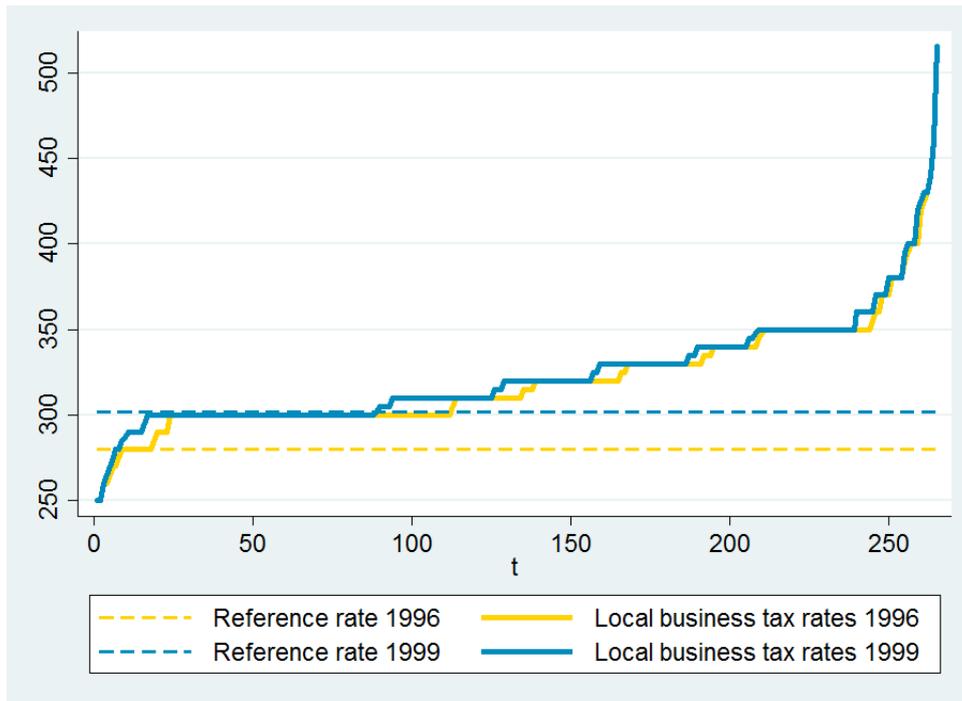


Figure 1
Hessian metropolitan municipalities' business tax rates and reference rates in 1996 and 1999. The solid lines show the distribution of Hessian municipalities business tax rates in 1996 and 2000 respectively. The dashed lines indicate the reference rates determined in the Hessian local fiscal equalization scheme in the respective year.

solid blue line the distribution in 1999 corresponding to a reference rate of 302. The graphic reveals that the Hessian municipalities responded strongly to the increase in the reference rate. As expected, particularly those municipalities with low business tax rates raised their business tax rates. Although some high-tax municipalities also increase their business tax rates, their response is more modest as compared to low-tax municipalities'. From 1996 to 1999 the average business tax rate increased by 3.04 percentage points (Table 1).

Table 1
Rhineland-Palatine and Hessian municipalities local business tax rates in 1996 and 1999

	Rhineland-Palatina			Hesse		
	all	interior	metropolitan	metropolitan	interior	all
Number of municipalities	2,304	1,813	137	265	161	426
Local business tax rate in 1996						
Average	334.33	335.90	338.83	321.01	313.70	318.25
Minimum	260	260	320	250	250	250
Maximum	500	500	440	515	440	515
Local business tax rate in 1999						
Average	337.33	339.15	340.41	324.05	316.07	321.03
Minimum	260	260	320	250	250	250
Maximum	900	900	440	515	440	515

Note: The table provides descriptive statistics on Rhineland-Palatine and Hessian municipalities' local business tax rates split by a municipality's affiliation to the metropolitan area *FrankfurtRheinMain* for the year 1996 and 1999. Data source: German Statistical Office (*Statistisches Bundesamt*), *Hebesaetze der Realsteuern*.

Rhineland-Palatinate's local fiscal equalization scheme is in its essential features identically to Hesse's. During the period from 1994 to 2000, Rhineland-Palatinate applied in all years the same local business tax reference rate of 356, except in 2000. In 2000, Rhineland-Palatina decreased its reference rate by four points from 356 to 352. As we cannot assure that all Rhineland-Palatinate municipalities were equally affected by this change in the reference rate, we will exclude in the following the year 2000 from our difference-in-differences analysis. As the Rhineland-Palatine federal state government decided in summer 1999 to increase its 2000 business tax reference rate, we can rule out any anticipation effects on the municipalities' 1999 business tax rates, as these were already determined at the end of 1998.

4 Identification of tax mimicking

To identify Rhineland-Palatine municipalities' mimicking of Hessian municipalities' business tax rates, we use an identification strategy similar to the one by Baskaran (2014). Baskaran studied tax mimicking in case of two other German federal states, Northrhine-Westfalia and Lower-Saxony. He developed the idea that those Lower-Saxonian municipalities directly neighboring Northrhine-Westfalia had the strongest exposure to an increase in Northrhine-Westfalian business tax rates in 2003 as compared to the rest of Lower-Saxonian municipalities located in the federal state's interior. Baskaran convincingly argues that if there is interdependency of business tax rates, business tax rates of treated border municipalities should, therefore, diverge from untreated interior municipalities. The idea that geographical proximity is a determinant of tax mimicking can also be found in two other earlier causal studies on the interdependence of fiscal policies (Lyytikäinen, 2012; Isen, 2014).

For our analysis, we exploit regional variation in the exposure to Hessian business tax changes among Rhineland-Palatine municipalities which provides a quasi-experimental set-up

for a causal identification of tax mimicking. We employ a difference-in-differences (DD) approach that is based on the before-after change in business tax rates between a control and a treatment group. We present in the following results for two difference-in-differences (DD) analyzes which differ in their definition of the treatment group. The first DD setup relates very closely to previous quasi-experimental studies (Lyytikäinen, 2012; Baskaran, 2014; Isen, 2014) primarily relying on geographical proximity between municipalities to determine a municipalities' treatment status with respect to another municipality's tax policy change. Following this literature, we define those Rhineland-Palatine municipalities which are directly located at the Hessian border as treated (in the following called *border municipalities*). The second DD setup defines municipalities' treatment status according to their level of economic integration with the tax-policy-changing municipality. Accordingly, we take Rhineland-Palatine municipalities located in the metropolitan area *FrankfurtRheinMain* for treated (in the following referred to as *metropolitan municipalities*).

For both DD setups, we choose an identical control group definition. We pick Rhineland-Palatine municipalities that are on the one hand located in the interior of Rhineland-Palatinate and on the other hand arguable homogenous compared to the treatment group(s). Therefore, we firstly ensure that interior control municipalities are neither neighboring Hesse nor are located in a Rhineland-Palatine administrative district neighboring Hesse. Secondly, referring to former sub-state administrative structures of Rhineland-Palatinate (which were in place until 1999), we only choose municipalities in the former sub-states (*Regierungsbezirke*) of Rhine-Hesse-Palatinate and Koblenz as control observations. All further Western municipalities located in the sub-state of Trier are dropped from the analysis to ensure homogeneity between treatment and control group municipalities.

We estimate the following regression equation:

$$\text{tax rate}_{it} = \alpha' \text{Hesse rise}_{it} + \gamma' \text{municip}_i + \delta' \text{time}_t + \varepsilon_{it}, \quad (1)$$

where *tax rate* is the local business tax rate of Rhineland-Palatine municipality *i* at time *t*. *Hesse rise* is an indicator variable that equals one in DD setup one if the municipality neighbors Hesse and $t \geq 1997$. In the second DD setup *Hesse rise* is unity for all Rhineland-Palatine metropolitan municipalities for $t \geq 1997$. The coefficient of interest, α , measures the causal effect of tax mimicking. The DD approach takes account of unobserved factors that might affect a municipalities business tax rate by controlling for municipality effects and time effects: *municip* is a municipality fixed effect, *time* represents a fully nonparametric specification of the time trend with indicator variables for each year in the analysis period 1994-1999. γ and δ represent additional parameters to be estimated and ε is the error term. Since our DD design uses repeated observations clustered in municipalities, we cluster our stand error at the municipality level for consistency and estimate heteroscedasticity robust standard errors.

A key identifying assumption of the DD approach is that Rhineland-Palatine treatment and control municipalities have a common time trend in the absence of the Hessian increase in the local business tax reference rate. The common time trend assumption requires, for instance, that the federal state Rhineland-Palatine did not simultaneously adopt changes in its fiscal equalization scheme which affected treatment and control municipalities differently. We are not aware of any such reforms in the years from 1994 to 1999. In 2000, however, Rhineland-Palatinate decreased its own business tax reference rate by four points from 356 to 352. Therefore, we will exclude the year 2000 from our analysis. As the Rhineland-Palatine federal state government decided in summer 1999 to increase its 2000 business tax reference rate, we can rule out any anticipation effects on the municipalities' 1999 local business tax rates, as these were al-

ready determined at the end of 1998. Given that from 1996 to 1999 Rhineland-Palatinate did not change any features in its local fiscal equalization scheme, any potential responses in treated Rhineland-Palatine municipalities' business tax rates can be attributed to the increase in Hessian local business tax rates triggered by the rising Hessian local business tax reference rate.

We perform two robustness checks to examine the sensitivity of our results with respect to the common time trend assumption. First, we extend the basic specification in equation 1 by including an additional linear time trend for border municipalities. If a common time trend between border and interior municipalities exists, the estimate of the treatment effect α should be robust with respect to the inclusion of the linear time trend (Angrist and Pischke, 2009). Second, we estimate a fully flexible model to analyze the precise treatment time and the evolution of the treatment effect over time.

5 Data and Empirics

The German Statistical Office provides annual data on local business tax rates of German municipalities for the years 1994 until today⁶. We draw a sample for the years (1994-2000) and focus on municipalities located in the federal states of Hesse and Rhineland-Palatinate. The sample consists of 426 Hessian and 2'304 Rhineland-Palatine municipalities.

Hesse and Rhineland-Palatinate have a common border which follows the River Rhine in the Southern part and then directs North towards a border triangle between Hesse, Rhineland-Palatinate, and Northrhine-Westphalia. The border is roughly 200km long. In Hesse, 28 municipalities and in Rhineland-Palatinate 69 municipalities directly neighbor this border. Figure 2 shows the political maps of administrative districts in Rhineland-Palatinate and Hesse.

⁶ Access to the statistics "Hebesätze der Realsteuern" through the website of the German Statistical Office (Statistisches Bundesamt).



Figure 2
Political map of administrative districts in Rhineland-Palatinate (left) and Hesse (right).
Source: Wikimedia Commons.

After being a driver of economic development in Germany for centuries, the larger area of Frankfurt Main was formally defined as *European Metropolitan Area (EMR)* in 1995. Today, the EMR *FrankfurtRheinMain* consists of 467 municipalities. Amongst, there are prominent cities like Frankfurt on the Main, Wiesbaden, Mainz (Mayence), and Darmstadt. The area counts 5.5 millions inhabitants which represents approximately 7 percent of the entire German population. With its gross domestic product of 216,479 million Euros in 2014 and a GDP per capita 72,500 Euro the EMR *FrankfurtRheinMain* is, besides Munich, the economically mostly prospering region in Germany. Of the 467 metropolitan municipalities, 265 are located in Hesse and 137 belong to Rhineland-Palatinate.⁷

⁷ 65 metropolitan municipalities are located in the federal state of Bavaria.

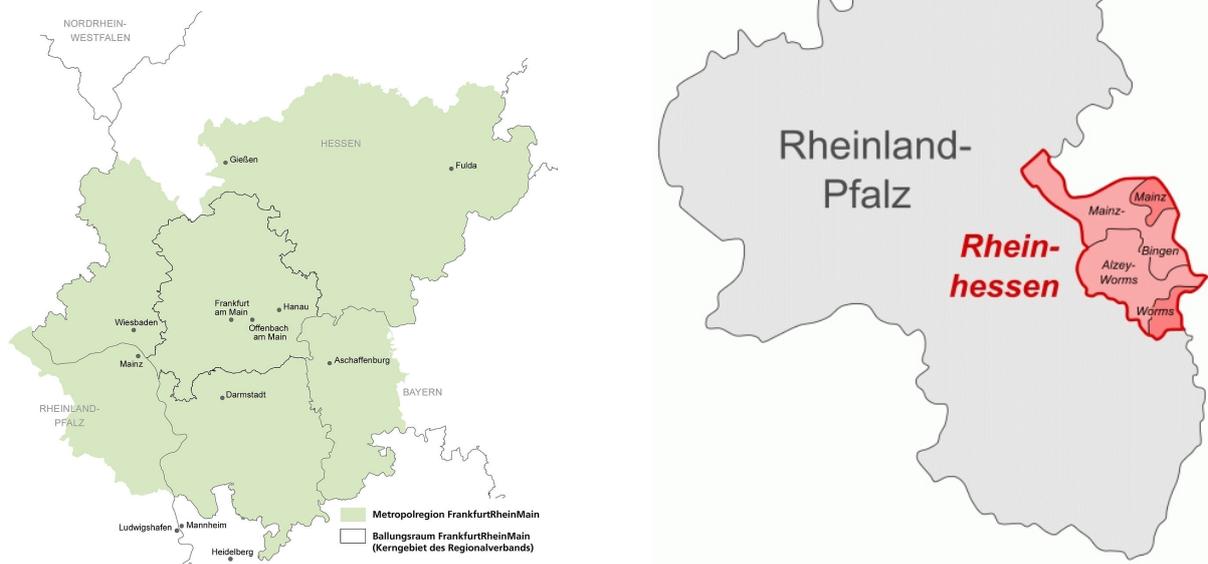


Figure 3
The *FrankfurtRheinMain* region (map on the left) and the local region Rhine-Hesse (map on the right). Source: Regionalverband FrankfurtRheinMain.

Our analysis focuses on tax policy interdependencies in the metropolitan area *FrankfurtRheinMain*. At the center of this analysis, there are those 137 Rhineland-Palatinate municipalities that actually form a region known as Rhine-Hesse. Rhine-Hesse, as its name already suggests, has always been culturally closely connected to Hesse and for vast parts of its history, this was also the case politically. Today, Rhine-Hesse is entirely located in Rhineland-Palatinate. All four Rhine-Hessian administrative districts form part of the EMR *FrankfurtRheinMain*. Municipalities located in these the Rhine-Hessian administrative districts are the only Rhineland-Palatinate municipalities that are affiliated to the EMR. The left panel of Figure 3 illustrates the EMR’s geographical location. The right panel shows a map of the federal state Rhineland-Palatinate featuring the region Rhine-Hesse which belongs as only Rhineland-Palatinate region to the EMR *FrankfurtRheinMain*. The strong economic integration of Rhine-

Hessian municipalities into the EMR *FrankfurtRheinMain* provides perfect testing ground for our analysis. Due to the high economic integration it is reasonable that the Rhineland-Palatine-Hessian state border which cuts through the integrated *FrankfurtRheinMain* region is actually arbitrary in the sense that it does not constitute a barrier for fiscal interdependencies.

Our fundamental assumption underlying the DD approach is a common time trend between the treatment and the control group. To descriptively assess the validity of this assumption, we graphically investigate the time trends in Rhineland-Palatine local business tax rates before the Hessian reference rate was increased.

Table 2
Difference-in-differences estimation results: Response to Hessian business tax reference rate increase

	Rhineland-Palatine border municipalities			Rhineland-Palatine metropolitan municipalities		
	1	2	3	4	5	6
Hesse rise	-0.714	.398		-1.187**	-.722*	
(p-value)	(0.345)	(0.585)		(0.017)	(0.107)	
Hesse rise*1995			-.469			.549
(p-value)			(0.709)			(0.546)
Hesse rise*1996			-1.342			.419
(p-value)			(0.310)			(0.656)
Hesse rise*1997			-1.400			-.359
(p-value)			(0.288)			(0.706)
Hesse rise*1998			-1.013			-.836
(p-value)			(0.469)			(0.402)
Hesse rise*1999			-1.541			-1.398
(p-value)			(0.280)			(0.162)
Fixed time effects	✓	✓	✓	✓	✓	✓
Fixed municipality effects	✓	✓	✓	✓	✓	✓
Group specific linear time trend		✓			✓	
Observations	7,956	7,956	7,956	8,364	8,364	8,364

Note: Dependent variable: a Rhineland-Palatine municipality's local business tax rate. The results in column 1-3 refer to a treatment group consisting of Rhineland-Palatine border municipalities. The results represented in column 4-6 are based on a treatment group consisting of Rhineland-Palatine metropolitan municipalities. P-values in parentheses. Significance: * <0.1 , ** <0.05 . Heteroscedasticity robust standard errors, clustered at municipality level.

Figure 4 includes graphs that trace the average normalized local business tax rate of Rhineland-Palatine border versus interior municipalities between 1994 and 2000. We normalize the business tax rates by subtracting for each municipality the value of its pre-treatment business tax rate in 1996. The pre-treatment time trends for both border and interior municipalities show a similar pattern. The continues upward trend over time reflects increasing business tax rates in both groups. Moreover, the business tax multipliers are almost identical over the entire analysis period. Corresponding to the graphs, the regression results in column 1 and 2 of Table 2 indicate that the treatment effect is statistically indifferent from zero. With this finding, we basically replicate the results of Baskaran (2014) who similarly found no empirical evidence for tax mimicking among German neighboring municipalities in the German federal states Lower-Saxony and Northrhine-Westfalia.

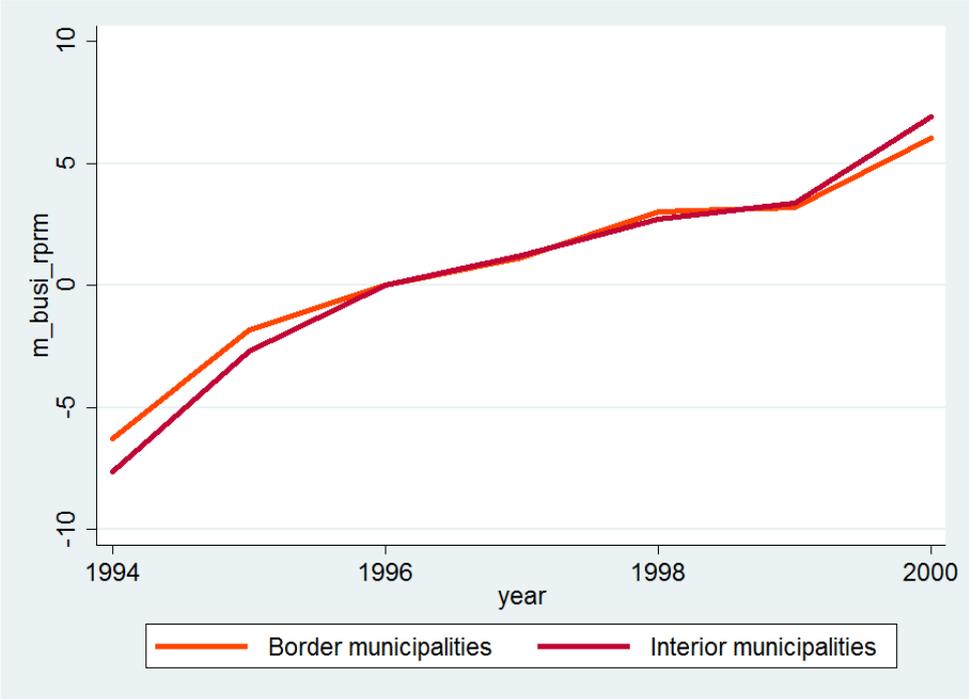


Figure 4
Business tax rates of Rhineland-Palatine border and interior municipalities from 1994 to 2000. The graphs show the development of the average normalized business tax rate in Rhineland-Palatine border and interior municipalities. The normalization is conducted by subtracting from each municipalities business tax rate in each year the value of the tax rate in 1996, the pre-treatment year.

While the institutional change in the Hessian local fiscal equalization scheme is arguably exogenous to Rhineland-Palatine municipalities, the DD identification strategy relying on border municipalities has one important potential limitation. The variation in tax rates which we use for identification is located beyond a federal state border line. It is possible that the state border constitutes such a strong barrier that neither tax nor yardstick competition nor budget spillovers result in meaningful tax interactions at the level of border municipalities. To rule out the possibility that the federal state border constitutes an obstacle for tax mimicking, we focus our analysis on the metropolitan area *FrankfurtRheinMain*. The metropolitan area is highly economically integrated and, characterized by a strong policy cooperation among municipalities in the fields of of culture, infrastructure, environment, and economic development. Further, the metropolitan area provides an institutional framework for exchange among regional policy makers. Therefore, we argue that the Hessian-Rhineland-Palatine border crossing the metropolitan region is arbitrary and should, therefore, not restrict potential tax interactions. To test this hypothesis, we modify our analysis sample and define Rhineland-Palatine metropolitan municipalities as treated. As control group serve, as in the previous specification, interior municipalities.

Figure 5 includes graphs that trace the average normalized local business tax rate of Rhineland-Palatine metropolitan municipalities versus interior municipalities during our analysis period. The pre-treatment time trends for both groups are identical. Up from 1997, the first treatment period, the trends deviate. While business tax rates on average increase over time in both groups, metropolitan municipalities are more moderate in rising their tax rates. Accordingly, the difference between the both group's business tax rates increases until 1999 and stays constant after 1999. The estimation results indicate an statistically significant average treatment effect of -1.187 on Rhineland-Palatine metropolitan municipalities' local business tax

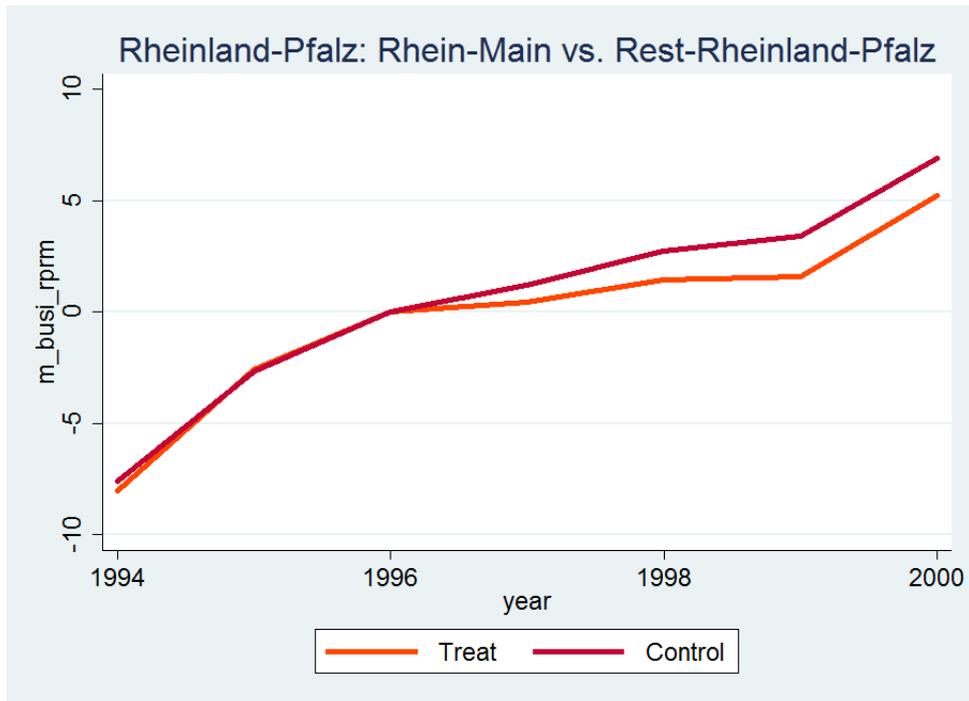


Figure 5

Business tax rates in Rhineland-Palatine metropolitan and interior municipalities from 1994 to 2000. The graphs show the development of the average normalized business tax rate in Rhineland-Palatine metropolitan and interior municipalities. The normalization is conducted by subtracting from each municipalities business tax rate in each year the value of the tax rate in 1996, the pre-treatment year.

rates (column 4 of Table 2). The DD analysis reveals that Rhineland-Palatine metropolitan municipalities increased their local business tax rates between 1997 and 1999 on average by 1.187 percentage points less than Rhineland-Palatine interior municipalities due to the institutionally induced local business tax increases in Hessian metropolitan municipalities. Our results are robust in case we include a group-specific linear time trend into our model. The 95%-confidence interval of the treatment estimate in the model without group-specific linear time trend (column 4 of Table 2) includes the estimate of $-.722$ which results from the model with a group-specific linear time trend (column 5 of Table 2).

Column 6 of Table 2 represents the results of a fully flexible model specification. We interact the indicator for a municipality's location within the metropolitan area with the year indicators. The results reveal that the treatment effect is rising over the three treatment periods from $-.359$ in

1997 to -1.400 in 1999. The three effects are at the 1% level (p -value=.004) jointly statistically significantly different from zero.

To put the finding into perspective, Table 1 shows the average level of metropolitan municipalities in both federal states. In both years, 1996 and 1999, exceed the Rhineland-Palatine average local business tax rates the Hessian. In 1996, the Rhineland-Palatine average rate is 17.82 percentage points higher, compared to 16.36 three years later in 1999. Apparently, Rhineland-Palatine municipalities moderation reduced their competitive disadvantage. This hints to either tax competition or benefit spillovers being the mechanism that drives the results. Concerning the effect size, an average treatment effect of -1.187 could appear small over the analysis period of three years. However, Table 1 shows that the exogenously induced Hessian increase in local business tax rates during the same period was on average with 3.04 percentage points of rather small size, too.

6 Conclusion

This paper provides quasi-experimental evidence for tax policy interdependence among municipalities. We study the case of an exogenous change in the fiscal equalization scheme of the German federal state of Hesse between 1997 and 2000 that lead to an increase in Hessian municipalities local business tax rates to analyze neighboring Rhineland-Palatine municipalities' tax mimicking. We show that tax rate interdependency exists only in case of Rhineland-Palatine metropolitan municipalities which are arguably strongly economically integrated with Hessian metropolitan municipalities. In case we do not condition on a high level of economic integration, we can replicate previous quasi-experimental studies' zero results for fiscal interdependency. Our findings indicate that economic integration is a key determinant for tax mimicking.

References

- Angrist, Joshua and Joern-Steffen Pischke (2009). *Mostly harmless econometrics*. Princeton University Press, Princeton, NJ
- Anselin, Luc (1988). *Spatial econometrics: methods and models*, Vol. 4. Springer
- Baskaran, Thushyanthan (2014). Identifying local tax mimicking with administrative borders and a policy reform. *Journal of Public Economics*, 118:p. 41–51
- Besley, Timothy and Anne Case (1995). Incumbent Behavior: Vote-Seeking, Tax-Setting, and Yardstick Competition. *The American Economic Review*, 85(1):p. 25–45
- Brueckner, J. K. (2003). Strategic Interaction Among Governments: An Overview of Empirical Studies. *International Regional Science Review*, 26:p. 175–188
- Brueckner, Jan K and Luz A Saavedra (2001). Do Local Governments Engage in Strategic Property—Tax Competition? *National Tax Journal*, p. 203–229
- Buettner, Thiess (2001). Local business taxation and competition for capital: the choice of the tax rate. *Regional Science and Urban Economics*, 31(2):p. 215–245
- Case, Anne C; Harvey S Rosen and James R Hines Jr (1993). Budget spillovers and fiscal policy interdependence: Evidence from the states. *Journal of public economics*, 52(3):p. 285–307
- Dhillon, Amrita; Myrna Wooders and Ben Zissimos (2007). Tax competition reconsidered. *Journal of Public Economic Theory*, 9(3):p. 391–423
- Isen, Adam (2014). Do local government fiscal spillovers exist? Evidence from counties, municipalities, and school districts. *Journal of Public Economics*, 110:p. 57–73
- Lenk, Thomas and Hans-Joachim Rudolph (2004). Die kommunalen Finanzausgleichssysteme in der Bundesrepublik Deutschland: Der Ausgleich zwischen Finanzbedarf und Finanzkraft. *Techn. Ber., Arbeitspapier//Universität Leipzig, Institut für Finanzen, Finanzwissenschaft*
- Lyytikäinen, Teemu (2012). Tax competition among local governments: Evidence from a property tax reform in Finland. *Journal of Public Economics*, 96(7):p. 584–595
- Meyer, Margaret A and John Vickers (1997). Performance comparisons and dynamic incentives. *Journal of Political Economy*, 105(3):p. 547–581
- Oates, Wallace E. (1972). *Fiscal Federalism*
- Scherf, Wolfgang (2000). Die Bedeutung der Nivellierungshebesätze im kommunalen Finanzausgleich. *Wirtschaftswissenschaft*
- Tiebout, Charles M (1956). A pure theory of local expenditures. *The journal of political economy*, p. 416–424
- Wilson, John D (1986). A theory of interregional tax competition. *Journal of urban Economics*, 19(3):p. 296–315
- Wilson, John Douglas (1999). Theories of tax competition. *National tax journal*, p. 269–304
- Zodrow, George R and Peter Mieszkowski (1986). Pigou, Tiebout, property taxation, and the underprovision of local public goods. *Journal of urban economics*, 19(3):p. 356–370