Do equalization payments affect subnational borrowing? Evidence from regression discontinuity

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Abstract

According to the fiscal federalism literature sub-central budget constraints become softer when local governments are more dependent on revenues over which they have no discretion. As a consequence of higher ’transfer-dependency’, sub-central governments can expect to be bailed out by the central government and therefore tend to accumulate higher levels of debt. We test this conjecture with data from Austrian municipalities. Austria is a fiscally highly centralized federation in which tax autonomy at the sub-central level is almost absent. Our identification strategy is based on a discontinuity caused by a special regulation on population weights in the tax sharing agreement between central government and the municipalities. We analyze the discontinuity in the conditional expectation of borrowing given population size to unveil an average causal effect of the treatment. Our results indicate that in line with theoretical expectations municipalities with higher revenue dependency observe higher net borrowing per capita. We also find that almost one half of the observed discontinuity works through an investment channel. Net borrowing is spatially correlated.

JEL classification: D72; D78; H74; H77
Keywords: fiscal autonomy; subnational borrowing; vertical fiscal imbalance; regression discontinuity

1. Introduction

Among economic scholars, it is believed that carefully designed fiscal decentralization can contribute to the effectiveness of the public sector and eventually to an increase in welfare. This assumption stems from two strands of literature: on the one hand, the traditional fiscal decentralization theorem (Tiebout, 1956; Oates, 1972) points to the conclusion that local provision of public goods is better suited to satisfy the needs of local communities. On the other hand, public choice tradition identifies the role of decentralization in taming the “Leviathan” government (Brennan and Buchanan, 1980), which would otherwise inefficiently overexpand at the cost of the tax payers.

Critics of decentralization point to negative economic outcomes: ill-designed fiscal decentralization can produce “soft budget constraints”, which not only preclude efficient allocation of public

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money, but might in fact exaggerate the problem of over-expanding government. Creation of a soft budget constraint is facilitated if subnational governements largely depend on transfers from the central government. Goodspeed (2002) develops a model of central government transfer decisions and inter-temporal regional spending decisions when the central government is involved in the financing of regional governments via transfers. The model results in central government incentives to create a soft budget constraint by increasing grants when a region borrows because regional borrowing upsets the central government's politically optimal allocation strategy (Goodspeed, 2002). As a result, the soft budget constraint lowers the opportunity cost of borrowing for the subnational government.

In this work, we want to take a closer look at this result, and analyze whether higher dependence of municipalities on transfers from the central government, or in other words higher vertical fiscal gaps result in higher levels of public borrowing. We base our identification strategy on a discontinuity present in the Austrian tax sharing agreement between the central government and the municipalities.

2. Previous literature and predictions

The question of whether intergovernmental transfers and vertical fiscal gaps affect subnational fiscal performance has been intensively analyzed in economic and political-science literature. The link between vertical fiscal gaps and debt has been theoretically established by, among others, Goodspeed (2002) and Rodden (2006). Rodden (2006) argues that grants make subcentral governments expect central assistance if they fall into fiscal difficulty. Because the central government already funds substantial portions of subcentral budgets, subcentral governments will find it politically difficult to resist pleas for bailouts to avert bankruptcy. The more that subcentral governments depend on the central government for fiscal support, the more that creditors and voters will assume that the subcentral governments are simply administrative arms of the center and that the latter is responsible for the fiscal condition of its subordinates. Knowing this, subcentral governments will be more likely to run up large debts in the first place – the familiar phenomenon of moral hazard (Sorens, 2016).

Empirical evidence points to increasing subnational deficits and debts associated with vertical fiscal gaps. Rodden (2002, 2006) finds that vertical fiscal imbalance reduces subcentral government and total net surplus if combined with subnational borrowing autonomy. De Mello (2000) finds a non-linear effect of grants (excluding shared revenue) on the budget surplus: deficit increases along with grants when expenditure decentralization is high, and decreases when it is low. Similarly Eyraud and Lusinyan (2011) find that grants, excluding shared revenue, raise the deficit when combined with borrowing autonomy. Counter-evidence comes from Baskaran (2010) who finds that vertical fiscal imbalance is associated with lower debts.

As for other fiscal variables, large literature has analyzed whether vertical fiscal gaps are associated with higher, and potentially inefficent subcentral expenditure. Potential for inefficient fiscal performance as a result of grant financing has been recognized both by political-economy and public-finance scholars. Whereas political economy points to the claim by Brennan and Buchanan (1980) that the more dependent subcentral governments are on grants and shared revenue, the less they compete with each other for geographically mobile citizens and the more they can extract from citizens for their own benefit, public-finance scholars also recognize the dangers of vertical fiscal gaps, which create fiscal commons problem and in turn negative externatlities on other jurisdictions.

In light of these observations, empirical evidence exists on the dependence of the size of local governments and grant/transfer dependence. A large number of empirical studies point to a conclusion that dependence on grants is associated with higher government spending. Cross-country evidence (see e.g, Jin and Zou, 2002; Cassette and Paty, 2010; Ashworth et al., 2013; Prohl and Schneider, 2009) suggests that grants raise general, as well as subnational spending. Intra-country studies come to mixed conclusions. Dahlberg et al. (2008) using a strong identification strategy based on discontinuity in grants allocation concludes that equalization grants increase general spending roughly one for one. Similarly, Volden (1999) finds that grants raise U.S. social benefit payments, whereas cuts in grants do not decrease them. On the other hand, Gordon (2004) concludes that block grants increase expenditure only in the short run.

Effects of vertical fiscal imbalance on government spending have been analyzed by e.g., Fiva (2006) and Rodden (2003). Both conclude that vertical fiscal imbalance is associated with higher general spending. Rodden (2003) also concludes that subnational spending increases along with vertical fiscal imbalance.

3. Institutional setting, data and hypotheses

3.1. Institutional setting

Austria is a federation of nine states ("Länder"), and 2,100 municipalities[3]. The country is frequently characterized as a system of cooperative federalism, with substantial overlaps of competences of governmental levels, and very low tax autonomy of states and municipalities. Around 95 percent of total tax revenues are 'joint taxes'. Among others, revenues from personal income tax, corporation income tax, and VAT are shared among all three governmental levels, according to the rules of the national Fiscal Equalization Law (German: "Finanzausgleichsgesetz", short FAG). Even though the revenues from shared give slightly more autonomy to regional and local governments than intergovernmental grants, individual decision making sovereignty regarding taxes at the subcentral level is nevertheless limited (c.f. Blöchliger and Petzold (2009) for a theoretical discussion of dividing lines between grants and tax sharing arrangements). Incentives of states and municipalities to maintain and develop their own tax base are rather weak. For a very brief description and critic of the fiscal framework in Austria, c.f. Pitlik (2014). Austrian municipalities receive 11.9 percent of the shared taxes revenue. In a first step, the total municipalities' share is divided between the nine states according to a fixed formula. In a second step, the respective shares of the local units of a state are distributed.

Our regression discontinuity design originates from the Article §9(9) of the FAG, which stipulates that depending on the population of a municipality, per capita receipts from shared taxes are multiplied. This regulation is called *"abgestufter Bevölkerungsschlüssel"* (short, aBS). Depending on the state regulations, between 80 and 90 percent of the joint tax revenues are distributed according to the aBS scheme. The payments per capita are multiplied

1. for municipalities below 10,000 inhabitants with a factor of 1 41/67,
2. for municipalities between 10,001 and 20,000 inhabitants with a factor of 1 2/3,
3. for municipalities between 20,001 and 50,000 inhabitants and statutory cities with a factor of 2,
4. for municipalities above 50,000 and the city of Vienna with a factor of 2 1/3.

Importantly, the current shape of the aBS is in force starting from the fiscal year 2008. For the first five year in our sample, the previous discontinuity has been larger: population of municipalities

[3] This number has been higher until the end of 2012, which introduced a major wave of municipal amalgations in the federal state of Styria. As is shown in recent literature, planned amalgamations generate additional incentives for merging municipalities to increase local debt. See Jordahl and Liang (2010), or Nakazawa (2013). Hence, we shall exclude the municipalities located in Styria from the analysis.

up to 10,000 inhabitants has been multiplied with a facor 1 1/2. Before 2005, the factor equated 1 1/3.

The aBS regulation dates back to the law on public finance of 1948. At that point in time it was important to equip larger cities with additional financial means to alleviate reconstruction of city infrastructure damaged during the Second WorldWar. Yet, the basic regulation is still in force although the original rationale no longer exists. Currently, the main 'economic' argument is to compensate bigger municipalities for positive spillovers to neighboring entities, as well as a compensation for seemingly higher per capita costs of service provision. The historic origin of the aBS regulation leaves no doubt about is exogeneity. The 10,000 threshold has remained unchanged since the introduction in 1948, therefore the possibility that the threshold itself is endogenous to e.g., political negotiations between the different layers of the government is excluded.

At the population threshold of 10,000 there is a jump in the size of the per capita payments from the pool of joint revenues to a municipality, as depicted in Figure 1[4][5]. Just below the cut–off point, the municipalities receive on average slightly less than 700 Euro per capita, whereas the payment just above the 10,000 cut–off increases to about 800 Euro per capita. Although the *"Ertragsanteile"* payments are additionally complemented by other transfers to the municipalities, Figure 2 shows, that at a cut–off of 10,000 there is a drop in the fraction of income to a municipalities stemming from own taxation from about 30% to about 20%. Unlike other transfer payments, revenues from shared taxes are not earmarked, and are at a free disposal of the municipalities. Importantly, the overall level of per capita expenditure does not change at at the cut–off, as depicted in Figure 5.

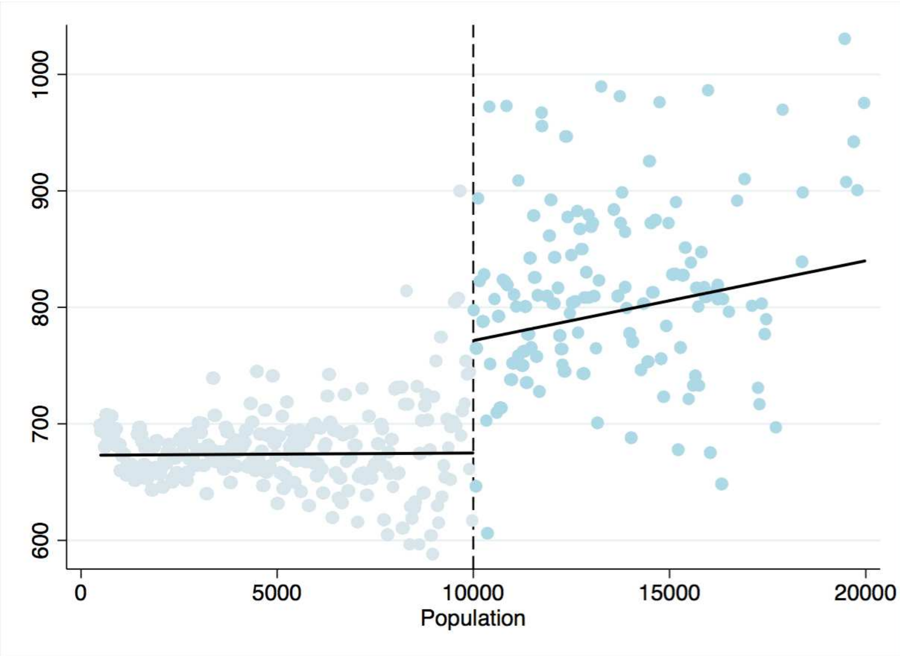
Following a basic agreement on a revision of the Fiscal Equalization scheme in 2007, the Federal Ministry of Finance initiated a major reform debate of the population accounting method used for the allocation of funds across jurisdictions. Due to unadjusted population figures, the pre-reform statistics did not adequately reflect changes in size and structure of the local population. This could lead to funding misallocation and overspending. In 2011 the hitherto employed census method has been replaced by more accurate and annually available registry data at the sub-central level. According to Statistics Austria, the system switch increased the transparency and accuracy of counting, and thus also reduced both incentives and opportunities for states and municipalities to manipulate population statistics (see Blöchliger and Vammalle, 2012).

A final aspect of the discontinuity set–up which needs to be addressed is the so-called fading-

[4]Scatters represent averages over 500 equally–spaced bins.

[5]In this study, we will not analyze the changes in borrowing at other threshold levels, as the sample becomes unreasonably small.

Figure 1: Revenue sharing payments (*“Ertragsanteile”*) per capita, in Euro



in-rule (“Einschleifungsregel”), which provides some additional payments to municipalities between 9,000 and 10,000 inhabitants, and has been introduced in 2001. These payments increase linearly with the population i.e., each additional inhabitant over 9,000 is multiplied with a small linear multiplier. Importantly, this regulation applied in 2005 to only five municipalities, in 2014 this number has risen to 10. In the main specification, we shall for the moment ignore this rule. In the robustness check section of our paper, we further report instrumental variables estimation (fuzzy regression discontinuity), in which we instrument the 10,000 threshold with the overall shape of the fiscal equalization rule.

We use official data on municipal finances provided by the Austrian Statistical Office for the years 2001–2014. Excluding the state of Styria and the ”statutory cities”, there are 1,685 muncipalitites in the sample, 372 of which are cities. Summary statistics of all used variables are provided in Table 13 in the Appendix. Our dataset comprises information about municipal finance between years 2004 and 2014. The smallest municipality Gramais has 60 inhabitants, the largest Vienna over 1.8 Million[6].

[6]Due to a special status of the city of Vienna in the fiscal equalization law, we further exclude it from any analysis. We also exclude ten ”statutory cities” to which special equalization schemes apply (Eisenstadt, Rust, Klagenfurt an Woerthersee, Villach, Krems an der Donau, St. Poelten, Waidhofen an der Ybbs, Wiener Neustadt, Linz, Steyr, Wels).

Figure 2: Fraction of income from own taxation

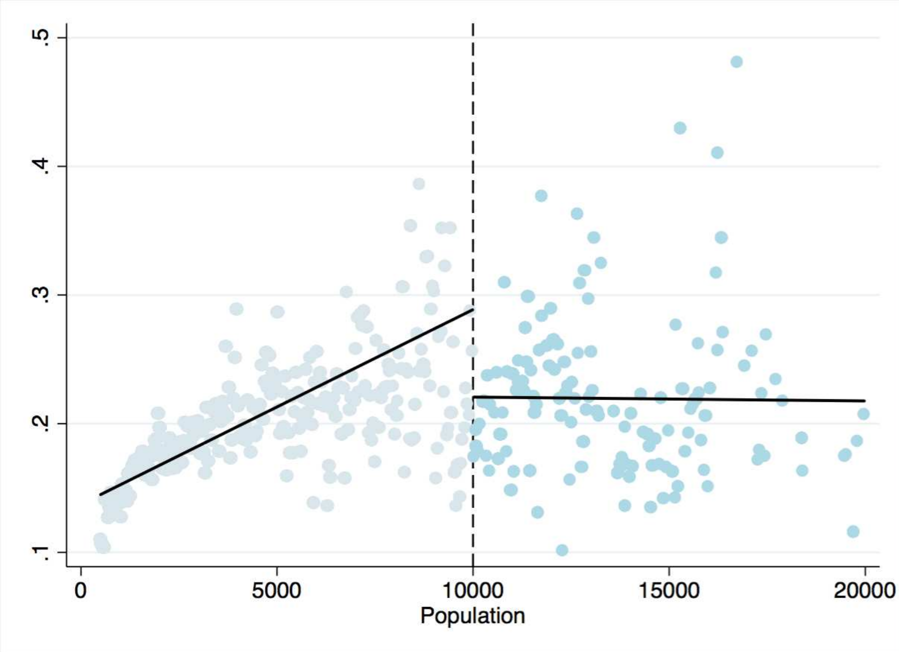


Table 1: Revenue mix of Austrian municipalities in 2014 (in Euro per capita)

Inhabitants	Revenue sharing p.c.	Local taxes p.c.	Fees p.c.
less than 2,500	786	325	249
between 2,501 and 5,000	795	418	290
between 5,001 and 10,000	782	526	320
between 10,001 and 20,000	910	559	313
between 20,001 and 50,000	1,093	554	335
more than 50,000	1,224	746	216

Source: Gemeindefinanzbericht 2014

3.2. Hypotheses

In general, tax autonomy of Austria's municipalities is thus fairly low. Austrian municipalities have a right to set tax rates of the real estate tax within limits set by state regulations. The federal level is in charge of the legal definition of the tax base. Cities and towns also have some discretion with respect to the design of local user fees and use charges. Even for the fiscally most important municipal payroll tax (Kommunalsteuer), municipalities have no discretion over the tax; tax base and tax rate are both fixed uniformly across all local jurisdictions by the federal government. However, local receipts from the Kommunalsteuer are exclusively for the respective local entity. The degree to which local governments in Austria are free to decide on own spending figures is substantially higher than on the revenue side. In general a principle of budgetary autonomy provides state and local governments with considerable decision-making autonomy. This holds especially with respect to revenue shares from joint taxes and from non-earmarked transfer receipts.

The combination of rather low tax autonomy and relatively high discretion over spending certainly creates the familiar common pool problem. Municipal governments can decide on the basis that higher expenditure do not correspond with local tax increases, as the resources stem from a common pool. And the smaller the share of own tax revenues the greater are incentives to inefficiently expand local spending, as corresponding cost increases are not fully internalized by the local units.

Our main hypothesis is hence derived from the "bailout" literature as well as the "soft-borrowing" and "common–pool" literature. As put by Rodden (2003) "transfer-dependent governments face weak incentives to be fiscally responsible, since it is more rewarding to position themselves for a bailout." According to Von Hagen and Eichengreen (1996) budget constraints become softer when subnational governments are more dependent on revenues over which they have no discretion. Subnational decision makers might then rationally expect to be bailed out ex-post by central government if they cause unsustainable debt figures. As joint taxes give local jurisdictions - from the perspective of tax autonomy - only slightly more decision making power than unconditional grants, we expect municipalities in Austria who receive higher per capita shares of joint taxes (Ertragsanteile) also to have a higher propensity to borrowing. Moreover, Austrian municipalities face a fairly high degree of borrowing autonomy connected with 'soft' forms of borrowing, i.e., borrowing from public banks and state-owned enterprises, which inevitably leads to insufficient control of borrowing through the financial market (Rodden, 2003; Oates, 2005).

Hypothesis 1. *We expect a positive relationship between higher transfer dependency and municipal borrowing.*

4. The empirical approach

Our dependent variable is borrowing per capita defined in net terms, i.e., we subtract repayments of debts from 'new' municipal borrowing during a fiscal year.

Since the assignment of fiscal revenues is a function of population, with a clear cut–off point at the level of 10,000 inhabitants, a natural way to explore this quasi–experimental set–up is to use a regression–discontinuity (RD) design. The muncipalities are assigned to two different groups $z_i \in \{0, 1\}$ depending on population. The outcome, in our case municipal borrowing can, thus be denoted:

$$y_i = \begin{cases} y_i(0) & \text{if } pop_i \leq c \\ y_i(1) & \text{if } pop_i > c, \end{cases} \tag{1}$$

where $c = 10,000$ and pop_i denotes the population of each municipality. Assignment is a deterministic function of population size and allows us to implement sharp regression discontinuity design (Imbens and Lemieux, 2008). We analyze the sharp discontinuity in the conditional expectation of borrowing given population size to unveil an average causal effect of the treatment:

$$\tau = \lim_{x \downarrow c} E[y_i | pop_i = x] - \lim_{x \uparrow c} E[y_i | pop_i = x]. \tag{2}$$

This term identifies the local average treatment effect at the threshold (Imbens and Lemieux, 2008):

$$\tau = E[y_i(1) - y_i(0) | pop_i = c]. \tag{3}$$

For the RD design to identify the local treatment effect some assumptions must be met. First, the treatment assignment must be a monotone deterministic function of the assignment variable. This holds in our study, as exogenously determined fiscal equalization law fully determines assignment to treatment.

Secondly, identification is possible only if municipalities are not able to manipulate the assignment variable. As stipulated by the law, population is collected yearly by the Austrian Statistical Office. Nevertheless, we need to establish whether manipulation of the running variable is not an issue in our study. Figures 3 and 4 present the density estimation using the McCrary (2008) procedure and test as implemented in *R* software. The estimated difference in the density height θ equals 0.21 with a standard error of 0.218. The p-value of the test equals 0.359, thus we cannot reject the null hypothesis that the running variable is not sorted. One potential critique of this approach is that, since population is a discrete variable any observations with lie exactly at the cut–off are automatically assigned to the first bin to the right of the threshold, which potentially biases the test statistic. Eggers et al. (2015) suggest in this case running a McCrary test at the cut–off value of -0.5. In this case, the value of the test statistic θ is 0.335 with a standard error of 0.188 resulting in a p-velue of 0.0751, which further confirms that sorting is not an issue. That is, with high probability the second assumption is satisfied.

Finally, in absence of treatment, the outcome variable has to evolve continuously with the assigment variable in the neighborhood of the threshold. In other words, confounded treatment

Figure 3: McCrary density test

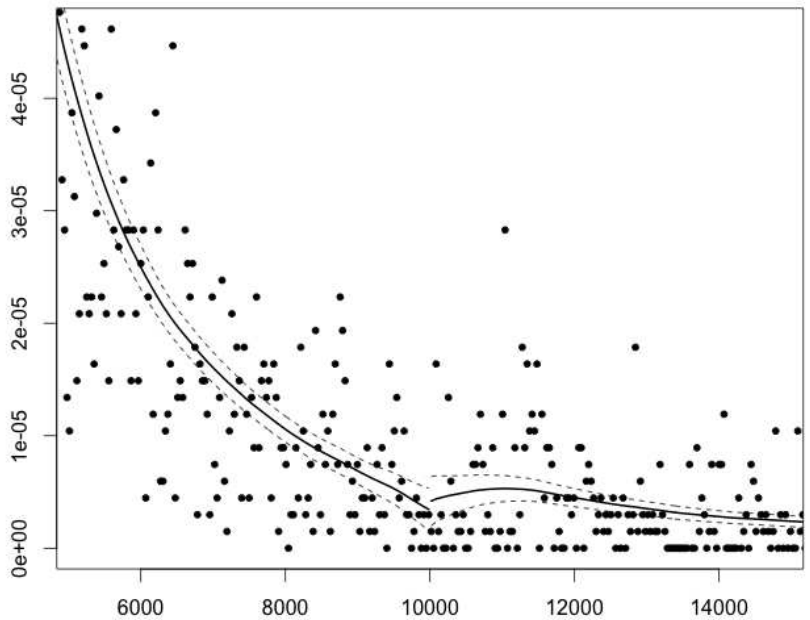


Figure 4: McCrary density test - close up

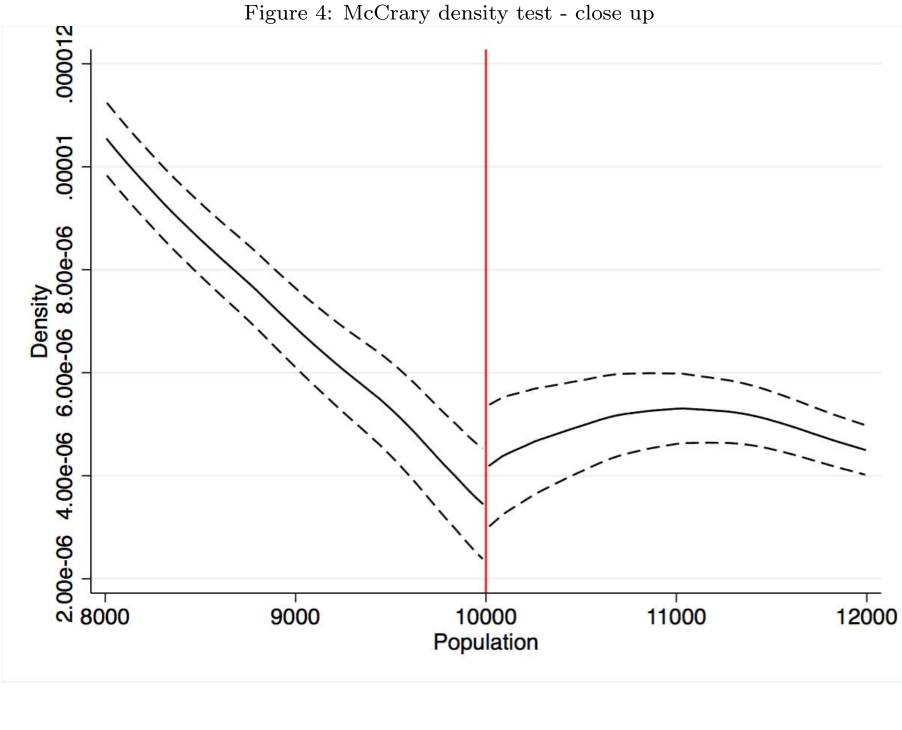
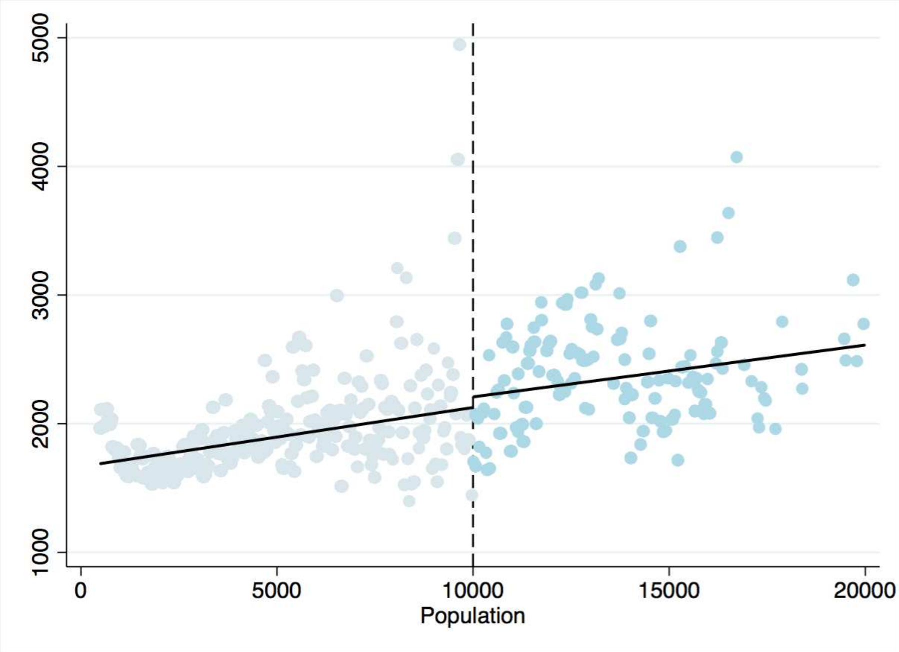


Figure 5: Per capita expenditure



should be excluded. If other factors create discontinuities in this relationship, a clear identification of the local treatment effect is not possible. We document the extent of potential confounded treatment in Appendix B. One potential distortion to our set–up could come from the discontinuity in the council size at the threshold of 10,000 inhabitants present in three states: Carinthia, Lower Austria and Tirol. Council size in itself could lead to higher expenditure and borrowing (see, e.g., Egger and Koethenbuerger, 2010), as well as incidences of coalitional governments do (e.g., Persson and Tabellini, 2005, 2004; Blume et al., 2009). It is likely that the common–pool problem associated with coalitional governments could become more severe in larger councils, which could lead to higher expenditures at the threshold of 10,000. In all states, the council size increases along with the population, but other states never use a threshold of 10,000. One way to deal with this issue is to include the council size in the regressions with control variables. Additionally, we run placebo tests as a robustness check, at other council–size thresholds (7,000 in Lower Austria and 6,000 in Carinthia and Tirol.). Moreover, we report robusteness checks excluding these states.

Regression discontinuity design can be implemented either with parametric or non-parametric models (see Imbens and Lemieux, 2008; Lee and Lemieux, 2010; Calonico et al., 2014, for further details).

We implement local parametric estimation with

$$y_{it} = \alpha + \beta_0 pop_{it} + \beta_1 z_{it} + \Gamma \mathbf{X}_{it} + \varepsilon_{it}, \tag{4}$$

on the range $[z - h, z + h]$ weighting the observations using a triangular kernel, that is the observations further away from the cut-off are weighted with a lower weight than the ones closer to the cut-off. The β_1 coefficient represents the regression discontinuity and β_2 is the change in the slope of the relationship at the cut–off; equation can be further augmented with, an interaction term $z_{it} \times\ pop_{it}$, control variables $\mathbf{X}$ or higher polynomial order terms pop_{it}^k and their interactions with the cut-off variable. For instance, for a second–order polynomial:

$$\begin{aligned} y_{it} = \alpha + \beta_1 z_{it} + \beta_2 pop_{it} \times 1(pop_{it} < z_{it}) + \beta_3 pop_{it}^2 \times 1(pop_{it} < z_{it}) + \\ + \beta_4 pop_{it} \times 1(pop_{it} > z_{it}) + \beta_5 pop_{it}^2 \times 1(pop_{it} > z_{it}) + \Gamma \mathbf{X}_{it} + \varepsilon_{it}. \end{aligned} \tag{5}$$

Alternatively, one can implement the RD design using local (linear or polynomial) non–parametric regression. We concentrate on parametric estimations with control variables, we report also nonparametric results. For the case of non-parametric polynomial regressions, the choice of bandwidth is conducted with Calonico et al. (2014) procedure (short. CCT).

In the parametric regressions with addionally control for other factors which could possibly explain the level of municipal expenditure and borrowing. Population itself is our course a running variable, but it could also potentially affect the borrowing level. The impact of population on the level of public borrowing cannot be easily predicted, however. For instance, the size of the population may have either positive or negative effects on public expenditure, depending on whether the demand for public goods, and hence also public expenses, grows faster or slower than the population (Werck et al., 2008). A number of works have found the negative relation between this variable and the level of public spending in categories such as transport and communications, health care, defense, and communal services (see e.g. Costa-Font and Moscone, 2009). As for socioeconomic and geographic factors, we include population density as well as LAU2 urbanization typology of the European Union to control for differences in service provision between rural and urban areas (Sanz and Velazquez, 2002). We also include the fractions of population below 15 and above 65 to control for the importance of local provision of (pre-)schooling services and social and health services for the elderly. The purpose of including these in the analysis is to test whether these two groups of electors benefit over-proportionately from the provision of particular public goods, such as health care or education, in comparison to the rest of the citizenry (Hayo and Neumeier, 2012), which in turn potentially affects incentives of municipalities to overborrow.

Another variable often employed in studies concerning the determinants of public expenditure is the average or median level of income, which intends to capture the per capita wealth of a community and may reflect its demands for public goods and services. Moreover, local income distribution could affect part of the expenditure, in particular the levels of expenditure on social policies. We include as control variables the average income in a municipality and the Gini coefficients.

Finally, political variables potentially affect the level of municipal borrowing. Increasing council size could lead to a more severe common–pool problem in the council and, positively affect deficits and, thus public debt (Persson and Tabellini, 2005, 2004). For example, Egger and Koethenbuerger (2010) apply a similar regression discontinuity design to municipalities in the German state of Bavaria, and find a robust positive impact of local council size on local spending.

5. Results

5.1. Baseline results

In this section we present the estimated local average treatment effects of the change in the vertical fiscal gap on the levels of new borrowing on municipalities. Linear regression results of a simple regression discountinuity are presented in Table 2[7]. Linear regression results with additional control variables are presented in Tables 3 and 4. In the parametric regressions, the observations are weighted triangularly according to $kwt = \max(0, abs(10,000 - pop_{it}))$. For the local polynomial regressions, bandwidths are computed based on the bandwidth selection procedure developed by Calonico et al. (2014).

In all specifications we only include municipalities within a size range between 2,000 and 20,000 residents. In smaller entities forces like suboptimal community size and/or local management incompetence may be at work. For example, small communities frequently have difficulties in finding qualified candidates for local mayors or other public posts[8]. Hence, we prefer specifications which exclude these smaller entities, even at the cost of having fewer observations. Additionally we report

[7]For the presentation of the results the population cutoff has been normalized to 0 and population expressed in 1,000.

[8]See e.g., http://derstandard.at/2000029520805/Debatte-ueber-Gemeindefusionen-Tirol-gehen-die-Buergermeister-aus

Table 2: Linear regression, triangular kernel weights. All municipalities larger than 2,000 (1) and (2); cities larger than 2,000 (3) and (4)

	(1)	(2)	(3)	(4)
Cut-off=1	102.67***	75.19**	190.18***	161.62***
	(3.46)	(2.22)	(3.98)	(3.94)
Normalized population	-11.86***	-12.69***	-21.50***	-23.91***
	(-4.48)	(-4.49)	(-4.52)	(-4.11)
Cut-off=1 × Normalized population		7.86		11.79
		(1.09)		(1.48)
Constant	-14.87	-20.44	-60.67**	-75.44**
	(-0.92)	(-1.19)	(-2.48)	(-2.48)
Observations	6525	6525	1919	1919

Robust standard errors, clustered at municipality level.
t-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

results for the sub-sample of municipalities with a city status and less than 20,000 residents (and more than 2,000). By definition every community over 10,000 inhabitants is a "city", but smaller municipalities are sometimes assigned a city status ("Stadtrang"), too. While there are no legal (*de iure*) differences of cities and non-cities with respect to tasks and competences, municipalities with a city status frequently serve *de facto* as regional centers and agglomerations providing neighboring communities with regional public goods. Hence, with a focus on municipalities with city status the sample should be more homogeneous with respect to municipal spending composition.

The main results of our estimates without additional covariates are reported in Table 2. Across all specifications we observe significant local treatment effects. The simple linear regressions without covariates in Table 2 show a treatment effect of about 100 Euro increased net borrowing per capita for the sample of municipalities between 2,000 and 20,000 residents. When we consider the sub-sample of cities only, the effect increases to 160-190 Euro. Our results also indicate certain 'scale effects', as (normalized) population size is always negatively related to net borrowing per capita. Adding covariates in Table 3, the treatment effects are only slightly smaller in both samples.

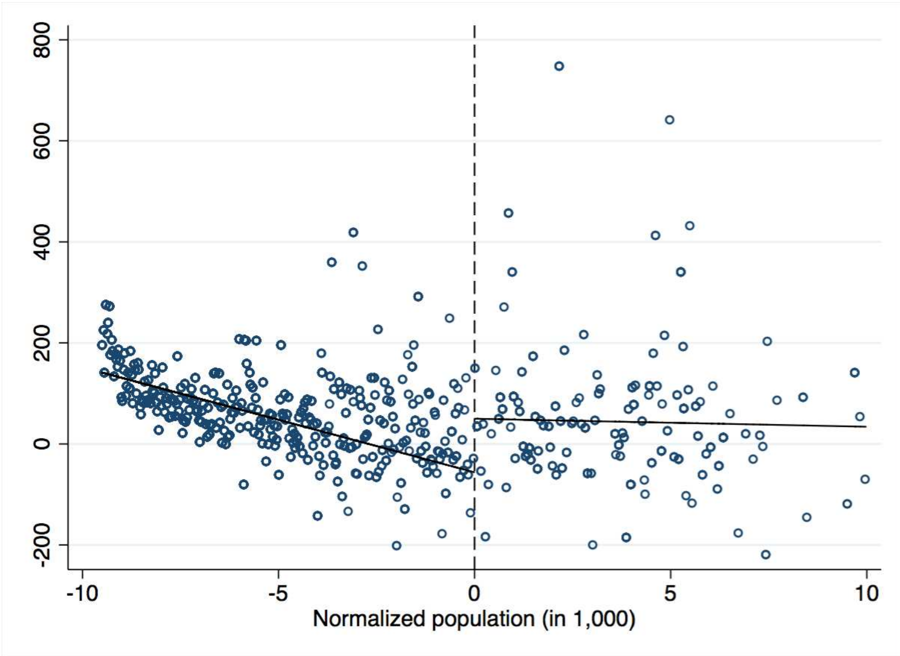
Turning very briefly to the behavior of our controls we do not find robust effects of urbanization or population density on net borrowing. Median income is negatively related to local net borrowing per capita in all specifications, indicating that on average poorer entities indeed are relying more on higher deficits and debt. This may be due to both higher social spending or reduced revenues per capita. Results for local income distribution are inconsistent and far from being significant across specifications. We do not find any consistent results regarding the impact of local taxes on debt levels. We could also not find any effects of municipal council size or council fragmentation on borrowing behavior. Party effects are close to significant and appear with a negative sign in Columns (1) and (2), but turn insignificant if we consider only citites. This is likely due

Table 3: Linear regression, triangular kernel weights. All municipalities larger than 2,000 (1) and (2); cities larger than 2,000 (3) and (4) with control variables.

	(1)	(2)	(3)	(4)
Cut-off=1	91.94***	66.11**	159.52***	150.67***
	(2.76)	(2.05)	(3.70)	(3.53)
Normalized population	-11.89***	-15.63***	-16.65***	-20.05**
	(-2.90)	(-2.71)	(-3.43)	(-2.28)
Cut-off=1 × Normalized population		10.72		6.86
		(1.23)		(0.56)
Urbanization	11.57	12.56	21.29	22.38
	(0.89)	(0.97)	(0.78)	(0.81)
% Post-working	-391.53	-398.10	-389.25	-388.70
	(-1.16)	(-1.18)	(-0.62)	(-0.62)
% Pre-working	-100.91	-98.91	-160.21	-152.35
	(-0.42)	(-0.41)	(-0.43)	(-0.41)
Population density	2.96*	3.00*	0.92	1.11
	(1.72)	(1.75)	(0.32)	(0.38)
Median Income	-0.01***	-0.01***	-0.02*	-0.02*
	(-3.15)	(-3.12)	(-1.89)	(-1.89)
Gini Income	73.15	66.97	-444.71	-437.08
	(0.32)	(0.29)	(-0.75)	(-0.74)
Payroll tax p.c.	0.00	0.00	-0.01	-0.02
	(0.11)	(0.09)	(-0.18)	(-0.22)
Real estate tax p.c.	0.27	0.28	1.38	1.38
	(0.68)	(0.70)	(1.53)	(1.53)
Other taxes p.c.	0.04	0.04	0.16	0.17
	(0.35)	(0.38)	(0.81)	(0.85)
Council size	-0.11	1.45	-2.58	-1.27
	(-0.05)	(0.57)	(-0.82)	(-0.30)
HHI in council	38.64	36.50	-44.20	-46.69
	(0.70)	(0.66)	(-0.44)	(-0.46)
Absolute SPOE	-41.64	-40.08	1.50	1.93
	(-1.47)	(-1.41)	(0.05)	(0.06)
Absolute OEVP	-34.06	-32.15	3.16	4.20
	(-1.26)	(-1.18)	(0.10)	(0.14)
Absolute FPOE	-62.00	-60.16	-	-
	(-0.81)	(-0.77)	-	-
Coalitions	-25.14	-23.34	-8.57	-7.48
	(-0.98)	(-0.90)	(-0.33)	(-0.29)
Constant	206.52	143.23	392.87	335.31
	(1.38)	(0.88)	(1.47)	(1.28)
Observations	6493	6493	1909	1909
Time effects	YES	YES	YES	YES
State effects	YES	YES	YES	YES

Robust standard errors, clustered at municipality level.
t-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

Figure 6: Net borrowing per capita



to independent local voter associations being more popular in smaller communities. Coalitional governments are also not associated with higher net borrowing.

Municipal borrowing should be strongly related to local investment expenditures. In particular spending on municipal infrastructure may be financed through higher deficits, and larger investment projects (in relation to budget size) possibly inflate local borrowing in the respective fiscal year. Table 4 provides some evidence that additional investment spending indeed contributes to higher net per capita borrowing at the local level. In all specifications investment spending per capita has a positive and significant effect on net borrowing. Effects are of very similar size (+0.5 Euros p.c.) throughout. Treatment effects become slightly weaker in the full sample of municipalities larger than 2,000 residents. Columns (3) and (4) which display the results for municipalities with city status only, the discontinuity remains significant at the 5 percent level, although coefficients are also reduced by almost 50 percent, which is consistent with the coefficient of the investment variable, that is that for each 1 Euro of net borrowing, about 50 cents can be attributed to investment decisions. We cautiously conclude that almost one half of the observed discontinuity works through an investment channel.

Results of local non-parametric regressions are presented in Tables 5 and 6 and further confirm the results.

The local treatment effect equals (depending on the exact specification) around 90 Euro per

Table 4: Linear regression, triangluar kernel weights - the effect of investments. All municipalities larger than 2,000 (1) and (2); cities larger than 2,000 (3) and (4).

	(1)	(2)	(3)	(4)
Cut-off=1	50.70	74.46**	113.56**	130.22***
	(1.58)	(2.34)	(2.40)	(2.62)
Normalized population	-8.83**	-5.23	-15.09**	-8.29
	(-2.19)	(-0.99)	(-2.32)	(-1.01)
Cut-off=1 × Normalized population		-10.05		-13.46
		(-1.18)		(-1.13)
Investment p.c.	0.49***	0.49***	0.52***	0.52***
	(17.19)	(17.21)	(10.19)	(10.26)
Urbanization	7.99	7.04	-0.54	-2.85
	(0.76)	(0.67)	(-0.03)	(-0.14)
% Post-working	-522.50**	-517.50**	-3.18	-1.22
	(-2.19)	(-2.17)	(-0.01)	(-0.00)
% Pre-working	-149.31	-152.22	76.96	61.75
	(-0.82)	(-0.84)	(0.23)	(0.19)
Population density	3.40*	3.37*	4.91	4.60
	(1.88)	(1.86)	(1.33)	(1.24)
Median Income	-0.01**	-0.01**	-0.01**	-0.01**
	(-2.06)	(-2.10)	(-2.19)	(-2.17)
Gini Income	340.73*	347.49*	-222.20	-237.53
	(1.73)	(1.76)	(-0.37)	(-0.39)
Payroll tax p.c.	-0.05	-0.05	0.00	0.01
	(-1.42)	(-1.38)	(0.05)	(0.10)
Real estate tax p.c.	-0.01	-0.01	0.71	0.71
	(-0.03)	(-0.05)	(1.02)	(1.01)
Other taxes p.c.	-0.10	-0.10	0.02	0.01
	(-1.49)	(-1.54)	(0.10)	(0.03)
Council size	2.66	1.16	2.80	0.21
	(1.33)	(0.47)	(0.79)	(0.05)
HHI in council	-43.48	-41.15	-124.99	-119.93
	(-0.90)	(-0.85)	(-1.14)	(-1.10)
Absolute SPOE	13.77	12.31	53.11*	52.12*
	(0.78)	(0.70)	(1.91)	(1.88)
Absolute OEVP	-18.48	-20.33	23.52	21.33
	(-1.09)	(-1.20)	(0.83)	(0.75)
Absolute FPOE	-11.58	-15.62	-	-
	(-0.42)	(-0.57)	-	-
Coalitions	-5.24	-6.93	-1.69	-4.10
	(-0.31)	(-0.41)	(-0.07)	(-0.18)
Constant	-95.14	-34.61	-26.49	86.57
	(-0.84)	(-0.27)	(-0.10)	(0.33)
Observations	5468	5468	1620	1620
Time effects	YES	YES	YES	YES
State effects	YES	YES	YES	YES

Robust standard errors, clustered at municipality level.
t-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

Table 5: Local polynomial regression, bandwidth=CCT. Municipalities larger than 2,000 inhabitants.

	(1) Net borrowing p.c. Uniform kernel	(2) Net borrowing p.c. Triangular kernel
p=1	121.97***	71.93**
	(2.84)	(1.98)
h	1643.70	2960.71
b	3536.25	4615.02
p=2	60.99*	65.61*
	(1.33)	(1.74)
h	3577.08	5577.38
b	5289.44	6805.12
p=3	95.31*	51.35
	(1.86)	(1.15)
h	3769.70	3319.42
b	4814.11	4217.69
p=4	66.80	33.99
	(1.21)	(0.68)
h	5278.13	3981.68
b	6729.49	4889.49
Observations	6572	6572

Calonico et al. (2014) robust confidence intervals.
z-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

Table 6: Local polynomial regression, bandwidth=CCT. Cities only.

	(1)	(2)
	Net borrowing p.c.	Net borrowing p.c.
	Uniform kernel	Triangular kernel
p=1	112.36**	96.73**
	(2.14)	(2.05)
h	2138.59	2670.07
b	4086.28	4399.76
p=2	94.68 **	100.66**
	(1.97)	(1.95)
h	3609.31	3748.40
b	5583.08	5226.92
p=3	129.94*	67.41
	(1.88)	(0.96)
h	3716.84	3301.036
b	5175.64	4607.74
p=4	102.03*	52.60
	(1.88)	(0.67)
h	5189.78	4649.86
b	7015.01	5928.24
Observations	1919	1919

Calonico et al. (2014) robust confidence intervals.
z-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

capita more net borrowing, or when we consider only cities around 150 Euro. Given that the change in the vertical fiscal gap in about 10 p.p. at the threshold, this result suggest an additional 9 to 15 Euro new debt per capita for every 1 p.p. change in the fiscal gap.

5.2. Spatial dependence of borrowing

When it comes to public expenditure on the municipal level, spillovers to neighboring communitites are an important factor. Local centers of activity typically provide infrastructure and services, from which also neighboring communities profit, such as kindergartens, schools and old age homes. Normalizing service expenditure in per capita terms as well as controlling for the age structure of a community does not resolve the issue, as users of services will typically be registered in their home community and use the resources of the neighbor. To account for the possibility of spillovers we need to directly include spatial components in our regression model.

Figure 7: Muncipalities between 5,000 and 10,000 inhabitants (green) and between 10,000 and 20,000 (blue)

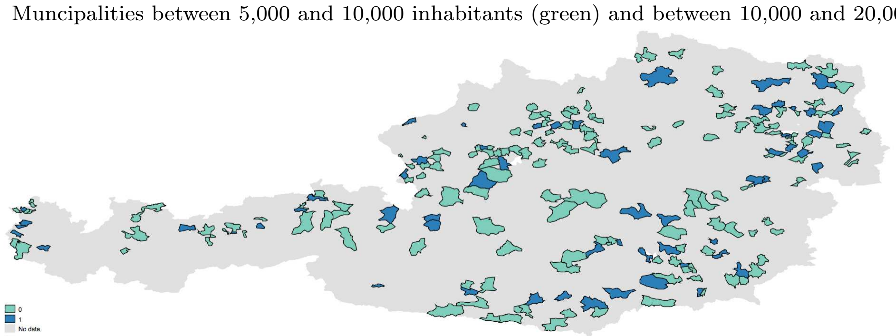


Figure 8: Spatial distribution of borrowing in 2014

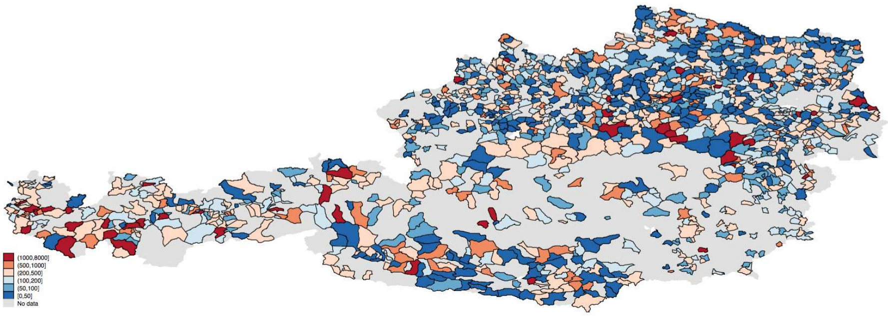


Figure 9: Spatial lag of borrowing

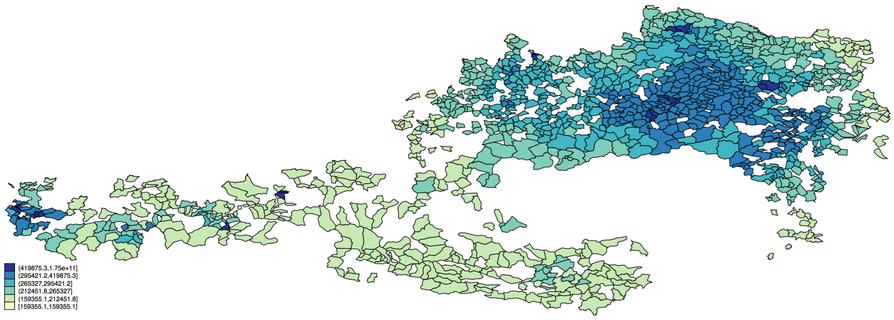


Figure 7 shows locations of municipalities which play a major role in our analysis, thus between 5,000 and 20,000 inhabitants. They often serve as service providers for smaller neighboring communities. Table 7 shows that the spatial correlation on one coordinate degree intervals in borrowing is a significant issue in our analysis. Positive values of Moran's I statistic suggest that public borrowing is spatially clustered. Judging by visual inspection of Figure 9, the issue is of particular importance in central-east part of Austria, the state of Lower Austria.

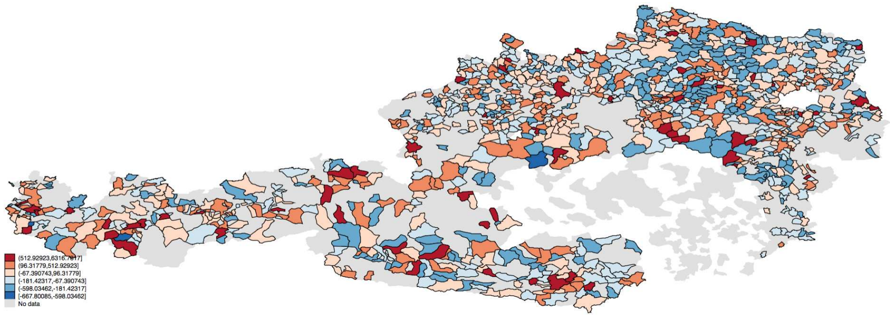
Table 7: Moran's I statististics for net borrowing p.c.

Band	I	z	p-val
(0,1>	0.055	22.195	0.000
(1,2>	0.014	7.209	0.000
(2,3>	0.011	4.824	0.000
(3,4>	-0.022	-6.204	0.000

Figure 10 shows the spatial distribution of the residuals from the OLS regressions with control variables from the previous section, with fixed- and time-effects. Despite using additional controls and regional effects, residuals from the OLS regressions show spatial dependence.

The question remains on how to handle the spatial pattern. From the economic perspective, an appealing conjecture is that the independent variables from smaller municipalities affect borrowing

Figure 10: Spatial distribution of the OLS residuals



levels of larger municipalities, as argued above. For infrastructure projects which benefit more than one municipality, one can also hypothesize a positive relationship between the outcome variables in neighboring communities. An appropriate model to consider both spillovers from independent variables and correlated borrowing due to larger regional projects is

$$y_{it} = \alpha + \beta_0 pop_{it} + \beta_1 z_{it} + \rho \mathbf{W} y_{jt} + \Gamma \mathbf{X}_{it} + \Phi \mathbf{W} \mathbf{Z}_{jt} + \varepsilon_{it}, \tag{6}$$

where

$$\varepsilon_{it} = \lambda \mathbf{W} \varepsilon_{jt} + \xi_{ij} \tag{7}$$

and Φ denotes the spatial dependence of independent variables Z in municipality j and the outcome y in municipality i, and ρ is the impact of the spatial lag of the dependent variable and $\mathbf{W}$ is the weighting matrix. This general specification allows also for spatial dependence of the error term. A GMM-IV estimator for this model has been developed by Drukker et al. (2009) and Arraiz et al. (2010) for the cross–sectional case. We implement this estimator as a pool cross–section model. The results are presented in Table 8.

Including the spatial lag of the dependent variable reveals that indeed net borrowing is strongly spatially correlated. Nevertheless, the local treatment effect is still significant at 1% level, although the size of the coefficient is reduced to about 65 Euro. On the other hand, the spatial lags of the independent variables do not significantly impact the net borrowing levels of neighbouring communities. Party effects are more visible than in the main results, in each case large parties being associated with lower borrowing than voter associations with a specific local focus.

Table 8: Spatial results

	(1)	(2)	(3)	(4)
SL. Net borrowing p.c.	0.53*	0.49*	0.77**	0.75**
	(1.95)	(1.80)	(2.10)	(2.03)
Cut-off	72.01***	64.58***	65.12***	64.16***
	(3.64)	(3.23)	(3.25)	(2.98)
Normalized population	-10.07***	-11.05***	-11.17***	-10.29***
	(-6.01)	(-5.87)	(-5.93)	(-3.18)
Urbanization		16.31*	16.38*	14.81
		(1.76)	(1.77)	(1.56)
% Post-working		-312.02	-313.56	-230.67
		(-1.41)	(-1.42)	(-1.02)
% Pre-working		-29.24	-30.78	-17.91
		(-0.21)	(-0.22)	(-0.13)
Population density		2.70*	2.76*	2.60*
		(1.87)	(1.91)	(1.77)
Median Income		-0.01***	-0.01***	-0.01***
		(-4.60)	(-4.60)	(-3.98)
Gini Income		132.09	129.80	-8.95
		(0.84)	(0.82)	(-0.05)
SL. Pop density			-0.41	-0.42
			(-0.89)	(-0.92)
SL. % Pre-working			43.71	43.40
			(1.42)	(1.40)
SL. % Post-working			-37.75	-38.24
			(-1.49)	(-1.51)
Payroll tax p.c.				0.02
				(0.80)
Real estate tax p.c.				0.19
				(1.12)
Other taxes p.c.				0.02
				(0.42)
Council size				-0.42
				(-0.24)
HHI in council				23.52
				(0.63)
Absolute SPOE				-42.69***
				(-2.83)
Absolute OEVP				-32.71**
				(-2.43)
Absolute FPOE				-37.44
				(-0.27)
Coalitions				-27.49**
				(-2.11)
Constant	-3.59	173.31**	176.48**	191.08*
	(-0.33)	(2.19)	(2.23)	(1.91)
Observations	6566	6566	6536	6521
Time effects	YES	YES	YES	YES
State effects	YES	YES	YES	YES

Figure 11: Local polynomial regression, p=1. Sensitivity to the choice of bandwidth = 1000, . . . , 9000.

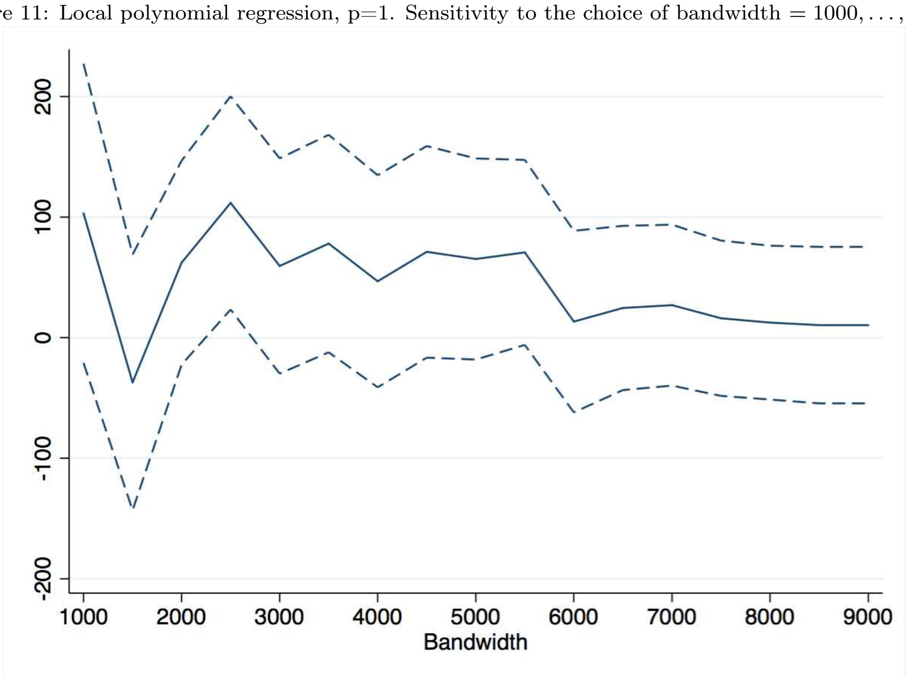


Figure 12: Local polynomial regression, p=1, bandwidth=CCT. Sensitivity to the choice of $\rho = 0, 1, \ldots, 0.9$.

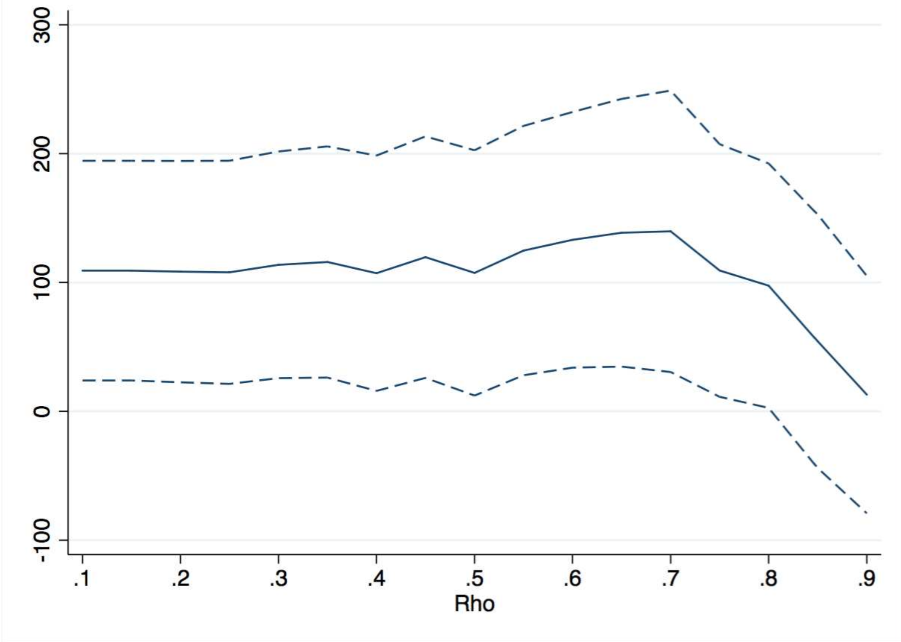
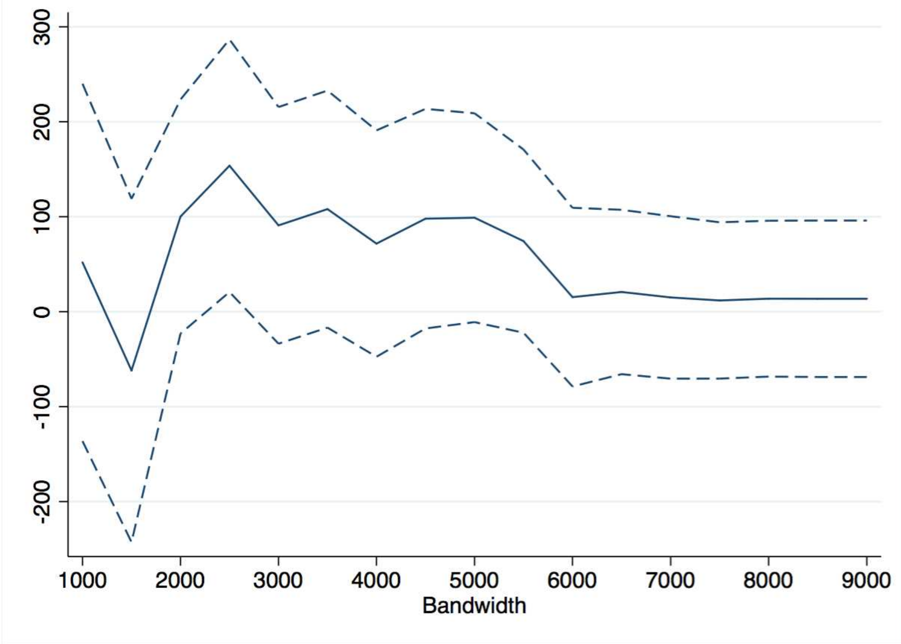


Figure 13: Local polynomial regression, p=1. Cities only. Sensitivity to the choice of bandwidth $= 1000, \ldots, 9000$.



5.3. *Sensitivity*

Figures 11, 13 and 12 present the sensitivity of the treatment effect to the choice of bandwidth in the non-parametric regressions. The results remain stable for the bandwidth choices of be-

Table 9: Placebo test, cut-off 8,500, bandwidth=CCT, uniform kernel.

	(1) Net borrowing p.c. All municipalities	(2) Net borrowing p.c. Cities
p=1	-2.53	-29.18
	(-0.08)	(-0.51)
p=2	-16.87	-25.18
	(-0.17)	(-0.33)
p=3	15.30	8.33
	(0.37)	(0.08)
p=4	-38.13	358.45
	(-0.66)	(1.37)
Observations	6572	1919

Calonico et al. (2014) robust confidence intervals.
z-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

Table 10: Placebo test, cut-off 11,500, bandwidth=CCT, uniform kernel.

	(1) Net borrowing p.c. All municipalities	(2) Net borrowing p.c. Cities
p=1	-23.30	-40.44
	(-0.61)	(-0.87)
p=2	-17.08	2.30
	(-0.49)	(0.05)
p=3	-15.92	-4.66
	(-0.40)	(-0.07)
p=4	-24.32	-41.12
	(-0.55)	(-0.56)
Observations	6572	1919

Calonico et al. (2014) robust confidence intervals.
z-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

Figure 14: Local polynomial regression, bandwidth=CCT. All municipalities.

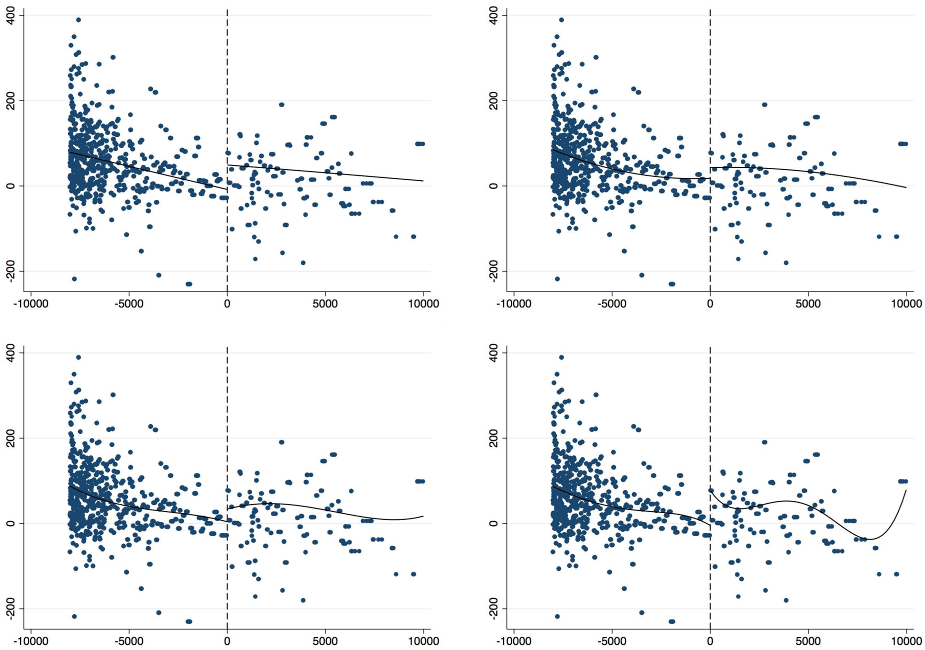


Figure 15: Local polynomial regression, bandwidth=CCT. Municipalities with “City” status.

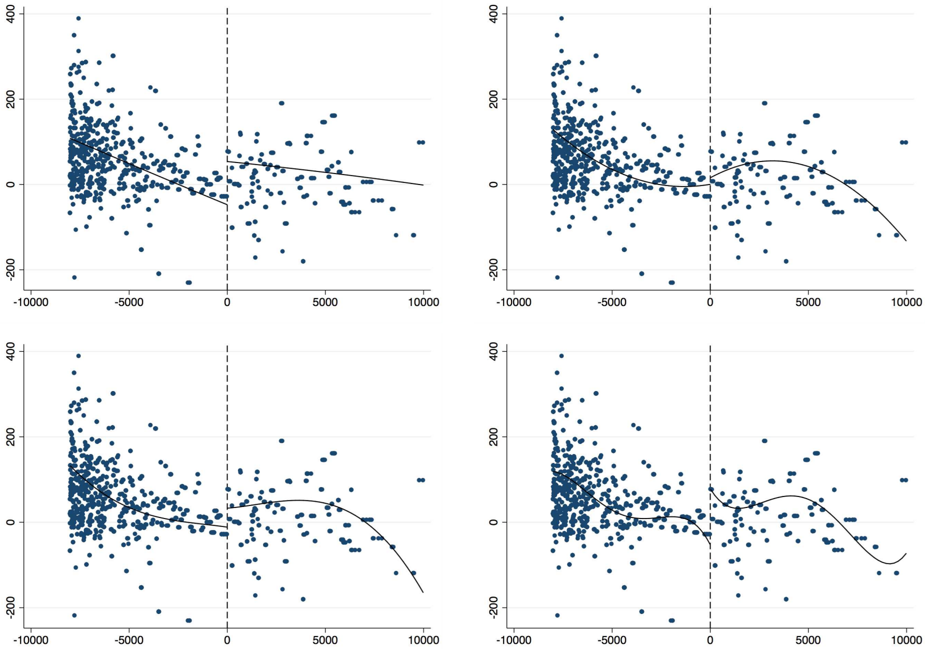


Table 11: Placebo test, cut-off 7,000, bandwidth=CCT, uniform kernel. Lower Austria only

	(1) Net borrowing p.c. All municipalities	(2) Net borrowing p.c. Cities
p=1	-20.48	68.08
	(-0.33)	(0.90)
p=2	21.63	32.44
	(0.33)	(0.29)
p=3	24.84	40.56
	(0.41)	(0.28)
p=4	37.91	69.62
	(0.30)	(0.30)
Observations	2452	805

Calonico et al. (2014) robust confidence intervals.
z-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

Table 12: Placebo test, cut-off 6,000, bandwidth=CCT, uniform kernel. Carinthia and Tirol only

	(1) Net borrowing p.c. All municipalities	(2) Net borrowing p.c. Cities
p=1	86.48	-1.23
	(1.49)	(-0.21)
p=2	8.99	176.01
	(0.08)	(0.87)
p=3	-32.09	-160.02
	(-0.20)	(-0.76)
p=4	131.11	-226.20*
	(1.01)	(-0.16)
Observations	1171	507

Calonico et al. (2014) robust confidence intervals.
z-Statistics in parentheses; significance: *** 0.01 ** 0.05 * 0.1

tween 2,000 and 6,000 inhabitants around the threshold. For a larger bandwidth, the results turn insignificant. Falsification test are presented in Tables 9 and 10 at 8,500 and 11,500 population thresholds for the whole sample. There is no evidence, that spurious jumps in the net borrowing can be observed at these thresholds. Regarding continuity of net borrowing at the population thresholds at which the size of the council changes, regression results already suggest that no changes in borrowing are associated with the changes in the size of the municipal council. Results of falsification test for two population thresholds at which the size changes in the three states (Carinthia, Tirol, and Lower Austria) at the 10,000 threshold, further confirm that the size of the municipal council does not influence the levels of borrowing.

6. Conclusions

The second generation fiscal federalism literature shows theoretically that sub-central budget constraints will be softer when local governments are more dependent on revenues over which they have no discretion (Von Hagen and Eichengreen, 1996; Goodspeed, 2002; Oates, 2005). As a consequence of reduced fiscal accountability, sub-central governments can expect to be bailed out by the central government and therefore tend to accumulate higher levels of debt. We test this conjecture using data from municipalities in Austria. The highly centralized fiscal framework in Austria is characterized by an exceptionally low financial responsibility of state and municipal governments to cover spending with own taxes and user fees. The excessive dependency of states and local entities on shared tax revenues and transfers from the central government is particularly likely to produce such negative incentives.

Employing a regression discontinuity design which utilizes a special regulation in the Austrian tax sharing agreement we find that, in line with theoretical expectations, municipalities with higher revenue dependency observe higher net borrowing per capita. Almost one half of the observed discontinuity works through an investment channel. The results in this paper thus confirm the notion that bad designed fiscal decentralization can be a potential source of over-spending and deficit bias, when sub-national governments fail to fully internalize the cost of financing additional spending.

Recent scholarly proposals for a reform of the Austrian fiscal framework, including the idea to substantially increase sub-national tax autonomy, hence point in the right direction: A resulting lower fiscal gap is supposed to harden the budget constraint for Austrian municipalities and would have positive effects on fiscal performance. The future prospects concerning a fundamental reform of intergovernmental fiscal relations to reduce fiscal imbalances in Austria are, however, rather weak. Both regional and local governments are unwilling to adopt reforms that would increase fiscal transparency and accountability. All attempts for the introduction of only very moderate elements of local tax autonomy and fiscal competition at the state and the municipal level failed over the past decades, as this is obviously not in the interest of political actors at all governmental levels.

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Appendix A

Table 13: Summary statistics

Variable	Obs	Mean	SD	Min	Max
Population	19677	2400	2394	53	19974
Net borrowing p.c.	13718	105	416	-2250	18949
Revenue share p.c.	19677	684	119	128	2191
Debt p.c.	19527	1954	1751	.0692	44685
Pop Density	19677	1.24	2.16	.00981	38.7
Mean Income (in 1,000 Euro)	15753	19.42	2.02	8.34	29.80
Gini Income	15470	.33	.02	.24	.52
% Pre-working	19677	.162	.0274	.0394	.331
% Post-working	19677	.224	.0388	.108	.518
Council Size	19677	18.9	5.78	9	37
HHI in Council	15041	.489	.136	.137	1

Figure 16: Continuity: Fraction of population above 65

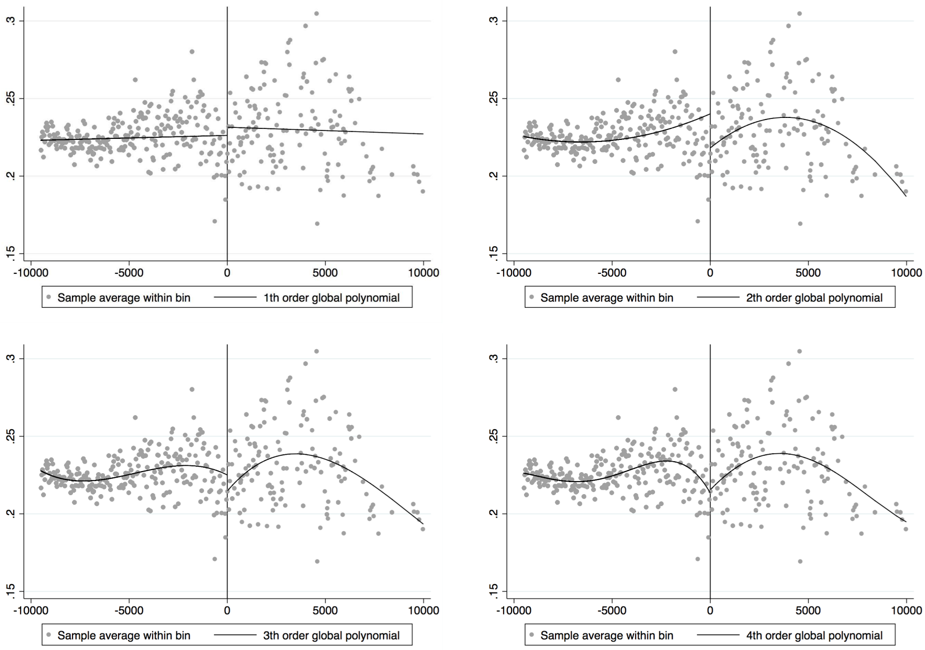


Figure 17: Continuity: Fraction of population below 15

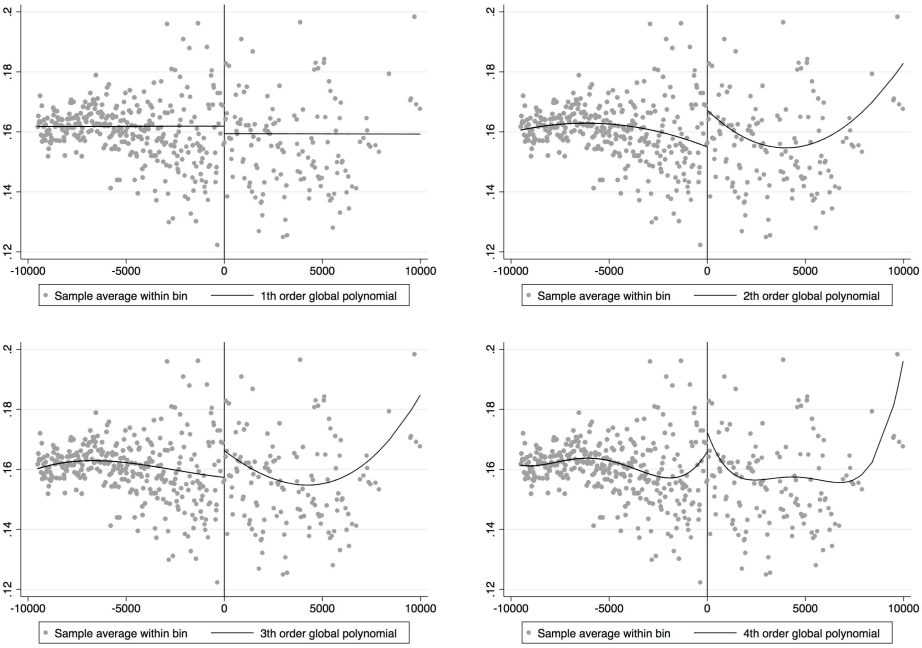
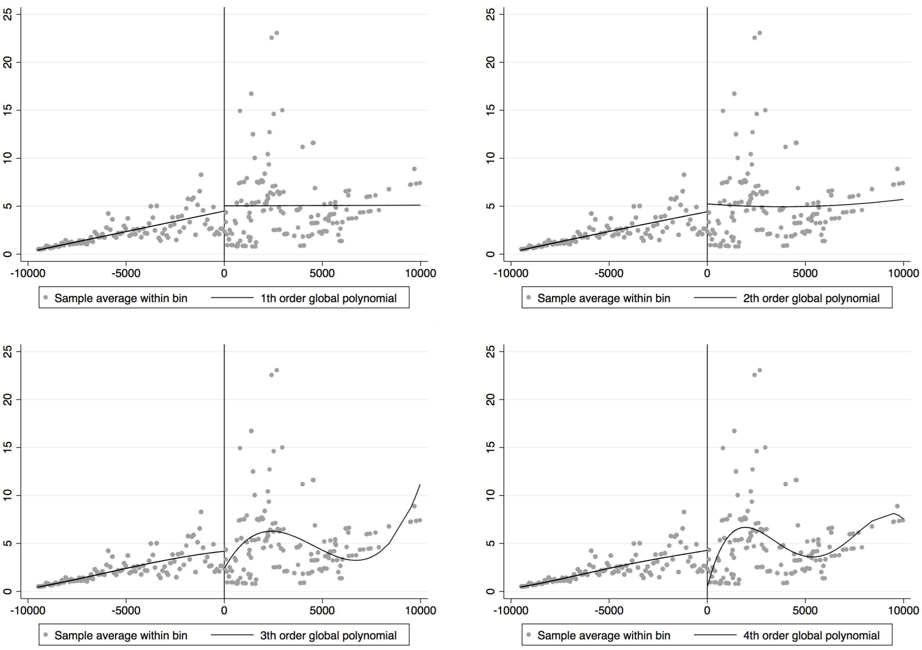


Figure 18: Continuity: Population density



Appendix B

Table 14: Regulations affecting the 10,000 threshold

State	Regulation	Source	Note
Burgenland	–	–	
Carinthia	The size of the council increases from 27 to 31 members	§18(1) K–AGO	It changes also at other thresholds
	The wage of the mayor changes	§29(1-5) K–AGO	
	Obligatory higher education of the head of the public service	§78(2) K–AGO	
Lower Austria	The size of the council increases from 33 to 37 members	§19(1) NÖ–GO	It changes also at other thresholds
	Council can choose a third vice-mayor	§24(1) NÖ–GO	Second vice-mayor at 2,000 threshold
	The council executive body increases from seven to eight members	§24(1) NÖ–GO	
Salzburg	–	–	
Tirol	The size of the council increases from 19 to 21 members	§22(1) TGO	It changes also at other thresholds
Upper Austria	Obligatory higher education of the head of the public service	§37(1) Oö. GemO	
	The necessary support for calling a referendum increases from 900 to 1,400 inhabitants	§38(1) Oö. GemO	
Vorarlberg	–	–	