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Fiscal Policy Adjustments to Budget Shocks: Evidence from German Municipalities*

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Abstract

We study the fiscal policy reactions of municipalities in the German state of North Rhine-Westphalia to an unanticipated spending shock. The implementation of a horizontal transfer system led to additional contributions for selected municipalities. Using the quasi-random assignment, we examine whether these contributing municipalities adjust their tax setting behavior, respond by adapting expenditures, or incur debt in the short run. We find a sizable increase of net borrowing. This increase is even higher than the expansion of spending. Municipalities additionally refrain from increasing tax rates. The results point to delayed fiscal adjustments. We conclude that the design and the predictability of transfer systems have significant implications on the behavior of municipalities within decentralized systems.

JEL classification: H71, H72, H77, R50

Keywords: local public finance, local taxation, public debt, fiscal shocks

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1 Introduction

When confronted with a shock that affects their budget, governments can generally choose from a wide range of fiscal instruments to adapt. They can adjust several types of taxes or spending categories. Furthermore, they can opt to finance measures by increasing debt. All of these instruments affect macroeconomic aggregates.[1] From a theoretical point of view, the optimal policy mix depends on the nature of the shock. The optimal tax smoothing theory would suggest to offset transitory negative shocks by temporary budget deficits leaving taxes and spending unchanged to minimize distortions (Barro 1979). Persistent shocks, however, require fiscal adjustments to be made at some point.

There are various reasons why governments experience shocks to their budget. While budget shocks at the national level often come with economic downturns, budget shocks for sub-national governments can also occur through changes of the intergovernmental equalization schemes imposed by higher tiers of government. Implications differ accordingly. Fiscal policy at the national level may aim to avoid a decline in aggregate demand, while municipalities may aim to avoid deficits.

In contrast to central governments, municipalities have only a limited set of policy instruments at hand to react to budget shocks. Aside from legal constraints on debt, they usually feature a lower level of fiscal autonomy. Differences in fiscal institutions may be one reason for the mixed empirical evidence on how local governments adjust their budget; see Section 2 for a brief literature review.

We study how municipalities in the German state of North Rhine-Westphalia (NRW) have adjusted their policy mix in the short run as a reaction to an unanticipated expansion of spending. They have limited room for maneuver on short notice. When confronted with a budgetary shock, municipalities can increase revenue particularly through higher tax rates on business profits or property. Alternatively, they can cut expenditure, which is possible only for a limited share of tasks carried out by

[1] There are two main strands of literature dealing with the effects of fiscal policy on the economy. On the one hand, the question whether and how fiscal policy should stabilize or stimulate aggregate demand has been discussed extensively (Coenen et al. 2012). There is a high level of uncertainty on the impact of fiscal policy stimuli, not least because the size of the fiscal multiplier depends on many factors such as the state of public finance or the exchange rate regime, see Cogan et al. (2010), Corsetti et al. (2012), Ilzetzki et al. (2013), and Mountford and Uhlig (2009) for an overview. On the other hand, a related strand of literature studies which policy mix is better suited to consolidate public budgets, see Alesina et al. (1995), Alesina and Perotti (1997), Perotti (2013), and Cogan et al. (2013), among many others.

the municipalities. Finally, they can increase short-term debt which is legally allowed only to bridge short-term liquidity shortages.

We make use of the quasi-random assignment of an unanticipated expansion of local spending induced by the implementation of a horizontal transfer system in NRW in 2014. Our identification strategy exploits the fact that some municipalities have to fund additional transfers while municipalities with similar characteristics escape these transfers. The selection of the contributing municipalities was strictly rule-based and determined by state law shortly before the first contribution was due. The selection criterion had never been used before and the design of the law makes it unlikely that these payments are subject to manipulation and negotiations. Additionally, the selection criterion has not been tied to real economic conditions and, therefore, is not directly associated with ad hoc behavior of municipalities. As it has not been possible to foresee or influence the selection into treatment, we can investigate municipalities' reaction to this shock.

In 2011, the state government of Germany's most populous state, NRW, established a bailout fund for municipalities. This was done to address the debt problem of the most indebted jurisdictions among them (*Stärkungspakt Stadtfinanzen*). To finance grants to these indebted municipalities, the state government implemented a new horizontal transfer system charging selected municipalities directly, see Rappen (2017). For the contributing municipalities, this leads to unanticipated payments. From 2014 to 2020, municipalities classified as "sustainably abundant" have to fund €90 million per year in total. The selection of contributing municipalities is a repeated procedure in each year between 2014 and 2020, and the yearly payment for a specific municipality cannot be anticipated (Rappen 2017). We study how these contributors responded to the expansion of spending in the years 2014 to 2016.

The definition of "sustainably abundant" was established only months before the first contribution was due and applied to 59 municipalities in 2014. On average, the individual additional expenditures for these municipalities amounted to €51 per capita in the first year. Due to the design of the definition, we can estimate the causal effect of this unanticipated expenditure shock. Selection is based upon a double criterion. Therefore, we use municipalities as control group for which the criterion was fulfilled only partially. Using an event study design, we examine the assumption of common trends and find no significant pre-trends for key fiscal variables.

We find that municipalities have responded to the expansion of spending by increasing net borrowing. With a point estimate of 2.17 per euro in our baseline estimations,

the increase is even larger than the additional transfers. The contribution comes along with a negative effect on tax rates and the corresponding revenues when considering delayed responses. One potential reason why municipalities refrain from increasing tax rates is the unpredictability of the additional transfers. The uncertainty about the size of the budget shock has been reinforced by the fact that the contributors brought an action against the federal state after the reform had been implemented. The action was rejected in 2016. Our finding emphasizes that the design and the predictability of transfer systems have significant implications on the behavior of municipalities within decentralized systems.

The rest of the paper is structured as follows. Section 2 provides a brief literature review. Section 3 describes the institutional setting, the reform and our data set. Section 4 presents the econometric framework. Section 5 discusses the main results and robustness checks. Section 6 concludes the paper.

2 Related literature

Our analysis relates to several strands of literature. It contributes to the analysis which kind of policy variable local governments use to balance their budget. Koethenbuerger (2011) provides a theoretical model and shows that the interactions between federal policy and local governments can influence the choice of the policy instrument. Several other empirical studies analyze the response of local governments to expenditure or revenue shocks. Lundberg (2001) studies short-term responses to fiscal shocks for Swedish municipalities and stresses the role of political preferences. Snoddon (2004) shows that Canadian provinces respond asymmetrically to positive and negative grant shocks. Asymmetric responses with respect to positive or negative windfalls or the affected revenue category are also found by Heyndels and Driessche (2002) for Flemish, and Rattsø and Tovmo (2002) for Danish local governments. Solé-Ollé and Sorribas-Navarro (2012) provide further evidence for Spanish municipalities. Grembi et al. (2016) analyze fiscal adjustments following the relaxation of fiscal rules in Italy. Buettner (2009) finds that a large share of revenue shocks is absorbed by intergovernmental transfers in Germany. Buettner and Wildasin (2006) analyze the dynamics of the fiscal policy adjustment for municipalities in the US.

Another related strand of literature deals with the effects of grants and bailouts, see Dahlberg et al. (2008) and Lundqvist (2013) on the effects of federal grants on taxes and spending, Dietrichson and Ellegård (2015) on conditional bailouts and fiscal

discipline, and Lundqvist et al. (2014) on the effects of intergovernmental grants on local public employment. Buettner (2006) and Smart (2007) analyze the incentive effects of fiscal equalization transfers on tax rates. Köppl–Turyna and Pitlik (2018) exploit a discontinuity in the tax-sharing agreement between the central and local governments in Austria and find that lower tiers of governments that have a low level of revenue autonomy show higher net borrowing.

Such institutional differences can constitute one explanation for the various adjustment patterns in the different countries. They can also translate into variation which is necessary to study the causal effects of fiscal policy. Among others, Clemens and Miran (2012) and Acconcia et al. (2014) use contractions in sub-national public spending to estimate output multipliers. Clemens and Miran (2012) summarize the advantages and disadvantages of these approaches vis-à-vis other approaches from the empirical macroeconomic literature such as Structural Vector Autoregressions (SVARs) and narrative histories.

3 Institutional setting, data and descriptive statistics

3.1 Institutional setting

In NRW, the largest German state in terms of population (17.9 million inhabitants in 2016), a substantial range of tasks is carried out at the local level. However, despite the constitutionally guaranteed right of local self-government (Article 28 (2) of the German Basic Law), instruments to respond to shocks, especially in the short-term, are limited. Municipalities are only allowed to incur debt to finance investment or to ensure liquidity, see Christofzik and Kessing (2018). The latter type of debt is intended to serve as a buffer. However, this short-term debt is also used abusively to finance deficits (Heinemann et al. 2009). In case of an unanticipated shock to the municipal budget, as studied in this paper, it is likely that municipalities incur short-term debt. Because they are not allowed to run deficits, fiscal adjustments on the revenue or expenditure side are likely, at least in the medium term.

For some expenditures, the 396 municipalities are executing agents without having autonomy over spending levels. This applies to most social expenditures. In other areas (e.g. schooling or child-care) municipalities have more discretion in the way they provide local services. The main areas in which municipalities can determine

their tasks are general administration, cultural institutions, recreation and sport facilities, hospitals, local infrastructure, and public transport. However, most of these categories are unsuitable shock absorbers in the short run. Transfers to higher levels of government, or associations the municipality belongs to, complete the list of expenses.

On the revenue side, municipalities receive fixed shares of tax revenue, in particular of the personal income tax (PIT) and the value added tax (VAT). However, local authorities have no discretion over the rates of these taxes. User charges or fees for local services can only contribute to additional revenue creation as long as they were not economically viable beforehand. The main source of self-controlled revenue are two local taxes. Municipalities can set tax rate multipliers on tax bases defined by the federal law for a tax on business profits and a property tax on business and private land[2]. These tax rate multipliers together with the tax base and a basic tax rate, which are set at the federal level, determine the effective tax rate, see Baskaran (2014) and Fuest et al. (2018).

The largest share of grants are general grants (*Schlüsselzuweisungen*) within a strictly rule-based vertical fiscal equalization scheme. The intention of this scheme is to balance out differences in *fiscal need* and *fiscal capacity*. These measures form the basis for the selection procedure of contributing municipalities in the horizontal transfer system we use as our testing ground. Fiscal capacity in NRW is determined by the tax bases of the three local taxes and the fixed shares from the PIT and the VAT. Tax revenues of the local taxes are normalized by an identical hypothetical tax multiplier (*fiktiver Hebesatz*) to ensure that fiscal capacity can hardly be influenced by the tax setting behavior on short notice.[3] Fiscal need is mainly based on population measures (e.g. total population, change of population, welfare recipients). Municipalities for which fiscal capacity exceeds fiscal need receive no transfers, but they do not have to pay any additional transfers either. This principle, however, was changed in 2014 when the state government implemented a temporal horizontal transfer system as described below in Section 3.2.

3.2 Bailout fund and additional contributions

In 2011, the state government of NRW established a bailout fund for highly indebted municipalities to address the budgetary problems of the most indebted communities among them. The program was foreseen to last until 2020 and consists of different

[2]There is a separate tax on agricultural land which is, however, less important in terms of revenue.

[3]Baskaran (2014) provides an elaborate discussion on hypothetical tax multipliers.

phases. The scheme has committed participating municipalities to strengthen their own consolidation efforts via individual contracts. In return, they receive fiscal aid in order to re-balance budgets in the medium term. In a first stage, which started in 2011, it was obligatory for 34 heavily indebted municipalities to participate, implicating additional grants from the state budget and strict austerity measures (Rappen 2017). In a second stage, 27 more municipalities were accepted to enter in 2012. Grants to this second group of recipients amounted to €65 million in 2012, €115 million in 2013 and €296 million per year for the period from 2014 to 2020.

These transfers are financed partly with the involvement of other municipalities. First, the total amount to be redistributed under the fiscal equalization scheme has been reduced from 2012 onwards. This leads to reduced general grants for municipalities for which fiscal need exceeds fiscal capacity. Second, a new horizontal transfer system charging selected municipalities directly was introduced in 2014. From 2014 to 2020, municipalities which are classified as "sustainably abundant" have to provide €90 million overall per year. This is approximately 31% of the total amount of transfers to municipalities in the second stage of the program. We study the behavior of these contributing municipalities.

The selection of contributing municipalities is rule-based and was determined by state law on December 3, 2013 (*Zweites Gesetz zur Änderung des Stärkungspaktgesetzes*). It is based upon two criteria that have to be fulfilled simultaneously. Municipalities have to contribute to the horizontal transfer scheme in a specific year if they are defined as "sustainably abundant". This is the case if in the current year as well as in two of the preceding four years, fiscal capacity exceeds fiscal need mainly based on population measures. According to this double criterion, 59 municipalities with an excess fiscal capacity in 2014 as well as in two or more years between 2010 and 2013 were selected as contributing municipalities. The first contribution payment was due in April 2014.

The selection of contributing municipalities is a repeated procedure from 2014 to 2020 based on the same rule. The group of contributing municipalities can change over time. The sum to be funded by the contributing municipalities (€90 million per year in total) is a fixed amount. Based on the design of this horizontal transfer system, neither the number of contributing municipalities nor the amount of the individual payment is necessarily identical in each year. The individual contribution depends on the number of municipalities that are classified as sustainably abundant and the total excess fiscal capacity of these municipalities. Each contributing municipality has

to contribute the same share of its excess fiscal capacity. This contribution rate is determined by

$$\text{Contribution Rate} = \frac{\text{EUR 90 million}}{\sum_{i=1}^{n} \left(\underbrace{\text{Fiscal Capacity - Fiscal Need}}_{\text{Excess Fiscal Capacity}} \right)}, \tag{1}$$

where n is the number of contributing municipalities, and fiscal capacity and fiscal need are determined according to the existing rules within the fiscal equalization system. For the 59 contributing municipalities in 2014 a contribution rate of approximately 11.86% applied.

We exploit the fact that, due to the double criterion, an excess fiscal capacity is not necessarily associated with a payment. For example, in 2014, fiscal capacity was larger than fiscal need for 27 municipalities but they were not classified as sustainably abundant. We show that these municipalities form a suitable control group for the contributing municipalities to identify the causal effect of the payment (see Section 4.1).

3.3 Data and descriptive statistics

The basic balanced panel data set consists of all 396 municipalities in NRW over the years 2010–2016. The data have been combined from different sources. Municipality-level financial data, tax multipliers, population characteristics, political constellations of the local council as well as data on participation in the bailout fund are obtained from the state's statistical office (Landesbetrieb Information und Technik Nordrhein-Westfalen 2017) and the ministry (Ministerium für Heimat, Kommunales, Bau und Gleichstellung des Landes Nordrhein-Westfalen 2017). Financial data have been deflated using the consumer price index for NRW.

Many municipalities in NRW have persistent problems balancing their budget. If they are in financial distress, they have to present a consolidation plan *(Haushaltssicherungskonzept)* indicating how to balance the budget within a given period. If this plan is not sufficiently effective or credible, the supervising authority at the county or district level disapproves the plan and the municipality is put under direct fiscal supervision.[4] Information on whether a municipality was obliged to present a budget consolidation plan was extracted from publications of the statistical office and

[4]See Christofzik and Kessing (2018) for details on the oversight regulations.

completed by information from municipalities. Table 1 provides descriptive statistics of our data set.

Table 1: Summary statistics (2010–2016)

Variable		Mean	Std. Dev.	Min.	Max.
			General		
Population	Metric	44,842.32	87,832	4,116	1,070,357
Population over the age of 65	Metric	19.39	2.44	11.2	31.67
Population share employees	Metric	33.6	3.25	19.87	44.84
Population share foreigners	Binary	7.34	3.9	1.28	37.58
Differential fiscal capacity	EUR per capita	-164.55	336.58	-1,263.35	6,514.02
Total contributions (2014-2016)	EUR per capita	94.94	207.78	0.43	1,799.65
Unbalanced budget in 2013	Binary	0.28	0.45	0	1
			Revenue		
Net borrowing	EUR per capita	51.05	176.51	-795.58	1,165.09
Own tax revenues	EUR per capita	638.6	336.19	25.16	6,445.8
Tax multiplier business profits	Metric	421.82	29.01	265	550
Tax multiplier property, business & private	Metric	417.27	75.60	230	959
General grants	EUR per capita	198.39	161.47	0	1,137.02
Charges or fees for local services	EUR per capita	292.47	163.52	9.71	1,434.97
Revenues from shares taxes	EUR per capita	368.49	73.64	189.36	671.47
			Expenditure		
Net investment expenditure	EUR per capita	25.06	117.64	-561.49	1,439.82
Maintenance expenditure	EUR per capita	325.59	117.98	23.3	953.04
Social transfers	EUR per capita	111.93	176.97	0	1,704.43
Personnel expenditure	EUR per capita	388.95	127.41	170.04	910.16
			Political variables		
Majority right-wing[a]	Binary	0.77	0.42	0	1
Majority left-wing[a]	Binary	0.20	0.40	0	1
No majority	Binary	0.72	0.45	0	1
Number of parties in council	Metric	5.85	1.96	2	17

Notes: [a] *right-wing* comprises the center-right party CDU and the liberal party FDP; *left-wing* comprises the center-left party SPD and the Green Party (Bündnis 90/Die Grünen). Remaining mayors are independent candidates or from voter lists. Remaining seats in local councils are mainly held by local parties. The binary variable *divided government* takes the value 1 if the mayor's party has no majority in the local council

4 Econometric framework

4.1 Identification strategy

We use two different empirical strategies to estimate the effect of the additional payments on fiscal variables. We exploit the fact that the selection of the contributing municipalities is strictly rule-based and was determined by state law only a few months before the first payment was due. The design of the law makes it unlikely that these payments are subject to manipulation and negotiation. Additionally, the selection criteria is not tied to real economic conditions and, therefore, not directly associated with fiscal performance or short-term behavior of municipalities. In fact, a considerable share of contributing municipalities was not able to balance their budget even before the horizontal transfer system was implemented. Even one of the heavily indebted municipalities that participates in the bailout program had been classified as "sustainably abundant". It would have been selected as a contributing municipality if

it had not participated in the bailout scheme. Only half of the treated municipalities balanced their budget before they had to fund additional transfers. This signalizes that the financial situation did not directly influence the selection. Table 2 summarizes the selection criteria of the contributing municipalities.

Table 2: Rule-based selection of contributing municipalities

Criteria	**Contributing municipalities**
Number of years in abundance between t_{-4} and t_{-1}	≥ 2
In abundance in t?	yes

The double criterion for the selection of contributing municipalities allows us to identify a suitable control group. Municipalities have to contribute to the fund in a specific year if fiscal capacity exceeds fiscal need in the current year as well as in at least two of the four preceding years. Between 2014 and 2016, 58 municipalities fulfilled only the first part of this double criterion, and therefore escaped the contribution at least once.

The left-hand side of Figure 1 contains all municipalities in NRW between 2014 and 2016 and shows the differential fiscal capacity per capita in these years. The figure reflects how excess fiscal capacity translates linearly into the payment of the contributing municipalities. As is evident from the left-hand panel in Figure 1, the excess fiscal capacity was very high for some contributing municipalities and the corresponding payments per capita were large in these three years.

We base the selection of our baseline sample on the differential fiscal capacity in 2014.[5] We restrict the group of contributing municipalities by excluding municipalities with an excess fiscal capacity in 2014 that was higher than the excess fiscal capacity of the municipality with the highest excess fiscal capacity which was not a permanent contributor. This corresponds to a maximum contribution of about €40 per capita in 2014. To get a comparable control group we use all municipalities with a higher differential fiscal capacity than the 10% percentile of those municipalities that were

[5]In general, the measure of differential fiscal capacity can hardly be governed by municipalities. On the one hand, it is linked to population measures, on the other hand to a hypothetical state-wide tax multiplier that is fixed by the state government. Neither of them can be influenced by fiscal policy decisions on short notice. Nevertheless, to exclude the possibility that municipalities may find ways to directly influence this measure, we use the (predetermined) differential fiscal capacity in 2014 to select our baseline sample. Our results are, however, robust to alternative selections, see Tables A4.7, A4.8, A4.9, and A4.10 in the Appendix.

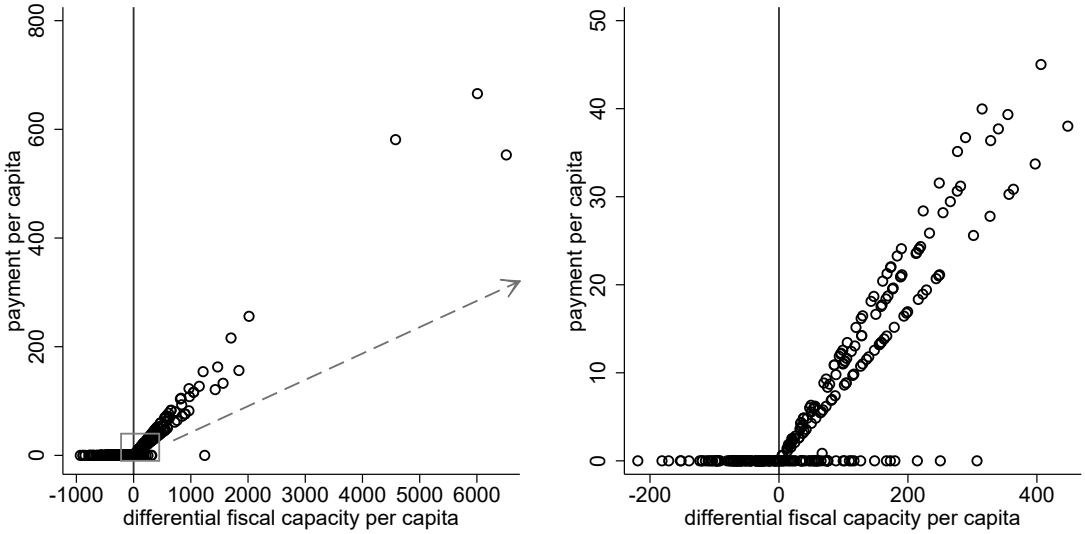

Figure 1: Differential fiscal capacity and transfers (2014–2016). Each marker represents one municipality in one year. The left-hand panel contains all NRW municipalities. The right-hand panel represents an excerpt of the left-hand panel comprising our baseline treatment and control group.

not permanent contributors but featured a positive differential at least once between 2014 and 2016.

The right-hand panel represents an excerpt of the left panel with our baseline treatment and control group. On the one hand, this procedure provides us with municipalities that are very similar with respect to the trend of key variables as we show below. On the other hand, we end up with a small sample. Additionally, we exclude those municipalities for which the treatment, and therefore the budget shock, was more sizable.

Table 3 comprises the number of years in which the municipalities in our baseline specifications had to fund additional payments. A total of 32 municipalities in our matched sample contributed to the horizontal transfer system in each of the years 2014 to 2016. The same number of municipalities was not selected as contributors despite comparable differential fiscal capacities in the reform year 2014. The remaining municipalities contributed once or twice.

Table 3: Baseline treatment and control group: number of contributions between 2014 and 2016

Years	**Freq.**
0	32
1	14
2	16
3	32
Total	94

We estimate binary probit regression models where we relate a dummy for whether a municipality was selected as a contributor in 2014 to a set of variables in the pre-treatment year 2013. Firstly, we include key population characteristics and do not find systematic correlations. The results are presented in Table A4.1 in the Appendix. Secondly, this analysis shows that neither a municipality's net borrowing nor different expenditure variables played a role for the selection. There is only a slightly statistically significant effect for social transfers. The political majorities in the council did not affect the selection either. In summary, these findings demonstrate that the selection is uncorrelated with any key population, fiscal and political variables before the treatment. Thus, the assignment to the treatment and the control group cannot be explained by these variables.

Additionally, we compare linear trends between 2011 and 2013 in Table A4.2 in the Appendix, and do not find any statistically significant differences in these trends in the four years before the reform between our treatment and our reference group.

4.2 Alternative estimation strategies

These results corroborate that the design of the reform allows us to identify a very suitable control group for the contributing municipalities. The drawback of our identification strategy is that the treatment for our restricted sample is quite small. This is also one reason, why we refrain from using alternative estimation strategies such as, for example, a regression kink design. This approach would exploit a change in the slope of the assignment function into treatment at a kink point, see Card et al. (2017) for an overview. In our setting, the likelihood of being selected as a contributing municipality would change in case of an excess fiscal capacity. As our assignment function is based on a double criterion, a "fuzzy regression kink design" could be an alternative

estimation strategy, see Card et al. (2015). However, our sample size around the cutoff point is likely to be far too small to obtain unbiased and precise estimates, see Ando (2017).

The assignment rule of this reform was applied for the first time. Therefore, the application of a difference-in-discontinuities design as introduced by Grembi et al. (2016) is not necessary. This approach would combine features of the regression discontinuity design and the difference-in-differences design. It addresses settings in which the treatment of interest changes jointly with other policies. This is commonly the case when relying on population thresholds, see Eggers et al. (2018) for a discussion. In our case it could be problematic to consider solely the excess fiscal capacity as an assignment rule. Hence, we stress the nature of the double criterion which provides us with a suitable control group and has not been used for other policy measures.

4.3 Event study

Given that our identification strategy is related to a generalized difference-in-differences setting, it relies on the assumption of common debt trends of the treated and non-treated. Therefore, we first analyze our data using an event study design. The event is defined as the total contribution in euro per capita during the years 2014 and 2016.[6] We estimate the following event study equation:

$$y_{i,t} = \alpha_i + \gamma_t + \sum_{\substack{s=-5 \\ s\neq -1}}^{2} \beta_s D_{i,t}^{s} \times totcontrib_i + \delta grants_{i,t} + \varepsilon_{i,t}, \tag{2}$$

where the variable $y_{i,t}$ denotes net borrowing, revenues or expenditures per capita or the tax rate multiplier, α_i and γ_t are municipality and year fixed effects, respectively, $D_{i,t}^{s}$ is a set of dummy variables indicating the first payment happening s years away, $totcontrib_i$ is the total contribution of municipality i in euro per capita, and the β_s are our parameters of interest. We include general grants ($grants_{i,t}$) as a control variable, because the reform also had a small effect on grants. The results are however robust to the exclusion of this variable. Our baseline event window runs from five years before the first payment to two years after.[7] As we have a balanced panel in terms of years, but treatment years differ across municipalities, we bin up event dummies at the endpoints of the event window (i.e., $s = -5$ and $s = 2$), see also McCrary (2007) and

[6] We additionally present results from analogous estimations with a dummy variable indicating the year of the first treatment instead of the contribution.

[7] Results are robust to different definitions of the event window.

Fuest et al. (2018). This means that the dummy $D_{i,t}^{-5}$ mirrors all observations from five or more years before the first payment was due. We normalize to the year before the first payment was due and provide the resulting event study graphs in Figures 2 and A4.1 in the Appendix, and the regression results in Tables A4.3 and A4.4 in the Appendix.

4.4 Fixed effects panel model

In our event study approach, identification is achieved within municipalities over time. We use this approach mainly to check for pre-treatment trends. To estimate the average treatment effect of the payment on fiscal variables, we estimate a fixed effects panel model. The latter is related to a difference-in-differences approach with a continuous treatment variable. A comparable approach is used by Acemoglu et al. (2004). We study the adjustment behavior of municipalities by looking at net borrowing, revenues, expenditures and tax rate multipliers. The respective dependent variable is $y_{i,t}$.

Given the panel structure of our data, we employ a fixed effects approach with municipality-specific intercepts and a set of time effects to control for unobserved heterogeneity between municipalities and for time trends. We explore dynamics by including lags of the contributions, as applied for example by Autor (2003). Additionally, we test for the assumption of identical counterfactual trends in treatment and control groups by using leads of the treatment. Accordingly, we estimate models of the following form for per capita net borrowing, revenues and expenditures as well as the tax rates in municipality i in year t:

$$y_{i,t} = \alpha_i + \gamma_t + \sum_{j=-m}^{n} \beta_j contrib_{i,t+j} + \delta_k x_{ki,t} + \varepsilon_{i,t}, \tag{3}$$

where α_i are municipality fixed effects, γ_t are year fixed effects, $contrib_{i,t}$ is a variable indicating the per capita contribution of municipality i in year t. We include m leads and n lags of the treatment effect; the coefficient on the jth lead or lag is β_j; $x_{ki,t}$ are control variables, and δ_k the corresponding parameter to be estimated. In our baseline specifications, we only include general grants as a control variable. We include additional control variables in the spirit of Altonji et al. (2005) as a robustness check.

5 Empirical results

5.1 Event study

We first present results from our event study approach for different fiscal variables of interest. In Figure 2 we plot results for net borrowing, revenues from own taxes, and the two tax rates that generate the most important sources of municipal revenue: the tax on property and the tax on business profits. We do not find an effect that is statistically significantly different from zero in the pretreatment years for any of these variables. However, net borrowing increases after the first contribution is made. Two years after the first payment, the point estimate is even higher than one. This would mean that for every additional euro, net borrowing increases by more than one euro. The results for the revenue from own taxes could provide an explanation for this result. While expenditures increase because of the additional payment, own source revenues decrease. In the second year after the first payment, the point estimate is also significantly lower. This in turn could be explained by a negative effect on the tax rate on business profits in the first two years after the first payment. Such effect on tax rates would be reflected with a delay in lower cash inflows in subsequent years. In Table A4.3 in the Appendix, we present the corresponding estimations.

Figure A4.1 in the Appendix includes results for further variables of interest. For these expenditure and revenue categories, we do not find any significant differences in the pretreatment years. In the years after the first payment, we observe only a significant effect for social transfers. The magnitude of this effect is however small.

As an alternative approach, we re-estimate all specifications with a dummy variable indicating the first year a contribution was due without interacting this binary variable with the amount of the total contribution. As shown in Figures A4.2 and A4.3 in the Appendix, results point in the same direction. With this specification, there are no differences in the years before the first treatment. We find a positive effect on net borrowing, a negative effect on revenue from own taxes. The effects for the tax rates are, however, no longer statistically significantly different from zero.

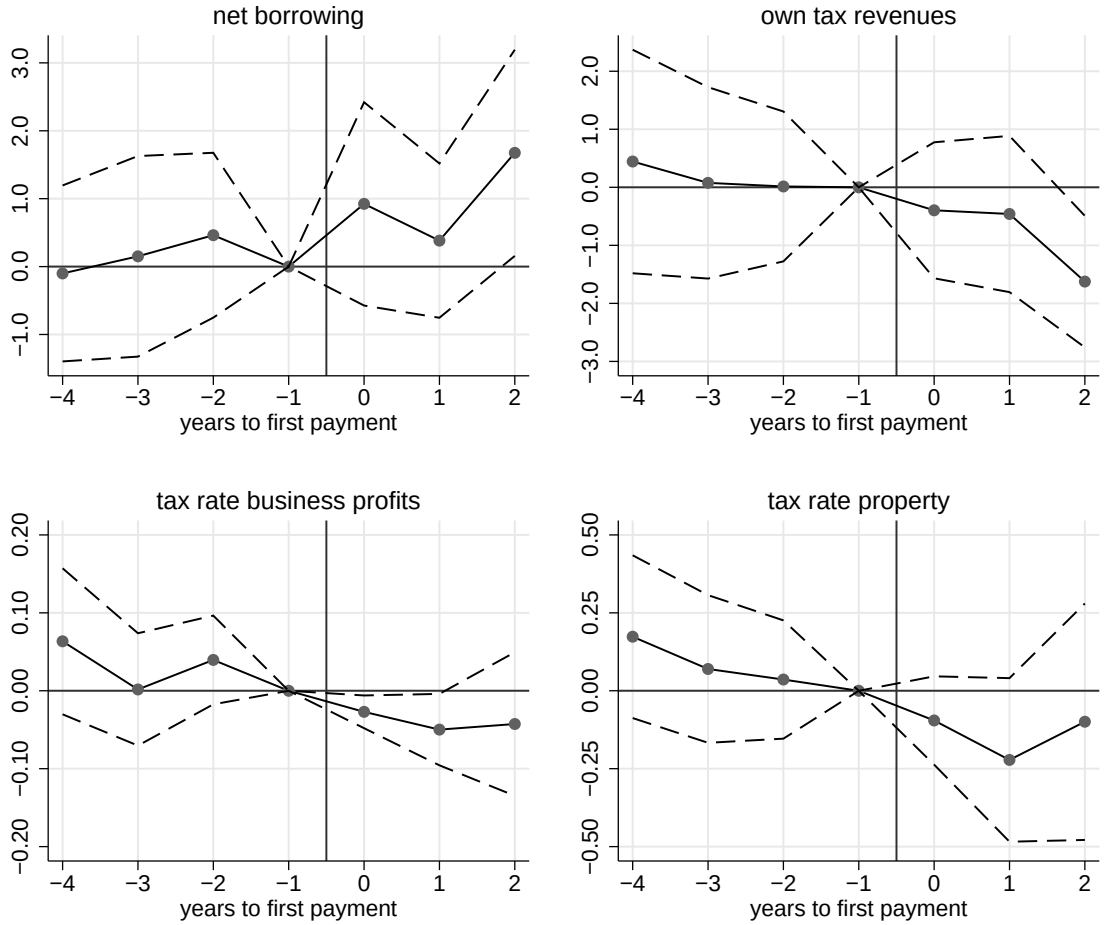

Figure 2: Key fiscal variables before and after the first payment, debt and taxes. The vertical line indicates the year of the first payment. The solid line plots estimates using a quasi-event specification with a balanced panel of municipalities covering the seven years surrounding the first payment date with municipality and time fixed effects. The treatment is the total amount of contributions in euro per capita in 2014–2016. Dashed lines indicate 95% confidence intervals. Standard errors are clustered at the municipal level.

5.2 Fixed effects panel model

In this Section, we present our baseline results from estimating the effect of the contribution on key fiscal variables using a fixed effects panel model. As in our event study, we first consider net borrowing per capita, the revenues from own taxes per capita and the tax rates on business profits as well as on property. For each of these variables, we first study the contemporaneous impact of the contribution. Results are presented in Columns (1), (3), (5), and (7) in Table 4. We find a positive effect on net borrowing, again larger than one. It is statistically significantly different from zero at the 0.05 level. The size of the effect is remarkable as it cannot be explained by the additional transfers alone. Our estimations yield no significant impact on tax revenue. However, we find a negative effect for both tax rates. For each euro of the contribution, the negative effect on the tax rate multiplier is 0.57 points in case of the property tax, and 0.16 points in case of the business tax. A contribution of €20, which is the mean contribution, corresponds to a decrease of tax rates by 2.7% and 0.8%, respectively.

Table 4: Main results: the impact of the contribution on debt and taxes

	Specification							
	net borrowing		tax revenues		tax rate property		tax rate business	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution$_t$	2.174**	1.797*	-1.300	-0.275	-0.570**	-0.449**	-0.155**	-0.127**
	(2.47)	(1.88)	(-0.94)	(-0.18)	(-2.24)	(-2.19)	(-2.06)	(-2.00)
contribution$_{(t-1)}$		-0.666		-2.259		-0.537*		-0.0733
		(-0.53)		(-1.34)		(-1.87)		(-1.07)
contribution$_{(t-2)}$		3.598**		-2.348*		0.217		-0.0448
		(2.33)		(-1.71)		(0.55)		(-0.46)
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	752	752	752	752	752	752	752	752
number of municipalities	94	94	94	94	94	94	94	94

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In a next step, we consider delayed effects. For example, if tax rates are adjusted, this has an effect on tax revenue, in particular in subsequent years. Most expenditures also can only be adjusted in subsequent years. Therefore, we include lagged values of the contributions in our estimations to incorporate feedback over time. For an application of such distributed lag model in a difference-in-differences setting see Autor

(2003). The corresponding results are presented in Columns (2), (4), (6), and (8) in Table 4. As expected, there is a negative effect on revenues from own taxes, when considering the second lag of the contributions, and also a large positive effect on net borrowing.

Analogously, we present our results for our four expenditure categories in Table 5. When considering the contemporaneous impact of the contribution, estimations yield no significant effects. In case of investment expenditures, we find a large negative effect for the first lag of the contribution, which is statistically significantly different from zero at the 0.05 level. With -1.99 it is also economically significant.

Table 5: Main results: the impact of the contribution on expenditures

	Specification							
	investment		maintenance		personnel		social transfers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution_t	-0.170	0.473	0.696	0.725	0.102	0.0826	0.191	0.0922
	(-0.26)	(0.72)	(1.56)	(1.60)	(0.39)	(0.40)	(0.97)	(0.50)
$\text{contribution}_{(t-1)}$		-1.992**		-0.295		0.0584		0.316
		(-2.39)		(-0.63)		(0.23)		(1.42)
$\text{contribution}_{(t-2)}$		-0.417		0.352		0.0170		0.0428
		(-0.25)		(0.96)		(0.06)		(0.11)
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	752	752	752	752	752	752	752	752
number of municipalities	94	94	94	94	94	94	94	94

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3 Robustness checks

To test the robustness of the results obtained in the previous Section, we first perform a placebo analysis. We include leads instead of lags in our estimations. The results in Tables A4.5 and A4.6 in the Appendix show that the coefficients of the two leads are not statistically significantly different from zero.

In our baseline sample, we include municipalities that were never treated, always treated or treated once or twice, see Table 3. It is unlikely that the selection as a contributing municipality could be influenced by the municipalities in the sense that they could escape the contribution. Nevertheless, in a first step, we exclude all municipalities which were treated only once or twice. This leaves us with a sample

of 64 municipalities. As shown in Tables A4.7 and A4.8 in the Appendix, results are very similar to the baseline. In this case, we also find a significantly negative effect for the contemporaneous impact of the contribution on tax revenues.

In a second step, we include only those municipalities with a positive differential fiscal capacity in 2014 into our estimations. In this case, our sample consists of 62 municipalities. Tables A4.9 and A4.10 in the Appendix show very similar results compared to our baseline estimations. The effect on the business tax rate is the only one that is no longer statistically significant. The choice of the control group is therefore also unlikely to drive our results.

To address potential issues of bias from omitted variables, we provide estimations using the approach suggested by Altonji et al. (2005). The idea behind this approach is that if the point estimates are insensitive to the inclusion of additional (observable) control variables, they should be insensitive to unobservables as well, see also the explanations by Dahlberg et al. (2008). As control variables, we include the revenues from shared taxes as well as population characteristics. The results are provided in Tables A4.11 and A4.12 in the Appendix. Because point estimates hardly change, the potential bias due to omitted variables is likely to be small.

To address the problem of biased standard errors in difference-in-differences models as discussed by Bertrand et al. (2004), we assess the sensitivity of our estimates by clustering standard errors on different levels of aggregation and comparing results to our baseline, in which we cluster standard errors at the municipal level. This approach was suggested by Angrist and Pischke (2009), see also Fuest et al. (2018). We present the results in Tables A4.13 and A4.14 in the Appendix. We cluster standard errors at the municipal as well as the year level, and, additionally, at the county level. Standard errors differ only slightly from our baseline estimations.

6 Discussion and conclusion

Our results show that municipalities react to an unanticipated and exogenous expenditure shock by increasing net borrowing. The point estimate is even larger than the additional payment. This increase of net borrowing is accompanied by a negative effect on revenues from own taxes indicating that the treated municipalities refrain from increasing tax rates.

The finding that the spending shock translates in higher net borrowing in the short run is in line with the results of Corsetti et al. (2011). Additionally, they find that the

increase in debt is followed by a spending reversal, i.e. a decline of public spending below trend. Because municipalities in NRW are constrained by a balanced budget rule, either tax increases or spending cuts are likely to be necessary in the medium term. The design of the horizontal transfer scheme has made individual contributions unpredictable. This uncertainty may contribute to the postponed fiscal adjustment which in turn can make the adjustment more costly.

In terms of further research, it would be interesting to study the long-term consequences of such a spending shock as well as heterogeneous behavior between municipalities with different budgetary pressure or political constellations. It may be more difficult to enforce a policy measure rapidly if more than one party has to approve it. For example, Poterba (1994) finds that deficit adjustment is quicker if the fragmentation of local government is low. Alesina et al. (2006) also stress political factors to explain why countries postpone the stabilization of deficits.

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A Additional Tables

Table A4.1: Determinants of the selection as contributing municipality

	(1)	(2)	(3)	(4)	(5)
Population over age 65 (%)	0.0179				0.0435
	(0.28)				(0.54)
Share of employees (%)	-0.0314				0.0226
	(-0.42)				(0.27)
Net borrowing		-0.0000412			-0.000289
		(-0.04)			(-0.24)
Investment expenditures		0.000730			0.000637
		(0.50)			(0.39)
Maintenance expenditures		0.000588			0.00101
		(0.42)			(0.65)
Personnel expenditures		-0.000740			-0.000516
		(-0.38)			(-0.26)
Social transfers		0.00679*			0.00868*
		(1.75)			(1.72)
Tax rate property			-0.00222		-0.00169
			(-0.43)		(-0.31)
Tax rate business			-0.00357		-0.0175*
			(-0.41)		(-1.82)
Left-wing majority in council				-0.615	-0.219
				(-1.25)	(-0.47)
No majority in council				-0.147	-0.258
				(-0.44)	(-0.68)
Number of parties in council				0.167	0.0453
				(1.49)	(0.31)
No balanced budget				0.253	0.676
				(0.83)	(1.62)
_cons	0.495	-0.547	2.159	-1.102**	5.353
	(0.14)	(-0.84)	(0.84)	(-2.02)	(1.07)
N	94	94	94	94	94
Pseudo R^2	0.004	0.055	0.010	0.042	0.125

Notes: Regression coefficients of probit models. The dependent variable is being selected as a contributor in 2014. 94 municipalities included, see Table 3. Period: 2013. Political variables refer to the local elections in 2009. t-statistics are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.2: Pretreatment trends of municipality groups

	Linear trend	Trend differences between groups
	contributors in 2014	reference group *minus* contributors
	(1)	(2)
	A. Population	
Population	65.222	-65.989
	[73.814]	(76.912)
Population over age 65 (%)	0.174	0.023
	[0.017]	(0.024)
Share of employees (%)	0.485	0.034
	[0.023]	(0.040)
Share of foreign inhabitants (%)	0.285	-0.014
	[0.031]	(0.056)
	B. Baseline fiscal variables	
Revenues from own taxes and fees	48.941	-26.148
	[43.466]	(44.269)
Revenues from shared taxes	22.823	-0.874
	[0.884]	(1.314)
Tax rate property	10.238	0.762
	[1.859]	(2.910)
Tax rate business profits	3.024	0.631
	[1.317]	(1.500)
Personnel expenditures	7.225	-3.423
	[2.249]	(3.055)
Maintenance expenditures	-1.684	-5.920
	[4.558]	(6.512)
Social transfers	3.523	-1.360
	[1.168]	(1.739)
Investment expenditures	17.376	-0.575
	[6.898]	(11.006)
Net borrowing	-10.172	10.883
	[15.591]	(19.778)
N	36	58

Notes: This table describes linear trends for different groups of municipalities between the years 2011 to 2013. Column (1) shows the linear trend for contributing municipalities in 2014 with an excess fiscal capacity which was smaller than the excess fiscal capacity of the municipality with the highest excess fiscal capacity which was not a permanent contributor. Column (2) compare means of linear trends of the reference group with the linear trend in column (1). The reference group comprises those municipalities with a higher differential fiscal capacity than the 10% percentile of those municipalities that were no permanent contributors but featured a positive differential at least once between 2014 and 2016. Standard errors are reported in parentheses and clustered at the municipal level; standard deviations are reported in brackets. All financial data are in prices of 2010.

Table A4.3: Event study estimates: Effects for debt and taxes

	Specification			
	net borrowing	tax revenues	tax rate business	tax rate property
	(1)	(2)	(3)	(4)
contributor(t)	0.924	-0.396	-0.0270**	-0.0952
	(1.23)	(-0.67)	(-2.55)	(-1.33)
contributor(t+1)	0.383	-0.459	-0.0498**	-0.222*
	(0.67)	(-0.68)	(-2.16)	(-1.68)
contributor(t+2)	1.676**	-1.624***	-0.0427	-0.0993
	(2.19)	(-2.85)	(-0.92)	(-0.52)
contributor(t-2)	0.463	0.0153	0.0396	0.0362
	(0.76)	(0.02)	(1.38)	(0.38)
contributor(t-3)	0.151	0.0767	0.00173	0.0700
	(0.20)	(0.09)	(0.05)	(0.59)
contributor(t-4)	-0.101	0.445	0.0635	0.174
	(-0.15)	(0.46)	(1.35)	(1.32)
contributor(t-5)	-0.566	-0.834	0.0898*	0.263*
	(-0.77)	(-0.82)	(1.84)	(1.80)
municipality f.e.	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes
observations	752	752	752	752
municipalities	94	94	94	94

Notes: Table reports results from an event study design. The dependent variables are net borrowing and revenues from own taxes per capita in prices of 2010 in Columns (1) and (2), and the tax rate multipliers in Columns (3) and (4). The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.4: Event study estimates: Effects for expenditures and revenues

	Specification					
	expenditures				revenues	
	investment	maintenance	social tranfers	personnel	charges or fees	shared taxes
	(1)	(2)	(3)	(4)	(5)	(6)
contributor(t)	0.263	0.370*	0.0999	0.0948	-0.0367	0.0164
	(0.67)	(1.69)	(1.52)	(0.95)	(-0.21)	(0.78)
contributor(t+1)	-0.655	0.0267	0.167**	0.0197	-0.254	0.0510
	(-1.58)	(0.15)	(2.23)	(0.18)	(-1.11)	(1.01)
contributor(t+2)	-0.538	0.273	0.155	0.00613	0.241	0.0800
	(-0.85)	(1.07)	(1.05)	(0.04)	(0.73)	(1.27)
contributor(t-2)	0.192	-0.0381	0.0384	0.0885	-0.283	0.000381
	(0.52)	(-0.25)	(0.75)	(1.12)	(-1.38)	(0.02)
contributor(t-3)	0.670*	-0.0764	0.0708	-0.00122	-0.245	-0.0194
	(1.67)	(-0.32)	(0.76)	(-0.01)	(-1.20)	(-0.38)
contributor(t-4)	-0.415	-0.0393	-0.00293	-0.167	-0.0599	-0.0139
	(-1.16)	(-0.17)	(-0.03)	(-0.89)	(-0.24)	(-0.23)
contributor(t-5)	-0.637	0.0193	-0.0648	-0.0348	-0.313	0.0176
	(-1.65)	(0.07)	(-0.62)	(-0.20)	(-1.17)	(0.31)
municipality f.e.	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes
observations	752	752	752	752	752	752
municipalities	94	94	94	94	94	94

Notes: Table reports results from an event study design. The dependent variables are expenditures and revenues per capita in prices of 2010. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.5: Robustness check: Placebo treatment, debt and taxes

	Specification			
	net borrowing	tax revenues	tax rate business	tax rate property
	(1)	(2)	(3)	(4)
contribution$_{(t+1)}$	1.135	-0.544	-0.0710	-0.286
	(0.79)	(-0.29)	(-0.84)	(-1.39)
contribution$_{(t+2)}$	0.391	0.570	-0.0168	-0.0179
	(0.42)	(0.55)	(-0.29)	(-0.11)
municipality f.e.	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes
observations	564	564	564	564
municipalities	94	94	94	94

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.6: Robustness check: Placebo treatment, expenditures

	Specification					
	expenditures				revenues	
	investment	maintenance	social tranfers	personnel	charges or fees	shared taxes
	(1)	(2)	(3)	(4)	(5)	(6)
contribution$_{(t+1)}$	-0.458	0.557	0.102	0.189	0.494	-0.0930
	(-0.69)	(1.07)	(0.64)	(0.68)	(1.18)	(-1.21)
contribution$_{(t+2)}$	0.867	-0.0284	0.0857	0.0473	0.0614	0.0536
	(1.16)	(-0.06)	(0.65)	(0.25)	(0.17)	(0.65)
municipality f.e.	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes
observations	564	564	564	564	564	564
municipalities	94	94	94	94	94	94

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.7: Robustness check: Choice of the treatment group, debt and taxes

	Specification							
	net borrowing		tax revenues		tax rate property		tax rate business	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution_t	1.893**	1.383	-2.466**	-1.775	-0.776**	-0.562**	-0.163*	-0.134
	(2.08)	(1.41)	(-2.16)	(-1.41)	(-2.43)	(-2.47)	(-1.68)	(-1.63)
$\text{contribution}_{(t-1)}$		-0.861		-0.333		-0.506		-0.0423
		(-0.63)		(-0.24)		(-1.35)		(-0.50)
$\text{contribution}_{(t-2)}$		3.570**		-2.418**		-0.0927		-0.0554
		(2.23)		(-2.25)		(-0.20)		(-0.55)
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	512	512	512	512	512	512	512	512
number of municipalities	64	64	64	64	64	64	64	64

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities from our baseline sample which were either permanent contributors or never contributors between 2014 and 2016. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.8: Robustness check: Choice of the treatment group, expenditures

	Specification							
	investment		maintenance		personnel		social transfers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution_t	-0.00343	0.856	0.259	0.470	0.163	0.114	0.0333	-0.114
	(-0.00)	(1.12)	(0.49)	(0.83)	(0.50)	(0.43)	(0.15)	(-0.65)
$\text{contribution}_{(t-1)}$		-2.632***		-0.421		0.0807		0.257
		(-2.91)		(-0.84)		(0.25)		(1.02)
$\text{contribution}_{(t-2)}$		0.587		-0.219		0.0813		0.214
		(0.33)		(-0.54)		(0.26)		(0.51)
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	512	512	512	512	512	512	512	512
number of municipalities	64	64	64	64	64	64	64	64

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in Euro per capita. The sample includes all municipalities from our baseline sample which were either permanent contributors or never contributors between 2014 and 2016. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.9: Robustness check: Choice of the control group, debt and taxes

	Specification							
	net borrowing		tax revenues		tax rate property		tax rate business	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution$_t$	1.827**	1.371	-1.747	-0.919	-0.482*	-0.390*	-0.109	-0.0965
	(2.07)	(1.39)	(-1.11)	(-0.56)	(-1.70)	(-1.70)	(-1.41)	(-1.43)
contribution$_{(t-1)}$		-0.450		-1.047		-0.384		-0.0235
		(-0.32)		(-0.77)		(-1.04)		(-0.28)
contribution$_{(t-2)}$		4.210**		-3.818***		0.127		-0.0451
		(2.62)		(-2.84)		(0.29)		(-0.44)
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	496	496	496	496	496	496	496	496
number of municipalities	62	62	62	62	62	62	62	62

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between 0 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.10: Robustness check: Choice of the control group, expenditures

	Specification							
	investment		maintenance		personnel		social transfers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution$_t$	-1.133*	-0.400	0.898*	0.645	0.344	0.276	0.142	0.0733
	(-1.74)	(-0.58)	(1.85)	(1.19)	(1.24)	(1.24)	(0.62)	(0.35)
contribution$_{(t-1)}$		-2.732***		0.619		0.121		0.102
		(-2.94)		(1.21)		(0.40)		(0.37)
contribution$_{(t-2)}$		0.315		0.560		0.241		0.287
		(0.17)		(1.59)		(0.78)		(0.63)
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	496	496	496	496	496	496	496	496
number of municipalities	62	62	62	62	62	62	62	62

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between 0 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.11: Robustness check: Potential bias due to omitted variables unlikely, debt and taxes

	Specification							
	net borrowing		tax revenues		tax rate property		tax rate business	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution$_t$	1.797*	1.762*	-0.275	-0.261	-0.449**	-0.409**	-0.127**	-0.110*
	(1.88)	(1.82)	(-0.18)	(-0.18)	(-2.19)	(-2.04)	(-2.00)	(-1.91)
contribution$_{(t-1)}$	-0.666	-0.675	-2.259	-2.218	-0.537*	-0.538*	-0.0733	-0.0758
	(-0.53)	(-0.54)	(-1.34)	(-1.32)	(-1.87)	(-1.84)	(-1.07)	(-1.14)
contribution$_{(t-2)}$	3.598**	3.570**	-2.348*	-2.256*	0.217	0.103	-0.0448	-0.0722
	(2.33)	(2.35)	(-1.71)	(-1.77)	(0.55)	(0.25)	(-0.46)	(-0.71)
full set of controls	no	**yes**	no	**yes**	no	**yes**	no	**yes**
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	752	750	752	750	752	750	752	750
number of municipalities	94	94	94	94	94	94	94	94

Notes: In the spirit of Altonji et al. (2005), the invariance of the estimated coefficients to the inclusion of the full set of control variables indicates that the estimates are unlikely to be biased due to omitted and potentially unobservable variables. Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. The set of covariates includes revenues from shared taxes, the share of employees, the shares of inhabitants below the age of 25, and the share of foreign inhabitants. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.12: Robustness check: Potential bias due to omitted variables unlikely, expenditures

	Specification							
	investment		maintenance		personnel		social transfers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
contribution$_t$	0.473	0.467	0.725	0.671	0.0826	0.0518	0.0922	0.0995
	(0.72)	(0.71)	(1.60)	(1.51)	(0.40)	(0.26)	(0.50)	(0.55)
contribution$_{(t-1)}$	-1.992**	-2.119**	-0.295	-0.318	0.0584	0.0652	0.316	0.266
	(-2.39)	(-2.55)	(-0.63)	(-0.70)	(0.23)	(0.26)	(1.42)	(1.16)
contribution$_{(t-2)}$	-0.417	-0.644	0.352	0.365	0.0170	0.0592	0.0428	-0.0688
	(-0.25)	(-0.39)	(0.96)	(0.99)	(0.06)	(0.20)	(0.11)	(-0.17)
full set of controls	no	**yes**	no	**yes**	no	**yes**	no	**yes**
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	752	750	752	750	752	750	752	750
number of municipalities	94	94	94	94	94	94	94	94

Notes: In the spirit of Altonji et al. (2005), the invariance of the estimated coefficients to the inclusion of the full set of control variables indicates that the estimates are unlikely to be biased due to omitted and potentially unobservable variables. Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. The set of covariates includes revenues from shared taxes, the share of employees, the shares of inhabitants below the age of 25, and the share of foreign inhabitants. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.13: Robustness with respect to clustering, debt and taxes

	Specification											
	net borrowing			tax revenues			tax rate property			tax rate business		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
contribution$_t$	1.797*	1.797*	1.797**	-0.275	-0.275	-0.275	-0.449**	-0.449**	-0.449***	-0.127**	-0.127**	-0.127**
	(1.88)	(1.90)	(2.13)	(-0.18)	(-0.20)	(-0.17)	(-2.19)	(-2.29)	(-3.28)	(-2.00)	(-2.01)	(-2.27)
contribution$_{(t-1)}$	-0.666	-0.666	-0.666	-2.259	-2.259	-2.259	-0.537*	-0.537**	-0.537*	-0.0733	-0.0733	-0.0733
	(-0.53)	(-0.51)	(-0.46)	(-1.35)	(-1.44)	(-1.29)	(-1.87)	(-1.98)	(-1.77)	(-1.07)	(-0.85)	(-1.14)
contribution$_{(t-2)}$	3.598**	3.598**	3.598**	-2.348*	-2.348	-2.348	0.217	0.217	0.217	-0.0448	-0.0448	-0.0448
	(2.34)	(2.27)	(2.18)	(-1.71)	(-1.44)	(-1.63)	(0.55)	(0.50)	(0.52)	(-0.46)	(-0.37)	(-0.53)
clustering at level of	mun	mun×year	county	mun	mun×year	county	mun	mun×year	county	mun	mun×year	county
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	752	752	752	752	752	752	752	752	752	752	752	752
number of municipalities	94	94	94	94	94	94	94	94	94	94	94	94

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4.14: Robustness with respect to clustering, expenditures

	Specification											
	investment			maintenance			personnel			social transfers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
contribution_{t}	0.473	0.473	0.473	0.725	0.725*	0.725*	0.0826	0.0826	0.0826	0.0922	0.0922	0.0922
	(0.72)	(0.74)	(0.85)	(1.60)	(1.66)	(1.99)	(0.40)	(0.40)	(0.45)	(0.50)	(0.53)	(0.59)
$\text{contribution}_{(t-1)}$	-1.992**	-1.992**	-1.992**	-0.295	-0.295	-0.295	0.0584	0.0584	0.0584	0.316	0.316	0.316
	(-2.39)	(-2.37)	(-2.59)	(-0.63)	(-0.58)	(-0.74)	(0.23)	(0.22)	(0.24)	(1.42)	(1.35)	(1.29)
$\text{contribution}_{(t-2)}$	-0.417	-0.417	-0.417	0.352	0.352	0.352	0.0170	0.0170	0.0170	0.0428	0.0428	0.0428
	(-0.25)	(-0.25)	(-0.24)	(0.96)	(0.72)	(1.00)	(0.06)	(0.05)	(0.06)	(0.11)	(0.10)	(0.10)
clustering at level of	mun	mun×year	county	mun	mun×year	county	mun	mun×year	county	mun	mun×year	county
municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
year f.e.	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
number of observations	752	752	752	752	752	752	752	752	752	752	752	752
number of municipalities	94	94	94	94	94	94	94	94	94	94	94	94

Notes: Table reports results from panel OLS regressions. The treatment variable is the contribution in euro per capita. The sample includes all municipalities in NRW with a differential fiscal capacity of between -75.95 euro per capita and 316.75 euro per capita in 2014. t-statistics are in parentheses. Standard errors are clustered at the municipal level. Period: 2009-2016. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B Additional Figures

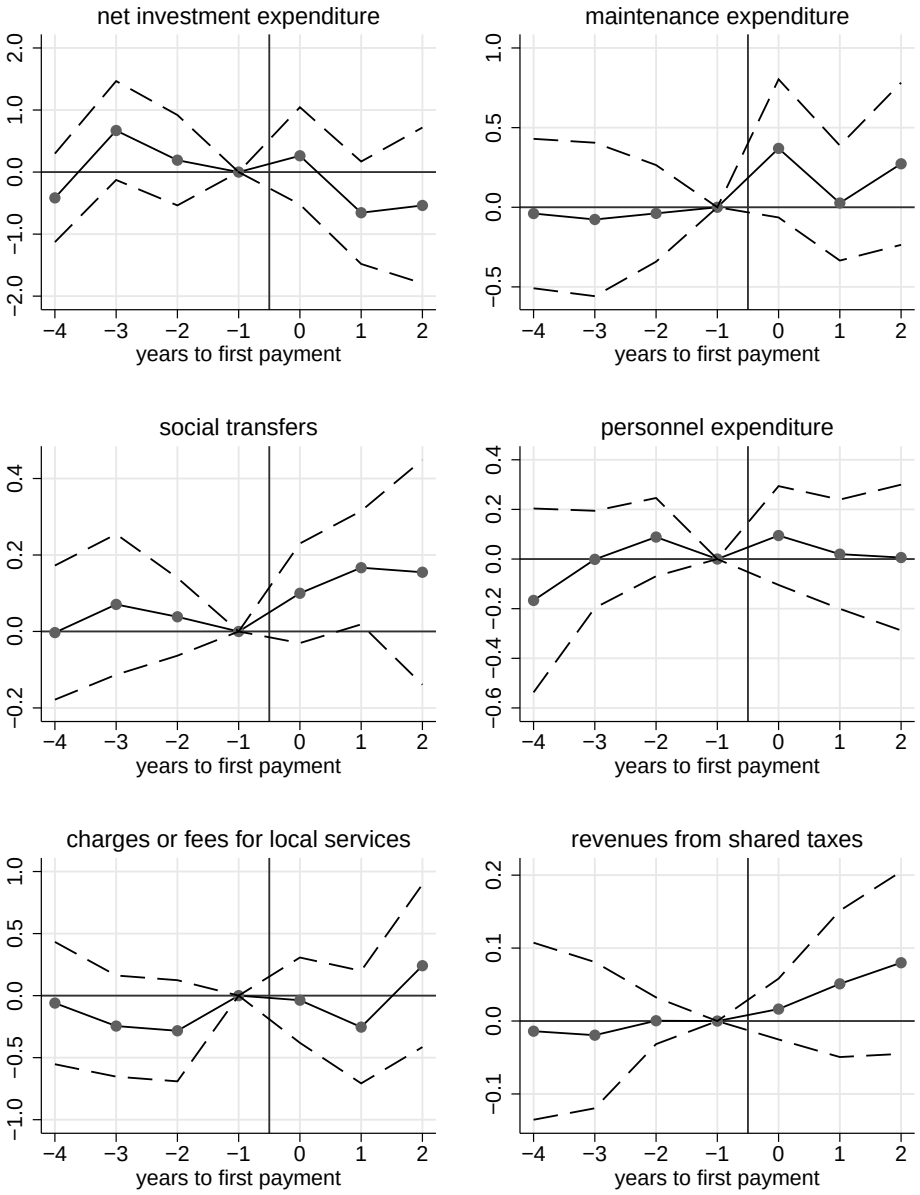

Figure A4.1: Key fiscal variables before and after the first payment, expenditures. The vertical line indicates the year of the first payment. The solid line plots estimates using a quasi-event specification with a balanced panel of municipalities covering the seven years surrounding the first payment date with municipality and time fixed effects. The treatment is the total amount of contributions in euro per capita between 2014 and 2016. Dashed lines indicate 95% confidence intervals. Standard errors are clustered at the municipal level.

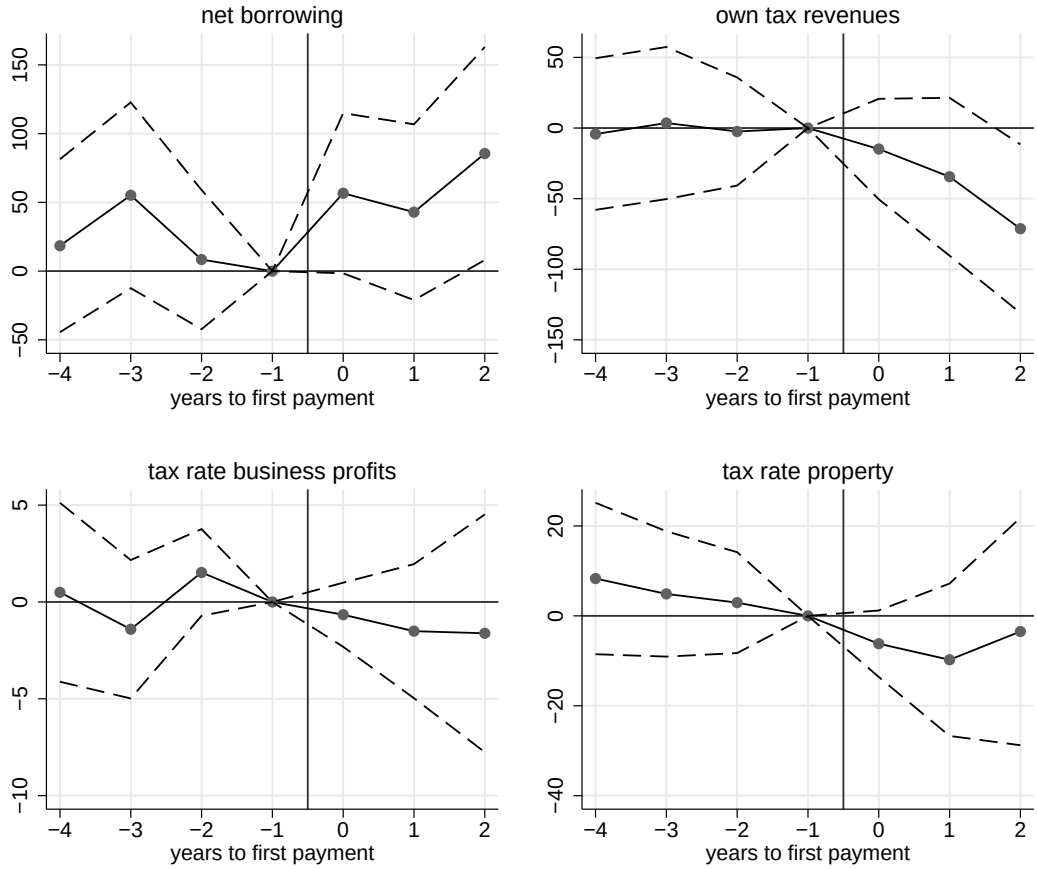

Figure A4.2: Key fiscal variables before and after the first payment (binary variable), debt and taxes. The vertical line indicates the year of the first payment. The solid line plots estimates using a quasi-event specification with a balanced panel of municipalities covering the seven years surrounding the first payment date with municipality and time fixed effects. The treatment is a dummy variable indicating the first contribution. Dashed lines indicate 95% confidence intervals. Standard errors are clustered at the municipal level.

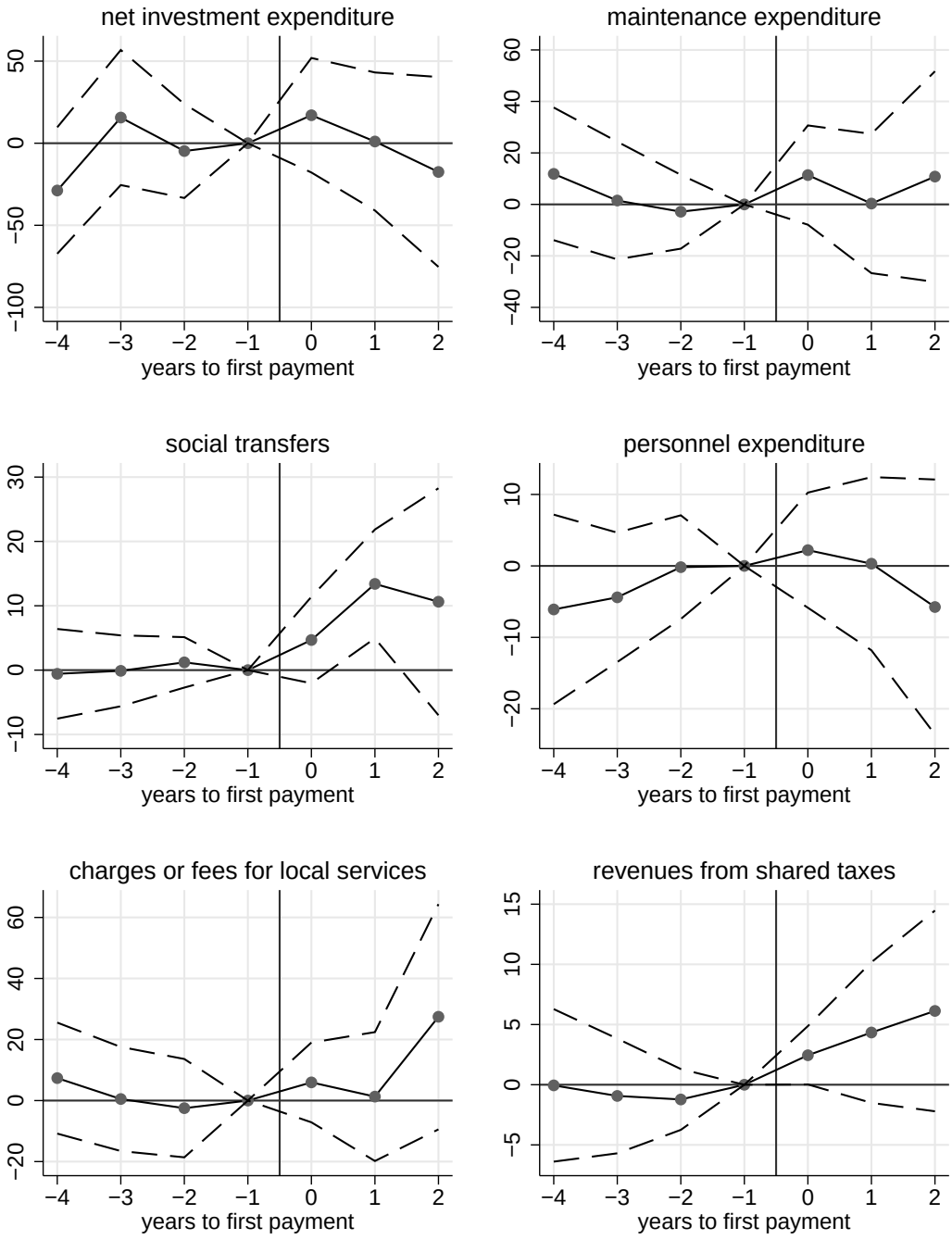

Figure A4.3: Key fiscal variables before and after the first payment, expenditures and revenues. The vertical line indicates the year of the first payment. The solid line plots estimates using a quasi-event specification with a balanced panel of municipalities covering the seven years surrounding the first payment date with municipality and time fixed effects. The treatment is a dummy variable indicating the first contribution. Dashed lines indicate 95% confidence intervals. Standard errors are clustered at the municipal level.