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## Fiscal and Economic Effects of Local Austerity

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# Fiscal and Economic Effects of Local Austerity

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# Fiscal and Economic Effects of Local Austerity

## Abstract

We study the consequences of a large-scale austerity program targeting financially-constrained municipalities in Germany. For identification, we exploit the quasi-random assignment of treatment among equally-distressed municipalities using a difference-in-differences design. The policy helped targeted municipalities to consolidate budgets. Whereas the amount of fiscal consolidation was homogeneous among treated municipalities, strategies of consolidation differed between smaller and larger municipalities. The former primarily cut spending on local public services, whereas the latter predominantly relied on tax increases. We detect no adverse economic effects but sizable negative effects on population levels and house prices in municipalities reducing local amenities.

JEL-Codes: H740, H730, H110, H300.

Keywords: austerity, fiscal consolidation, local amenities, taxes, spatial equilibrium.

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# 1 Introduction

Over the past decades, many advanced countries have seen rising debt to GDP ratios at different levels of government (Yared, 2019). While the temporary take-up of debt may act as a suitable fiscal stimulus to counteract short-run economic shocks and smooth public expenditures, most economists recognize that excessively high debt levels will exhibit sizable negative effects on economic growth in the long run (see, e.g., Reinhart et al., 2012, Hébert and Schreger, 2017, Romer and Romer, 2018).

Against this backdrop, countries across the world have increasingly implemented policy measures to curtail or reduce debt at different levels of government. For example, the number of fiscal rules setting limits to government spending in order to curb debt accumulation at the federal, regional, or local level has increased by an order of magnitude over past decades (Lledó et al., 2017). Alesina et al. (2019a) further identify around 200 austerity policies in 16 selected OECD countries over the period 1978–2014 that aimed at the (drastic) reduction of governmental budget deficits by means of spending cuts or tax increases. However, to date, the costs and benefits of such fiscal consolidation policies remain heavily discussed among politicians and economists alike, comprising debates about the policies' overall economic impact, their political consequences, as well as their optimal design (see, e.g., Blyth, 2013, Wyplosz, 2013, Alesina et al., 2019b, and Born et al., 2020).

In this paper, we analyze the fiscal and economic consequences of the *Stärkungspakt Stadtfinanzen*, a large-scale austerity program targeting municipalities in Germany's most populous state, North Rhine-Westphalia, in 2011. The policy provided treated local governments with sizable financial support via intergovernmental transfers but also imposed strict consolidation requirements: municipalities' budgets had to be consolidated six (ten) years after program implementation (net of the policy-induced transfers).<sup>1</sup> Consolidation efforts were tightly monitored by fiscal oversight committees throughout program duration and municipalities stripped from their self-governance rights in case of non-compliance. However, treated municipalities had large discretion about their preferred strategies of how to consolidate local budgets beyond the policy-induced transfers: through spending cuts on voluntary expense items such as local public services or amenities, increases in the local property or the local business tax, or a combination of these local policy instruments.

We use this set-up to analyze three different questions: Did the local austerity policy meet its ultimate goal, i.e., did municipalities achieve budget balance? If yes, how did they achieve consolidation beyond and above the consolidation grants provided? And, last, did spending cuts or tax increases induce adverse economic consequences among local residents or firms?

In order to provide causal evidence on these questions, we exploit the quasi-random assignment of treatment among equally financially-distressed municipalities via a difference-in-differences approach. The then-acting state government linked program participation to municipalities' level of equity: those municipalities predicted to deplete equity by 2016 entered the program.<sup>2</sup> However, and in contrast to the case of corporations, public equity lacks "any predictive power for municipalities' true financial scope of action" (Mühlenkamp and Magin, 2010). It neither affects municipalities'

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<sup>1</sup> In 2010, municipal deficits amounted to around 17% of local revenues on average.

<sup>2</sup> We filed several requests at different state government agencies but did not receive any official information on the running variable, i.e., the state government's forecast of municipalities' equity in 2016 (see Section 3 for details).

interest rates on borrowing nor causes any other fiscal consequences.<sup>3</sup> Government advisors and opposition parties indeed proposed alternative criteria for treatment assignment that would have led to different compositions of the treatment group (see, e.g., Junkernheinrich et al., 2011, or Landtag Nordrhein-Westfalen, 2011a). Ultimately, the legislative process thus caused municipalities of equal financial distress—as measured by municipalities’ interest payments, annual surplus, or primary balance—to be differently treated: some were subject to the *Stärkungspakt*, others were not (our control group). In this sense, the setup mimics identification strategies pursued by Greenstone et al. (2010), Busso et al. (2013), and Kline and Moretti (2014) who all compare treated jurisdictions to those proposed or considered for treatment but ultimately not chosen. Common pre-trends in a broad range of observable characteristics for treatment and control group support the underlying identifying assumptions of the dynamic difference-in-differences approach.

Based on this set-up, we derive three sets of results. First, we show that the *Stärkungspakt* helped treated municipalities to consolidate their budgets. Six to eight years after treatment, municipalities improved their fiscal balance by around 210 EUR per capita on average (156 EUR net of consolidation grants). Each EUR of policy-induced consolidation grants resulted in a three EUR reduction in municipal deficits. The program also increased treated municipalities’ chance of reporting a balanced budget or annual surplus by more than 40 percentage points (22 percentage points net of grants). The estimated effects on fiscal consolidation are robust to various specifications of the difference-in-differences design and homogeneous across the distribution of treated municipalities. Second, we find notable heterogeneity in municipalities’ implemented strategies of fiscal consolidation by population size. Smaller municipalities with less than 20,000 inhabitants predominantly consolidated budgets by reducing spending on local public services. In contrast, larger municipalities mainly consolidated budgets by increasing local taxes. Smaller municipalities thus shifted the burden of consolidation on their residents, whereas larger municipalities also burdened local firms. We suggest that these differences in consolidation strategies reflect policy makers’ expectations about firm mobility, e.g., because of varying agglomeration rents for firms in jurisdictions of different size (see, e.g., Baldwin and Krugman, 2004, Koh et al., 2013). Third, we show that the policy-induced tax increases had no negative effects on the local economy. We neither find an effect on treated municipalities’ VAT or business tax base—proxies of local economic output—nor the local number of firms or jobs. Firms indeed seem to accept a (slightly) higher financial burden in light of accruing agglomeration rents. However, we detect economically sizable and statistically significant negative effects of fiscal consolidation on population levels and house prices for smaller municipalities. Relative to the control group, treated municipalities see a two percent decline in population levels. These results suggest the presence of spatial equilibrium and capitalization effects in the spirit of Rosen (1979) and Roback (1982) models and indicate that spending cuts on local amenities can be harmful.

In a final step, we carefully discuss the policy implications of the *Stärkungspakt*. First, we illustrate the policy-induced redistribution of public resources from untreated to treated municipalities. We document that both abundant municipalities as well as those financially-stricken but not chosen

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<sup>3</sup> As detailed below, interest rates on borrowing are unrelated to German municipalities’ level of equity because lenders acknowledge the de facto bailout of local jurisdictions by higher levels of government (Deutsche Bundesbank, 2016).

for treatment (our control group) had to finance parts of the policy's consolidation grants. Second, we show that the consolidation program had moderate negative effects on household welfare in all municipalities across NRW, and in particular in those subject to treatment. To offset these welfare losses, treated households would have to significantly value future benefits accruing from the local austerity program, e.g., in the form of lower future taxes, higher future public spending or increased fiscal autonomy. Last, although the *Stärkungspakt* led to improvements in municipal budgets, we argue that the state government largely overestimated its positive effects as policy implementation coincided with an overall improvement of the state's economic conditions.

Our paper contributes to the literature by providing new insights about the consequences of fiscal consolidation programs. Most evidence on the financial, economic, and political effects of fiscal rules and austerity policies has so far been based on cross-country comparisons, which gives rise to endogeneity concerns (see, e.g., Perotti, 2013, Heinemann et al., 2018, or Arias and Stasavage, 2019, for overviews).<sup>4</sup> Notable exceptions are studies by Grembi et al. (2016), Baskaran (2017), Christofzik and Kessing (2018), as well as Carreri and Martinez (2021), who exploit within-country variation in municipalities' exposure to fiscal rules in Italy, Germany, and Colombia, respectively. These studies provide consistent evidence that fiscal rules and oversight matter. If municipalities' scope for financial actions is eased, they generate larger deficits either because of lower local taxes (Grembi et al., 2016) or higher spending (Christofzik and Kessing, 2018). In turn, tighter fiscal rules decrease local governments' deficits (Baskaran, 2017, Carreri and Martinez, 2021).<sup>5</sup> These studies are consistent with seminal work by Poterba (1994), who shows that institutional rules on U.S. states' ability to accumulate deficits affect policy makers' spending and tax setting behavior in response to unexpected fiscal shocks. The stricter the rules, the faster governments' fiscal adjustments. We add to these studies by providing quasi-experimental evidence on the fiscal, economic, and welfare effects of a large local austerity program in a joint framework that flexibly accounts for potential confounders and allows observing treatment effect dynamics over a long time period.<sup>6</sup>

The results of our analysis further highlight the importance of spatial equilibrium forces in the context of fiscal policy reforms. Whereas previous work has predominantly assessed effects on measures of fiscal and economic performance, we emphasize the importance of population and housing market responses in the context of such reforms. In line with the predictions by Moretti (2011) and Albouy (2016), we show that those municipalities that cut spending on local amenities see relative declines in population levels and house prices; arguably because they become less attractive places to live in. While we acknowledge that such mobility responses may be more important at the local level, Bertoli et al. (2016) finds corresponding cross-country migration patterns in the aftermath of the European debt crisis and the imposed austerity reforms in Southern European countries.

Last, we carefully relate to the debate about the consequences of spending- versus revenue-

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<sup>4</sup> Recent studies by Romer and Romer (2010), Guajardo et al. (2014), Jordà and Taylor (2016), and Alesina et al. (2019a) limit their focus to policies of fiscal consolidation that are detached from business cycle considerations. This "narrative approach" limits concerns of endogeneity, but threats of unobserved confounders at the national level remain.

<sup>5</sup> In Columbia, fiscal consolidation induced no meaningful reductions in local public good provision. Investigating the introduction of tighter fiscal rules for a subset of municipalities in Italy, Pavese and Rubolino (2022) and Alpino et al. (2020) yet show that austerity may induce lower local spending or more progressive tax setting, respectively.

<sup>6</sup> Rappen (2017) and Boettcher et al. (2018) provide descriptive short-run evidence on the fiscal effects of the *Stärkungspakt*. We add to these studies by using a more rigorous identification strategy and jointly investigating municipalities' consolidation strategies as well as the policy's broader economic consequences and welfare effects.

based austerity policies. Alesina et al. (2019a) argue that spending-based consolidation may be economically less harmful, reducing GDP to a lesser and shorter extent than tax increases. Recent within-country evidence for the U.S. by Serrato and Zidar (2016) as well as Giroud and Rauh (2019) indeed demonstrates that higher taxes cause negative economic effects, reducing employment and inducing firm mobility across jurisdictions. In contrast, we find no adverse effects of the *Stärkungspakt* on the local economy, irrespective of the type of consolidation strategy pursued. We hypothesize that the policy-induced tax increases in larger municipalities may have been too low to offset firms' benefits accruing from location-specific production amenities in these jurisdictions.

The remainder of the paper is structured as follows. In Section 2, we discuss the underlying institutional setting and the reform of interest, as well as describe the data assembled. In Section 3, we discuss our proposed difference-in-differences design, the strategy's underlying assumptions as well as potential threats to identification. We present our results in Section 4. Finally, we assess the policy's welfare implications in Section 5. Section 6 concludes.

## 2 Institutional Background and Data

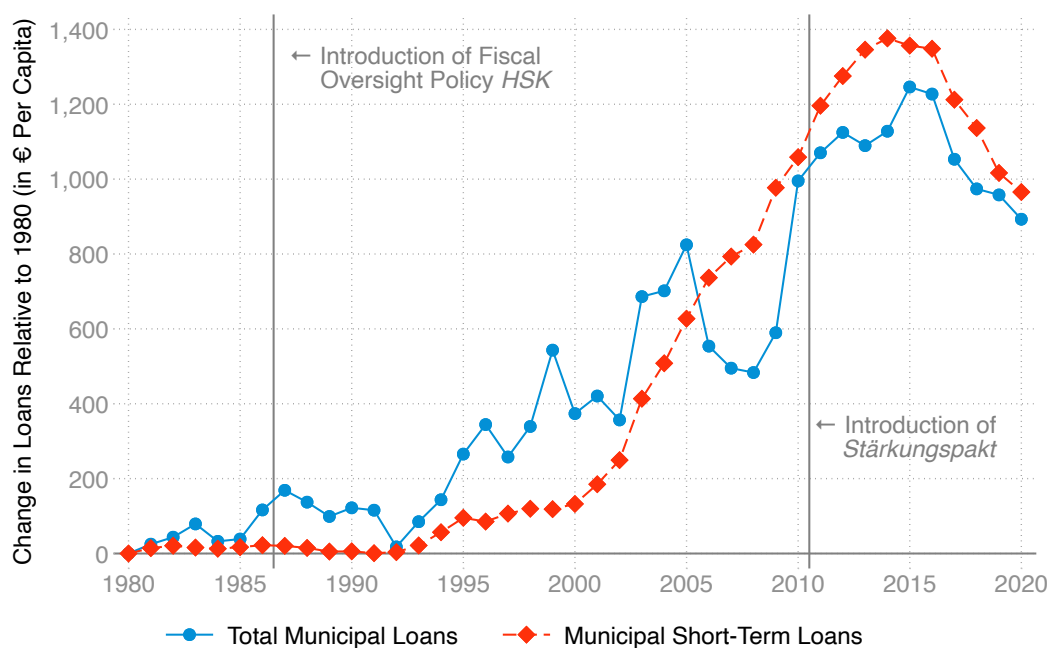
### 2.1 Municipal Finances in North Rhine-Westfalia

We study the effects of a local austerity program in Germany's most populous state, North Rhine-Westfalia (NRW), which is home to approximately 18 million inhabitants. NRW accounts for about one fifth of Germany's total population and GDP, respectively, and has long served as the economic powerhouse of the country. After World War II, the resident coal and steel industry served as a key driver of the country's economic miracle during the 1950s and 60s and transformed the state into one of the most important economic areas in Europe (Hassink, 1993, Goch, 2002). However, from the late 1960s onward, the rise of international competitors and lacking product demand caused many steel and coal regions to experience substantial unemployment and structural change (Hospers, 2004). Industrial transformation was of quite different success across NRW. Whereas some regions, such as the Rhineland in the south and Ostwestfalen-Lippe in the north-east of the state, today host a diverse set of industries, see little unemployment and rising population figures, others such as the Ruhrgebiet in central NRW face continuing reductions in local employment and population levels.

These adverse economic developments have long put considerable fiscal strain on all levels of government in NRW and in particular on municipal councils, Germany's lowest administrative unit of government. German municipalities have long enjoyed substantial rights of self-governance, both in terms of revenue collection and spending. Among others, municipalities levy taxes on local firm profits (*Gewerbesteuer*) and property (*Grundsteuer*), while fulfilling mandatory duties—such as the provision of welfare benefits to local residents according to federal law—as well as providing voluntary amenities to the population, e.g., local public services, theaters or sport facilities. Municipalities' actions are directed by the postulate of budget balance: in every year, revenues need to offset expenses. Municipalities may only take up debt in order to finance investments or to secure liquidity in the short run. However, in recent decades, there has been a notable increase in local spending due to the transfer of tasks from higher levels of government without the corresponding provision of sufficient additional funds (see, e.g., Holler et al., 2017). Examples include municipalities'



Figure 1: NRW Municipalities' Fiscal Strain over Time



Notes: This graph plots the evolution of NRW municipalities' average per capita debt since 1980 in 2010 prices. The vertical lines indicate the years of the introduction of the fiscal oversight mechanism *Haushaltssicherungskonzept* in 1987 and the *Stärkungspakt Stadtfinanzen* in 2011, respectively. Source: Federal Statistical Office and Statistical Office of NRW.

duty to cover the costs of accommodation for welfare recipients (imposed by the federal government in 2005) and obligation to provide daycare for children under the age of three (imposed in 2008). Thus, and despite the postulate of balanced budgets, municipalities' debt has been steadily increasing over recent decades (see Figure 1).

**Fiscal Oversight Policies.** To ease municipalities' rising fiscal strain and attain financially-sustainable local budgets, a system of fiscal oversight was first implemented in NRW in 1987. The *Haushaltssicherungskonzept* (henceforth: *HSK*), which is still in place today, comes into effect once annual expenses surpass revenues and reserves need to be depleted in a given magnitude in order to balance budgets.<sup>7</sup> Municipalities subject to the *HSK* are required to align their budget with higher levels of government and have to propose strategies to achieve a balanced budget in future years. In case of non-compliance or the presentation of non-sufficient consolidation plans, the respective higher authorities are allowed to block a municipality's budget for non-obligatory expenditures. The number of municipalities subject to the oversight mechanism increased quickly after its introduction, from eight out of 396 municipalities in NRW in 1987 to 135 in 1997, peaked in 2005, and remained rather stable thereafter at a level of around 100–130 covered municipalities per year (Junkernheinrich et al., 2011).

However, the implemented measure of fiscal oversight had no lasting effect on municipalities' financial strain (Geißler, 2009). As shown in Figure 1, the increase in municipal debt became

<sup>7</sup> Municipalities have to provide a consolidation plan to the fiscal oversight committee if the budget (plan) foresees a reduction of the general reserve by more than one 25% (5%) within one financial year (in two consecutive years), or in case a given municipality depletes its general reserve within the medium-term budget planning period (§76 GO NRW).

particularly sizable between the mid-1990s and late-2000s and led to persistent calls for additional measures targeting municipalities' tight fiscal situation (see, e.g., Articus, 2010, Junkernheinrich, 2010, Rosenfeld, 2010). These calls were echoed by all major political parties in NRW. However, proposed policies first centered around strategies that aimed at the rise and stabilization of municipalities' tax revenues (see, e.g., the coalition agreement of the 2005–2010 state government).

**The *Stärkungspakt* as an Explicit Austerity Program.** In December 2011, the succeeding state government eventually implemented an explicit local austerity program to tackle municipalities' growing budget deficits: the *Stärkungspakt Stadtfinanzen* (translates to “Act to Improve City Budgets”). The policy provided direct financial means for the group of targeted municipalities over a ten year period (2011–2020) but also imposed strict consolidation requirements: municipalities had to reach budget balance six (ten) years after the start of the program (net of the intergovernmental grants provided). Compliance with the stipulated consolidation efforts was strictly enforced. Municipalities that did not comply were deprived of their self-government rights, and decisions about local spending and revenue collection were transferred to higher levels of government. Whereas the expected scope and timeline of consolidation was thus tightly prescribed, treated municipalities, however, had large discretion about their preferred way of balancing budgets beyond and above the policy-induced fiscal consolidation grants: through spending cuts, tax increases, or a combination of the two.

Municipalities entered the consolidation scheme in two phases. First, in 2011, those municipalities that reported negative equity in 2010 or—based on their 2010 budget plan—were predicted to reach negative equity by 2013 were assigned to the austerity program. Participation was obligatory and non-deferrable. Second, those municipalities that were foreseen to report negative equity in their mid-term plan for 2014–2016 were allowed to join the consolidations scheme in 2012. Despite its voluntary nature, all eligible municipalities entered the scheme.<sup>8</sup>

Figure 2 plots the spatial distribution of municipalities across NRW that were targeted by the policy. In total, 61 municipalities entered the scheme in the two respective phases (34 in stage I, 27 in stage II). The map illustrates that participating municipalities are spread out across the state's five administrative districts (*Regierungsbezirke*, equivalent to NUTS 2 regions). Yet, there is also some amount of spatial clustering. The metropolitan statistical area Emscher-Lippe, the northern part of the Ruhr area, comprises twelve of the 61 treated municipalities, the metropolitan area Bochum/Hagen eleven. However, there are treated municipalities in nine of the state's 13 metropolitan statistical areas (henceforth: MSAs, *Raumordnungsregionen*). In our baseline specification of the difference-in-differences design we limit identification to within-MSA comparisons in order to account for differential trends across these regions (see Section 3 below). We show that estimated effects remain unchanged when accounting for time-varying local shocks at broader or finer geographical levels.

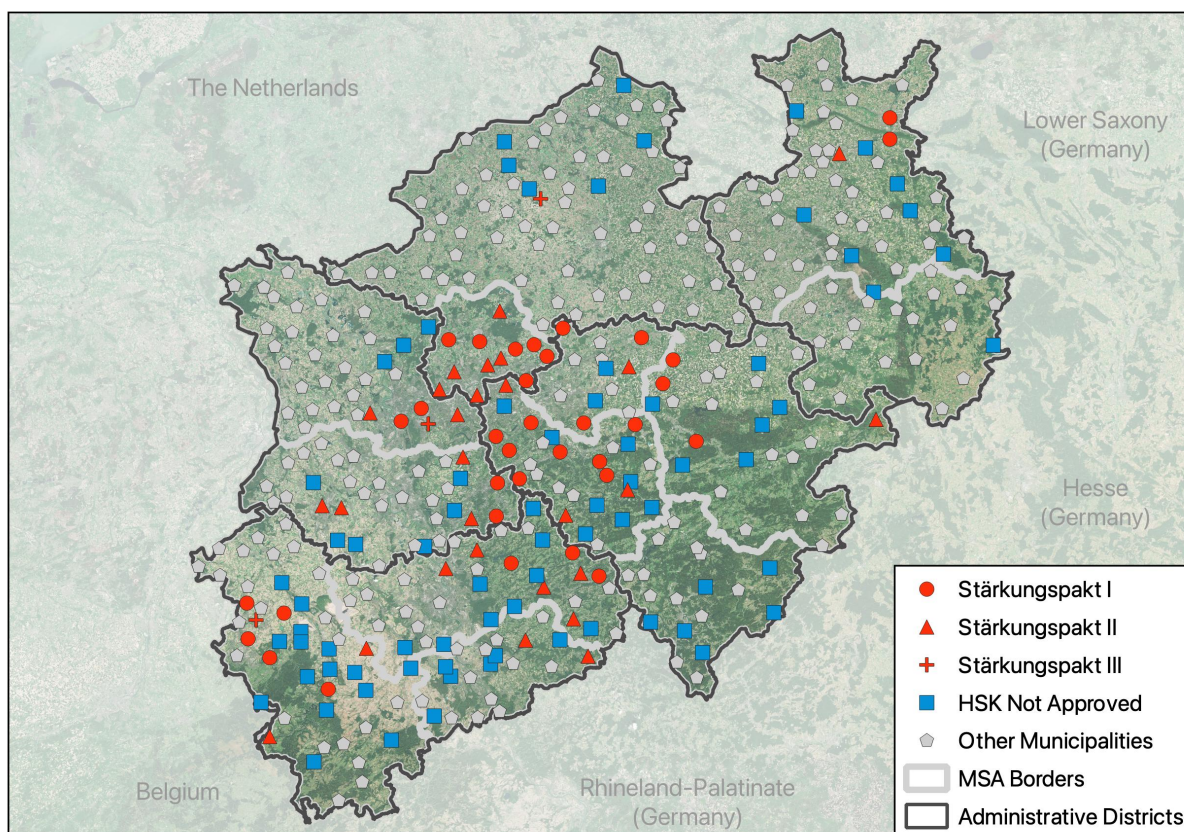
## 2.2 Data

For the purpose of our analysis, we combine information from various data sources. Foremost, we make use of detailed information on municipalities' annual financial accounts that are harmonized

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<sup>8</sup> In 2017, the *Stärkungspakt* was amended and three additional municipalities entered a third phase of the program. We drop these municipalities from the analysis as there is hardly any post-treatment data available to study effects.

Figure 2: Spatial Distribution of Treatment



Notes: This map displays the 396 municipalities of North Rhine-Westphalia. Colored in red are those municipalities that participated in the *Stärkungspakt* at different stages (as indicated by the different symbols). Municipalities colored in blue indicate municipalities that were equally financially-distressed as the set of treated municipalities but ultimately not subject to the policy (our control group). Grey markers indicate all other municipalities. The map further highlights the borders of the five administrative districts and 13 metropolitan statistical areas in NRW.

Maps: © GeoBasis-DE / BKG 2022 and European Union, Copernicus Sentinel-2 Data (2022).

and provided by NRW's statistical office (*IT.NRW*). Among others, the accounts comprise information on municipalities' varying sources of revenues, types of expenditures, their short- and long-run debt, as well as their annual surplus and level of equity. The latter information has been provided since 2009, when German municipalities had to alter their accounting systems from cash-based (*Kameralistik*) to accrual accounting (*Doppik*). With this change in accounting rules, municipalities had to create an opening balance and derive their respective level of equity. The change in accounting rules also alters the definition of municipalities' revenues and expenses before and after 2009 to some extent. Prior to 2009, municipal revenues comprised the amount of cash that was received in a given year from a given source (*Einnahmen*), whereas they comprise all earned annual revenues since 2009, irrespective of when the respective cash was actually received (*Erträge*). The same methodological difference holds true for municipalities' expenses.

Focusing on 2010, i.e., the year before policy implementation, Panel A of Appendix Table A.1 shows that municipalities' revenues primarily comprise of three key pillars: (i) local taxes, (ii) intergovernmental transfers, and (iii) fees. With regard to local taxes, accounting for around 27.1% of municipalities' total revenues, the local business tax (*Gewerbesteuer*) and the local property tax (*Grundsteuer B*) constitute the most important sources of revenue, totaling to 19.7% and 6.6% of

municipalities' overall revenues on average. Intergovernmental transfers account for around 44.7% of all revenues and primarily stem from fiscal equalization grants (17.5%) as well as the apportionment of revenues from the personal income and value added tax (17.7%); taxes levied at the national level and partially allocated to municipalities according to fixed formulas. Around 11.1% of municipalities' revenues further stem from fees and levies, e.g., from administrative or usage charges. The remaining 17.1% stem from other sources, such as the gains from privatization or profits of municipal companies.

Panel B of Appendix Table A.1 depicts municipalities' spending for different items. It becomes apparent that—ignoring expenditures on tax remittances and interest payments—municipalities spend most on the provision of public local services (around 21% on average). Municipal spending on social security as well as local infrastructure (e.g., roads, public transport, or health care facilities) accounts for approximately 12% and 14%, respectively. Local expenditures on education make up for around 8%, spending on public goods for around 6%, and business subsidies for around 1.5% of municipal expenditures on average. In the empirical analysis, we investigate the presence of policy-induced spending cuts on these items.

Panel C of Appendix Table A.1 summarizes municipalities' fiscal balance as of 2010. The average municipality reported higher expenditures than revenues—and only 12% of all municipalities in NRW reported a balanced or positive budget in that year.

To study the broader economic consequences of fiscal consolidation, we further draw upon detailed annual information on municipalities' number of firms, the local value-added and business tax base, population, and house prices. Annual information on municipalities' total number of firms come from the Research Institute of the Federal Employment Agency (*IAB*), information on municipalities' VAT and business tax base—variables used as proxies of local economic activity—from *IT.NRW*. Annual population figures stem from the latter source, too. Annual average house prices for each municipality base on the *RWI-GEO-RED: Real Estate Data* dataset provided by *FDZ Ruhr*, which contains information on all housing and flat sale advertisements on Germany's largest online real estate portal, *ImmoScout24*. Panel D of Appendix Table A.1 provides the corresponding descriptives.

### 3 Empirical Approach

#### 3.1 Estimation Model

To derive causal effects, we set up a dynamic difference-in-differences design that compares the pre- to post-reform evolution of fiscal and economic outcomes in municipalities subject to the policy with the respective evolution of outcomes in municipalities unaffected by the austerity program. Econometrically, we regress a given outcome variable  $y$ —say a measure of fiscal balance, different sources of revenues, expenditure types, or indicators of economic performance—of municipality  $m$  in year  $t$  on an indicator variable for program participation interacted with year dummies:

$$y_{mt} = \sum_{k \neq 2010} \beta_k \mathbb{1}(k = t) \text{Stärkungspakt}_m + \lambda_m + \rho_{zt} + \theta_{ct} + \varepsilon_{mt}. \quad (1)$$

In most regressions, we limit the event window to the period 2004–2018 ( $t, k \in [2004, 2018]$ ). The model further includes three different sets of fixed effects to account for unobserved confounders. First, we include municipality fixed effects ( $\lambda_m$ ) that control for unobserved time-invariant differences at the level of treatment and thus limit identification to within-unit changes over time. Second, we absorb time-varying common shocks at the broader regional level by including flexible time trends ( $\rho_{zt}$ ) for each metropolitan statistical area (MSA). Ultimately, this limits identification to the comparison of changes in outcomes in treated and untreated municipalities from the same MSA.<sup>9</sup> We show below that the comparison of geographically-close and economically-connected municipalities balances treatment and control group in terms of observable pre-treatment characteristics. Third, we allow for differential trends among municipalities subordinate to a given county (*kreisangehörige Gemeinden*) and municipalities constituting an independent county themselves (*kreisfreie Städte*), denoted by  $\theta_{ct}$ . Term  $\varepsilon_{mt}$  denotes the error term. We cluster standard errors at the county level in our baseline specification.

**Heterogeneous Treatment Effects.** Treated municipalities joined the consolidation program at two distinct points in time: either in 2011 or 2012, subject to their (predicted) level of equity (see Section 2.1 for details). In our baseline analysis, we ignore these different years of program entry because treatment assignment happened at the same time for both groups. Hence, even if some municipalities received the program’s consolidation grants and had to comply with the prescribed consolidation efforts one year later than others, they anticipated treatment and, therefore, might have changed their local policies right after assignment to the scheme. However, we acknowledge that this approach may blur the short-run effect pattern and may mask heterogeneity in treatment responses across the two groups. Therefore, we also (i) estimate treatment effects for both groups separately and (ii) implement the estimator by Borusyak et al. (2021) that is robust to heterogeneous treatment effects in two-way fixed effects models (see Section 4 below).

### 3.2 Identification

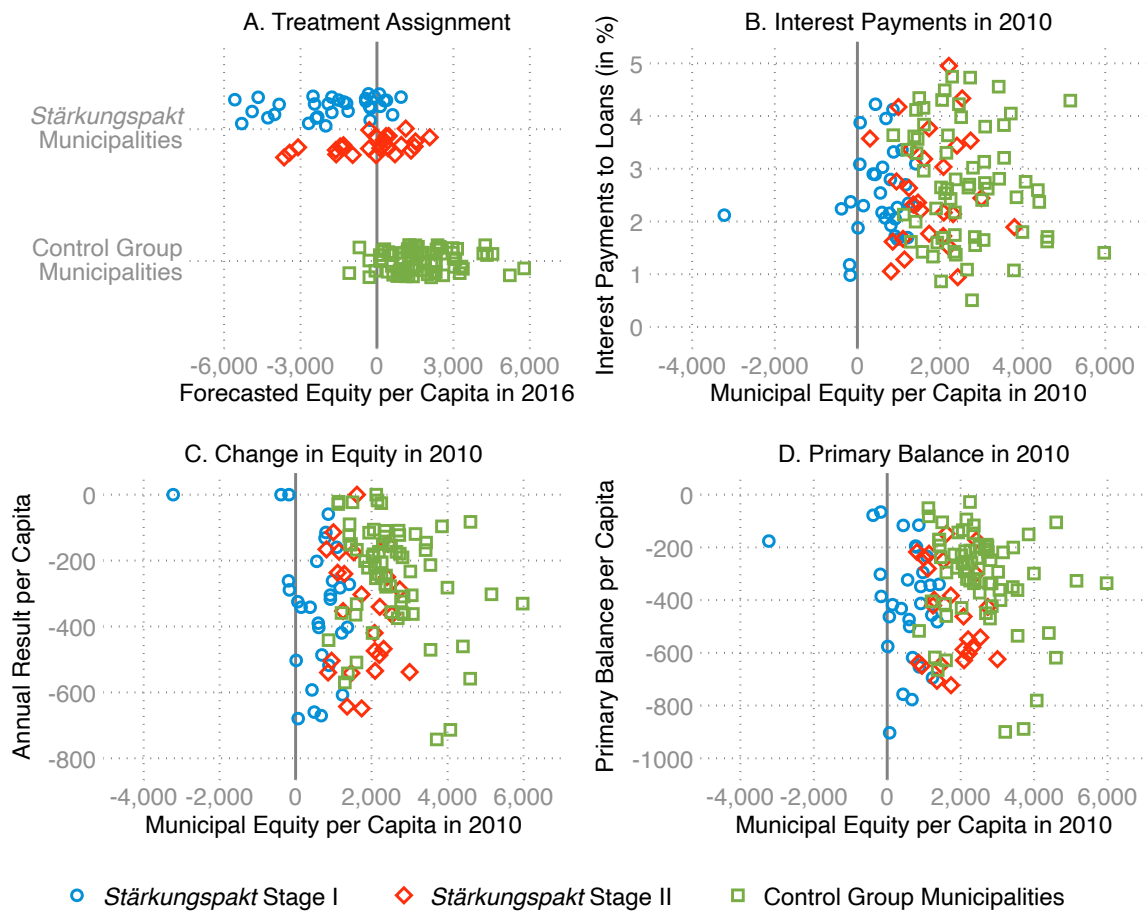
To discern reform effects from possible common shocks unrelated to treatment, we compare pre- to post-reform changes in outcomes in our treatment group to the corresponding changes in municipalities not subject to the local austerity program. To make treatment and control group as comparable as possible, we limit our control group to those municipalities that were also subject to considerable fiscal strain in 2010—i.e, subject to the fiscal oversight program *HSK* and insufficient voluntary consolidation efforts just as the treatment group—but did not enter the program because their level of equity was predicted to remain positive until at least 2017.<sup>10</sup>

Crucial for identification, the chosen cutoff determining treatment lacked any economic rationale. Neither does the level of municipalities’ equity provide “predictive power for municipalities’ true financial scope of action” (Mühlenkamp and Magin, 2010) nor does it affect municipalities’ borrowing costs (Deutsche Bundesbank, 2016). Every German municipality faces the same default risk as the

<sup>9</sup> In robustness checks, we show that our estimates remain qualitatively unchanged when allowing for time-varying local shocks at broader and finer regional levels.

<sup>10</sup> Note that all municipalities that entered the *Stärkungspakt* were subject to the *HSK* and had a non-approved consolidation plan in 2010. The only exception is Bönen, whose consolidation plan was approved in 2010.

Figure 3: Policy Assignment and Municipalities' Fiscal Situation in 2010



Notes: This graph displays various proxies of municipal financial distress for the set of municipalities subject to the *Stärkungspakt* (in stages I and II) as well as those in our control group. Panel A plots the simple forecast of municipal equity per capita in 2016 for each municipality in one of the three groups. We derive this measure by relying on municipalities' observed equity in 2010 as base level and linearly interpolating until 2016 using the average annual result between 2004–2010. Panel B plots municipalities' interest payments relative to their total outstanding loans over the observed equity per capita in 2010. Panels C and D show the reported annual result and the primary balance per capita in 2010 over the distribution of municipal equity per capita in 2010. To simplify exposition, we exclude the bottom and top 5% of municipalities for the latter three measures.

national government (European Banking Authority, 2021), which is due to the implicit bail-out of municipalities by higher levels of government that leaves all municipalities with the same financing conditions irrespective of their level of debt (Fritze, 2019). In addition, (reaching) negative equity does not trigger any political or fiscal consequences and neither affects municipalities' scope of decision-making nor incoming or outgoing transfers from higher levels of government. Government advisors and opposition parties indeed advocated for alternative measures to assign treatment that would have ultimately resulted in different and broader compositions of the group of municipalities subject to fiscal consolidation (see, e.g., Junkernheinrich et al., 2011, Landtag Nordrhein-Westfalen, 2011a). Mimicking the empirical mindset of Greenstone et al. (2010), Busso et al. (2013), and Kline and Moretti (2014), who all compare treated jurisdictions to those proposed or considered for treatment but ultimately not chosen, we thus base identification on the quasi-random assignment of treatment among equally financially-distressed municipalities.

In Panel of Figure 3, we proxy the state government’s assignment rule to the *Stärkungspakt* by linearly perpetuating municipalities’ evolution of equity from 2004–2010 up to 2016. Unfortunately, requests to various government agencies about the state government’s exact forecasts remained unsuccessful, which prevents us from exploiting the true assignment cutoff by means of a regression discontinuity design (RDD) for identification. However, we infer that our simple forecast approximates assignment to treatment quite well. The figure further indicates that municipalities’ level of equity is indeed uncorrelated with standard measures of financial distress. In 2010, municipalities subject to the *Stärkungspakt* faced no higher interest payments (Panel B), and showed no differential annual result or primary balance (Panels C and D) than the set of equally financially-constrained municipalities not chosen for program participation (our control group). We take this evidence in support of our notion that assignment to the *Stärkungspakt* was quasi-random among the set of financially-constrained municipalities.

To further corroborate the validity of the proposed difference-in-differences design, we additionally compare municipalities in our treatment and control group with regard to trends in observable fiscal and broader economic variables before reform implementation in a systematic way. We do this by regressing changes in fiscal measures, revenues and expenses, as well as broader economic outcomes over the period from 2000–2008 on an indicator variable for program participation. This method follows closely the test for covariate smoothness in RDD settings as suggested by Lee and Lemieux (2010). Given the number of outcome variables under study, we expect variables to indicate significant differences by random chance. Therefore, we complement the single hypothesis tests by displaying the results of a joint  $F$ -test of all estimated coefficients being zero.

Table 1 shows how our identification strategy balances treatment and control group. In column (1), we first compare treated municipalities’ evolution of outcomes prior to program implementation to all other municipalities in NRW. We find several economically sizable and statistically significant differences. Among others, treated municipalities saw adverse developments in tax revenues, working-age population levels, and local economic performance, e.g., the number of plants, relative to all untreated municipalities. In column (2) we additionally include MSA dummies. Differences become less pronounced and loose significance when only comparing treated and untreated municipalities in geographic proximity. However, the joint  $F$ -test of all estimated coefficients being jointly zero is still rejected. In columns (3) and (4), we therefore limit the control group to those municipalities which were subject to fiscal oversight and had shown insufficient consolidation plans but were not treated because of their (predicted) level of equity. Restricting the control group along this dimension helps balancing the sample along pre-reform outcome trends, especially when differences across MSAs are accounted for. In column (4), none of the outcome variables show significant differences in pre-reform trends, and we cannot reject the joint  $F$ -test for all pre-trend differences being zero ( $p$ -value: 0.655). We take these non-diverging pre-trends between treatment and control group as suggestive evidence in support of the identifying assumptions of the difference-in-differences design.

Table 1: Smoothness in Pre-Reform Outcome Trends (2000–2008)

	All Municipalities		Estimation Sample	
	(1)	(2)	(3)	(4)
Total Debt (P.C.)	-0.080 (0.061)	-0.128 (0.094)	-0.001 (0.009)	-0.001 (0.010)
Total Loans (P.C.)	-0.030 (0.061)	-0.094 (0.094)	0.022 (0.016)	0.011 (0.017)
Total Revenues (P.C.)	0.034 (0.132)	-0.055 (0.148)	0.066 (0.165)	-0.038 (0.186)
Business Tax Revenues (P.C.)	-0.016 (0.151)	0.050 (0.167)	0.078 (0.174)	0.089 (0.169)
Property Tax Revenues (P.C.)	-0.277** (0.124)	-0.095 (0.155)	-0.253* (0.142)	-0.190 (0.185)
Revenues from Transfers (P.C.)	0.124* (0.067)	0.105 (0.097)	-0.031 (0.060)	-0.040 (0.073)
Total Expenses (P.C.)	0.102 (0.149)	0.017 (0.175)	0.064 (0.191)	0.061 (0.205)
Operating Budget (P.C.)	-0.078 (0.156)	-0.132 (0.184)	-0.281 (0.211)	-0.191 (0.222)
Working-Age Population	-0.642*** (0.109)	-0.302*** (0.107)	-0.227 (0.144)	-0.020 (0.129)
Number of Workers	-0.276** (0.138)	-0.090 (0.158)	-0.059 (0.192)	-0.029 (0.238)
Number of Plants	-0.403*** (0.119)	-0.233* (0.139)	-0.127 (0.157)	-0.179 (0.192)
Average Wages	0.122 (0.151)	0.152 (0.166)	0.052 (0.183)	0.099 (0.199)
MSA Fixed Effects		Yes		Yes
Observations	393	393	137	137
Joint <i>F</i> -Test	7.993	2.577	2.057	0.795
<i>p</i> -value	0.000	0.003	0.024	0.655

*Notes:* This table presents the results of our covariate smoothness test. In column (1), we separately regress the 2000–2008 change each covariate on the *Stärkungspakt* indicator using all municipalities in NRW. Column (2) accounts for MSA fixed effects to limit comparisons to the same geographical area. Specification (3) is based on our estimation sample, restricting the control group to municipalities that were subject to fiscal oversight with an insufficient consolidation plan in 2010. In column (4), we additionally control for MSA fixed effects. All variables show growth rates over the period 2000–2008. Standard errors are two-way clustered at the municipality level. Significance levels are \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ . The reported *F*-test statistics and the corresponding *p*-values test the null hypothesis of all coefficients being jointly equal to zero in a stacked regression (Lee and Lemieux, 2010).

## 4 Empirical Results

We next present the results of our analysis. In Section 4.1, we first assess whether and to what extent municipalities subject to the *Stärkungspakt* balanced their budgets. We then identify municipalities' pursued strategies to achieve fiscal balance beyond and above the policy-induced consolidation grants (Section 4.2). In Section 4.3, we eventually test whether consolidation-induced tax increases or spending cuts led to broader economic consequences due to responses of local firms or residents.

### 4.1 Fiscal Effects

We start by investigating the effects of the *Stärkungspakt* on municipalities' annual fiscal balance using our baseline specification of the difference-in-differences setting as laid out in Equation (1),



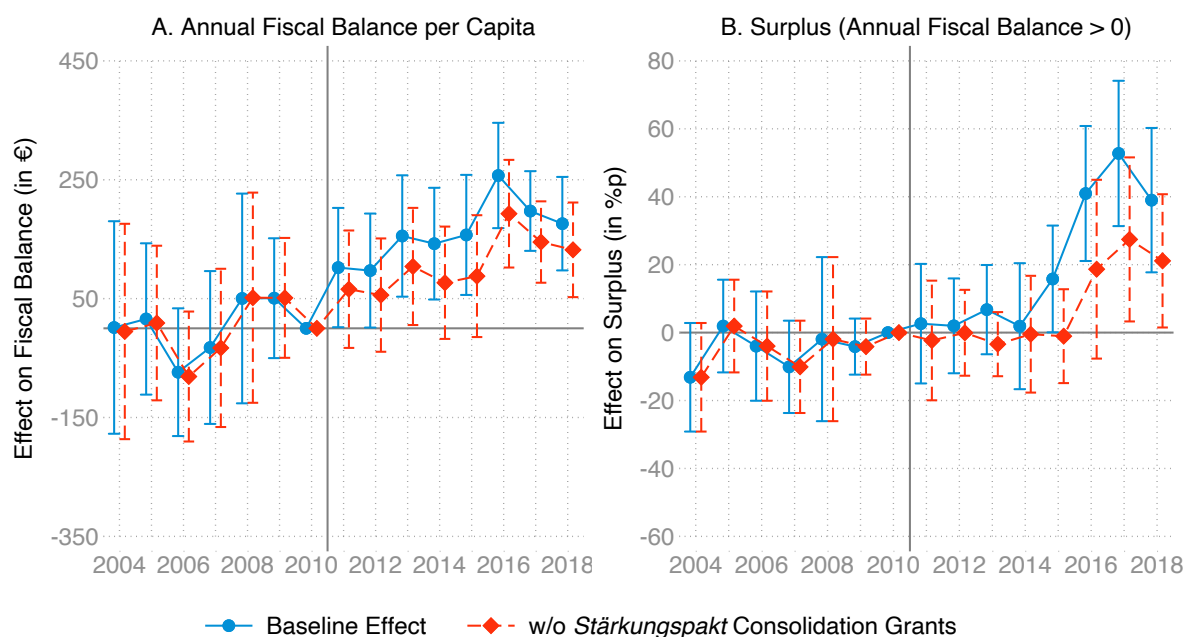
i.e., accounting for municipality fixed effects,  $MSA \times year$ , and city county  $\times year$  fixed effects. Panel A of Figure 4 presents the estimated policy effects (in blue). First, we find that treatment and control municipalities experienced similar trends in their annual fiscal balance during the pre-policy period 2004–2010. After policy implementation, treated municipalities, however, see a strong and statistically significant improvement in their annual fiscal balance. The estimated treatment effects are statistically significant right after the policy intervention and grow over time. In the medium to long run, i.e., six to eight years after reform implementation, the local austerity policy led municipalities to improve their annual fiscal balance by around 210 EUR per capita relative to the control group.<sup>11</sup> Around 25% of this effect can be attributed to the targeted consolidation grants linked to program participation. Net of consolidation grants, the average long-run consolidation effect amounts to around 156 EUR per capita (depicted in red). Comparing the post-reform effect patterns for the two specifications of the outcome variable (i.e., municipalities’ fiscal balance including and excluding consolidation grants) further reveals that most of the treatment effect in the first years after policy implementation can be attributed to the policy-induced transfers. The corresponding treatment effect on municipalities’ fiscal balance net of transfers remains statistically insignificant and economically small until 2015. In contrast, own consolidation efforts via increased taxes or reduced spending become notable in the longer run; compare the respective point estimates for both specifications of the outcome in 2016–2018. Below, we investigate (the timing of) municipalities’ own consolidation strategies in more detail.

While the preceding results indicate that the policy helped targeted municipalities to improve their financial situation, the ultimate goal of the *Stärkungspakt* was to alter local finances in such a way that municipalities no longer experienced budget deficits. Therefore, upon entry into the scheme, municipalities committed to achieve balanced budgets (or report a fiscal surplus) ten years after program adoption (six years when including the consolidation grants). Panel B of Figure 4 reports the corresponding estimated treatment effects on municipalities’ probability of reporting a fiscal surplus or balanced budget (in blue). Again, we find no indication for differential trends in the outcome prior to program implementation. Estimated pre-treatment trends are close to zero and statistically insignificant. Moreover, we see that treatment effects remain close to zero and statistically insignificant in the first years after the policy intervention. In the longer run, however, statistically significant and economically sizable treatment effects emerge. Six to eight years after treatment, municipalities subject to the consolidation policy were approximately 44 percentage points more likely to report a balanced budget or a surplus than those municipalities in the control group. Effects on the corresponding variable net of consolidation grants appear with an additional temporal lag and are of smaller size but statistically significant (in red). The *Stärkungspakt* thus helped municipalities to balance their budgets within the intended time frame after treatment. However, despite the positive average treatment effects, ten of the 61 treated municipalities still reported deficits in 2018 (22 treated municipalities when subtracting the policy-induced consolidation grants).

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<sup>11</sup> To account for outliers, we winsorize the outcome in our baseline specification at the bottom and top 5%. Appendix Figure A.1 shows that effects remain qualitatively identical when (i) not winsorizing the variable, (ii) dropping the bottom and top 5%, or (iii) taking the winsorized outcome in levels.

Figure 4: Effects on Fiscal Consolidation



Notes: This graph plots the point estimates,  $\hat{\beta}_k$ , and corresponding 95% confidence intervals of the difference-in-differences model as laid out in Equation (1). The dependent variable refers to municipalities' annual fiscal balance in Panel A, and municipalities' probability of having an annual surplus in Panel B. The outcomes in Panel A are re-scaled by each municipalities' level of population in 2008 and winsorized at the 5th and 95th percentile. In addition to the baseline specification we also present results for a counterfactual outcome that excludes *Stärkungspakt* consolidation grants. All regressions include municipality, MSA  $\times$  year, as well as city county  $\times$  year fixed effects. Standard errors are clustered at the county level. Prior to 2009, municipal revenues comprised the amount of cash that was received in a given year from a given source (*Einnahmen*), whereas they comprise all earned annual revenues since 2009, irrespective of when the respective cash was actually received (*Erträge*). The same difference holds true for municipalities' expenses.

**Sensitivity Checks and Heterogeneity.** We conduct several sensitivity checks to assess whether the estimated effects are robust to alternative specification choices. First, we show that effects are very similar when controlling for coarser or finer regional shocks than MSA  $\times$  year fixed effects. We do so by accounting for trends at the level of administrative districts (*Regierungsbezirke*, NUTS 2) or commuting zones (*Arbeitsmarktsregionen*, CZ), respectively (see Panel A of Appendix Figures A.2 and A.3). Second, we show that treatment effects are unchanged when explicitly accounting for the fact that municipalities started the consolidation scheme in two distinct phases (either in 2011 or 2012). In the baseline specification, we assign the same treatment year to both groups because notification of program participation occurred at the same time for both cohorts. Hence, even if some municipalities received the program's consolidation grants and had to comply with the prescribed consolidation efforts one year later than others, they might have anticipated treatment and, therefore, changed their local policies right after the announcement of the *Stärkungspakt*. However, as this baseline approach may in turn blur the estimated short-run effect pattern and mask effect heterogeneity across the two groups, we allow for heterogeneous treatment effects by cohorts in the simple difference-in-differences model. We also apply the estimator of Borusyak et al. (2021), which explicitly accounts for heterogeneous treatment effects across cohorts in two-way fixed effects designs. Results, displayed in Panels B and C of Appendix Figures A.2 and A.3, show that effects on fiscal consolidation are (i) very similar for both groups and (ii) unaffected by explicit corrections for

possible heterogeneous effects across both cohorts.

Third, we test whether estimated effects are robust to alternative ways of drawing inference. In addition to providing the respective confidence bands when clustering standard errors at the municipality rather than the county level (our baseline), we also explicitly test whether our inference is robust to spatial autocorrelation; estimating spatial HAC standard errors as discussed in Conley (1999) and Conley (2008).<sup>12</sup> As indicated in Panel D of Appendix Figures A.2 and A.3, results remain statistically significant when using these alternative strategies of drawing inference. Fourth, we also explicitly investigate whether treated municipalities' consolidation effort may have had spatial spillovers on neighboring municipalities' tax setting or spending behavior, which might in turn invalidate our treatment vs. control group comparison. To this end, we discard all municipalities from the control group that are within 10 km (20 km) to a *Stärkungspakt* municipality. Although the number of municipalities in our control group declines significantly in these specifications, estimated effects remain very similar (see Panel E of Appendix Figures A.2 and A.3).

Last, we test for heterogeneous effects across the size distribution of treated municipalities. Upon policy implementation, politicians debated whether the program's design might differently affect smaller and larger municipalities due to differences in their overall tax capacity (Landtag Nordrhein-Westfalen, 2011b,c). Ideas to customize the consolidation policy accordingly were yet discarded. Results displayed in Panel F of Appendix Figures A.2 and A.3 show that smaller municipalities (with less than 20,000 inhabitants) and larger ones (with 20,000 inhabitants or more) consolidated their budget by almost equal amounts.<sup>13</sup> Six to eight years after policy implementation, smaller (larger) municipalities subject to the fiscal consolidation policy improved their fiscal balance per capita by 219 EUR (206 EUR) on average compared to those municipalities in the control group.

## 4.2 Strategies of Consolidation

In light of the policy's positive impact on municipalities' fiscal budget, we next aim at identifying those margins of adjustments that municipalities used to consolidate budgets above and beyond the policy-induced transfers. Whereas effects on fiscal budgets were homogeneous, we uncover substantial differences in municipalities' consolidation strategies by population size.

**Increased Revenues.** We first investigate whether municipalities consolidated budgets by increasing their revenues. Specifically, we look at three key sources of municipal revenues, (i) the local business tax, (ii) the local property tax, (iii) intergovernmental transfers, as well as the residual sources of revenue as an aggregate. Figure 5 plots the corresponding treatment effects for smaller and larger municipalities separately—based on an augmented specification of the baseline difference-in-differences design laid out in Equation (1) that allows for heterogeneous effects via an interaction term and includes additional size group  $\times$  year fixed effects.

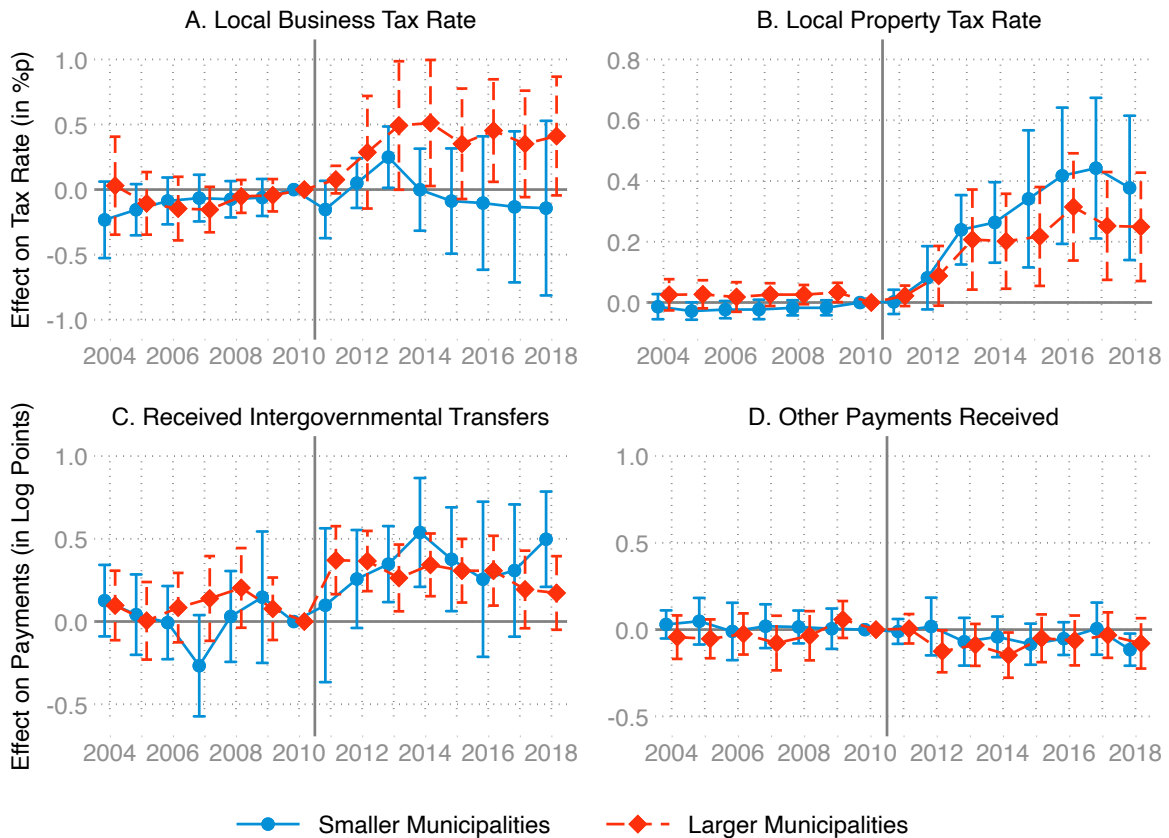
Panels A and B of Figure 5 highlight the differential effects of the *Stärkungspakt* on the tax setting behavior of smaller and larger municipalities. From Panel A, displaying the corresponding

<sup>12</sup> For implementation in Stata, we draw upon code provided by Fetzer (2020).

<sup>13</sup> We compare rural and smaller (*Landgemeinden* and *Kleinstädte*) to medium-sized and large municipalities (*Mittel-* and *Großstädte*), which is almost equivalent to a median split. No municipality switches groups during the period of study. Appendix Figure A.4 shows the spatial distribution of smaller and larger municipalities across NRW.

treatment effects on the local business tax rate, we first infer that pre-trends are small and statistically insignificant for both groups. Hence, treated and untreated municipalities did not alter their local business tax rate in systematically different ways prior to reform implementation. Post treatment, we find no effect for smaller municipalities but a positive and statistically significant one for larger municipalities subject to the local austerity program. This effect builds up over the first three years and remains constant thereafter. On average, larger municipalities subject to treatment raised their respective local business tax rate by around 0.4 percentage points (roughly 2.5% relative to their average tax rate).

Figure 5: Effects on Tax Rates, Transfers, and Revenues from Fees & Levies



Notes: This graph plots the point estimates,  $\hat{\beta}_k$ , and corresponding 95% confidence intervals of the difference-in-differences model laid out in Equation (1), allowing for heterogeneous treatment effects by municipality size via an interaction term. The dependent variable refers to municipalities' annual local business tax rate in Panel A, annual local property tax rate in Panel B, received intergovernmental transfers in Panel C, and revenues from other sources in Panel D. The outcomes in Panels C and D are log-transformed. All regressions include municipality, MSA $\times$ year, city $\times$ year as well as size group $\times$ year fixed effects. Standard errors are clustered at the county level.

Moreover, we find that both larger and smaller municipalities increased their local property tax rate (see Panel B). Estimated pre-trends are close to zero and insignificant for both groups. Post treatment, both groups of municipalities raise the local property tax rate over time, yet to different extents. Six to eight years after treatment, the policy led smaller municipalities to increase their local property tax rate by around 0.41 percentage points (32% relative to the group's pre-reform mean), whereas larger municipalities increased the corresponding multiplier by around 0.27 percentage points (19% relative

to their mean). The graphs thus indicate that the two groups of municipalities put the burden of taxation on different shoulders. Smaller municipalities disproportionately increased the property tax; a tax borne by local residents (Löffler and Siegloch, 2021). In contrast, larger municipalities shifted part of the additional tax burden on local businesses.

Panel C of Figure 5 reports the corresponding effects on municipalities' annual amount of inter-governmental transfers received. In line with expectations, we find that both smaller and larger municipalities subject to treatment received higher transfer payments after reform implementation than municipalities in the control group. This effect is at least to some extent mechanical given that program participation was accompanied by sizable consolidation grants. However, two features are worth pointing out. First, pre-trends are small and insignificant for both groups of treated municipalities, which lends further credibility to the implemented difference-in-differences design. Second, when subtracting the annual amount of *Stärkungspakt* grants from the annual total amount of transfers received (e.g., due to fiscal capacity equalization grants and other intergovernmental transfers), we find small and statistically insignificant treatment effects (see Appendix Figure A.5 for the corresponding estimates). This implies that municipalities' entry into the consolidation scheme did not systematically affect the receipt of other transfers (from higher levels of government) that may have eased or worsened municipalities' overall financial situation. Last, Panel D plots the corresponding treatment effects on municipalities' (log) revenues accruing from all remaining sources. We find small and statistically insignificant differences.

**Reduced Spending.** We next investigate whether treated municipalities consolidated their budgets via cuts in local spending, too. Due to the change of municipalities' accounting system in 2009 (cf. Section 2.2), detailed information on local spending for different items are given on an annual basis for the period 2009–2018 only. In the following analysis, we focus on seven spending categories that account for municipalities' total expenditures: (i) intergovernmental transfers to higher-level jurisdictions, as well as spending on (ii) local public services, (iii) social security, (iv) infrastructure, (v) education & science, (vi) public goods (such as theaters, sport facilities, parks), and (vii) business subsidies. We also distinguish effects on mandatory versus non-mandatory local spending as a falsification exercise. As detailed in Section 2, local governments have to fulfill some mandatory duties, such as the provision of welfare benefits to the local population, while being unconstrained with regard to, e.g., the provision of local amenities or specific public services.<sup>14</sup> Again, we allow for heterogeneous effects for smaller versus larger municipalities by adding an interaction term and including size group  $\times$  year fixed effects to the baseline difference-in-differences model as specified in Equation (1). All outcome variables are specified in logs, i.e., all estimates can be interpreted as semi-elasticities.

Table 2 plots the corresponding medium- to long-term treatment effects—defined as the average treatment effect six to eight years after the reform. The corresponding effects for all leads and lags of the underlying event studies are provided in Appendix Figure A.6. Again, we detect different responses among smaller versus larger municipalities subject to the local austerity program. Smaller municipalities subject to the *Stärkungspakt* cut spending on local public services—such as the residents'

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<sup>14</sup> In light of the granularity of the available spending data, our decomposition should be viewed as an approximation.

Table 2: Effects on Local Spending

	Administrative Expense Categories							Legal Categories	
	Intergov. Transfers (1)	Local Pub. Services (2)	Social Security (3)	Infra-structure (4)	Education & Science (5)	Public Goods (6)	Business Subsidies (7)	Man-datory (8)	Volun-tary (9)
Smaller Municipalities	-0.045 (0.047)	-0.185** (0.082)	-0.162 (0.124)	0.167 (0.171)	0.073 (0.206)	0.076 (0.146)	-0.086 (0.256)	0.013 (0.095)	-0.124** (0.057)
Larger Municipalities	0.054 (0.069)	0.010 (0.060)	0.036 (0.053)	0.030 (0.196)	0.106 (0.081)	0.034 (0.079)	-0.508* (0.272)	0.092 (0.088)	-0.017 (0.041)
Number of Observations	1,290	1,290	1,290	1,290	1,290	1,290	1,279	1,290	1,290
Share of Payments (in %)	37.36	20.71	14.41	13.36	7.45	5.41	1.32	22.80	39.84

*Notes:* This table shows the estimated long-term effects of fiscal consolidation on municipalities' spending for different items. All outcomes are in logs, such that estimated coefficients can be interpreted as semi-elasticities. Estimates are the simple average of  $\hat{\beta}_{2016-2018}$  and stem from an augmented version of the difference-in-differences model laid out in Equation (1), allowing for heterogeneous effects by size via an interaction term. The given relative spending shares for each item refer to averages in 2010. All regressions include municipality, MSA  $\times$  year, city  $\times$  year as well as size group  $\times$  year fixed effects. Standard errors, clustered at the county level, are displayed in parentheses. Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

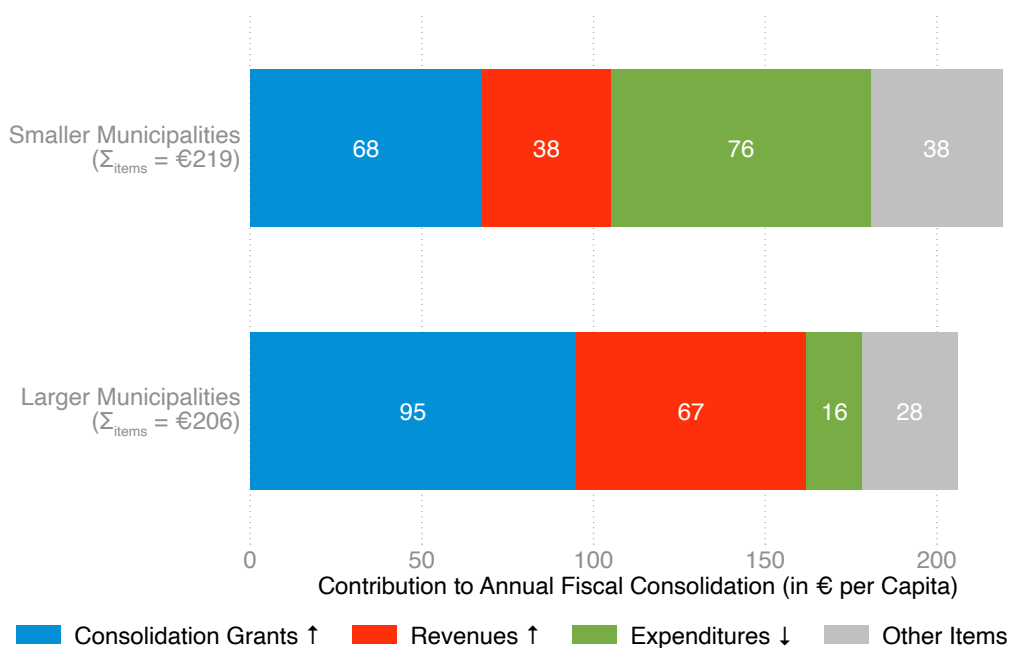
registration office, the traffic office or the building supervisory board—by roughly 17% compared to the control group in the medium to long run, whereas larger municipalities did not reduce spending on this item. In contrast, we detect a sizable and significant decline in spending on business subsidies among the larger municipalities subject to treatment. On average, they decreased spending by around 40% relative to the control group six to eight years after treatment. Smaller municipalities did not cut back spending on this item in turn. For all other spending items, we detect no statistically significant treatment effects. While some of these estimated semi-elasticities are of small magnitude, others are more sizable but imprecisely estimated.

When testing for heterogeneous effects on mandatory versus voluntary spending items in columns (8) and (9) of Table 2, we find the expected pattern: neither smaller nor larger municipalities exhibit changes in mandatory spending. For smaller municipalities, we, however, detect a sizable and statistically significant negative effect on voluntary spending items. On average, smaller municipalities subject to the local austerity program reduced local spending on expenditure items that are at their own disposal by around 12%. For larger municipalities we see no effect.

**The Importance of Each Margin of Consolidation.** To provide an overview about the relative importance of revenue- vs. expenditure-based consolidation for the two groups of treated municipalities, we translate the corresponding medium- to long-run treatment effects on different sources of revenues and spending items (cf. Figure 5 and Table 2) in EUR per capita and relate them to municipalities' overall fiscal consolidation efforts. Figure 6 summarizes the results of this exercise.

As shown in Section 4.1, smaller and larger municipalities subject to the *Stärkungspakt* display similar improvements in their annual fiscal balance per capita: smaller (larger) municipalities improved their fiscal balance by around 219 EUR (206 EUR) per capita relative to the control group six to eight years after the local austerity program was enacted. However, smaller and larger municipalities differed markedly in their consolidation strategies. Smaller municipalities predominantly consolidated their budgets via the policy-induced consolidation grants (accounting

Figure 6: The Importance of Municipalities' Different Consolidation Strategies



Notes: This graph summarizes the relative contributions of the policy-induced consolidation grants, increased revenues, and reduced expenditures on municipalities' fiscal consolidation for smaller and larger municipalities, respectively. Depicted figures are measured in per capita EUR terms and based on the estimates presented in Figure 5 and Table 2, averaging over the period from 2016 to 2018.

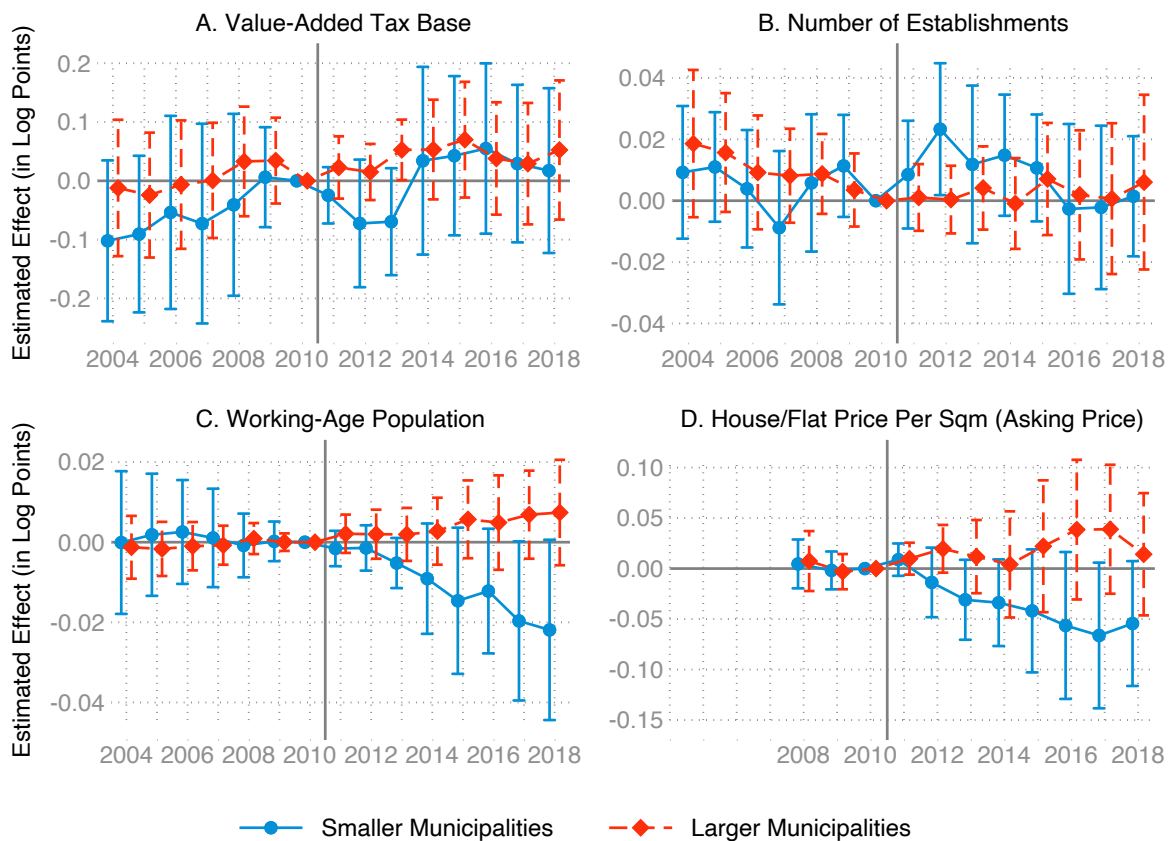
for 31%) and cuts in local expenditures (35%), whereas larger ones primarily relied on the additional transfers (46%) as well as higher revenues from taxes (33%). These differences in consolidation strategies may, for example, reflect heterogeneous agglomeration rents across municipalities. Larger municipalities may set higher corporate taxes than smaller ones without the loss of economic activity due to firms' agglomeration rents in more urban areas arising from, e.g., better market access and infrastructure or knowledge spillovers among competitors (Baldwin and Krugman, 2004, Borck and Pflüger, 2006), which limits firm mobility in light of tax rate increases. Focusing on the local tax setting behavior of German and Swiss municipalities, respectively, Koh et al. (2013) and Luthi and Schmidheiny (2014) indeed show that larger, more urban municipalities tax agglomeration rents by levying higher corporate taxes on local firms (in response to some external shock).

Our results also document that local authorities made use of various margins to consolidate their budget rather than focussing on a single measure. Previous studies have shown that the local property tax could have served as one such single measure because of its inelastic tax base and rather high revenue elasticity (Blesse et al., 2019, Löffler and Siegloch, 2021). We hypothesize that municipalities' choice to balance the burden of fiscal consolidation among various revenue and spending items reflects political economy concerns rather than efficiency or equity considerations. For example, because property tax increases are considered as highly unpopular among residents (see Cabral and Hoxby, 2012, for corresponding evidence from the United States).

### 4.3 Broader Consequences of Municipalities' Fiscal Consolidation

In light of the observed consolidation strategies, we last test whether the policy-induced cuts in local spending and increases in local tax rates triggered broader (economic) consequences. Spatial equilibrium models in the spirit of Rosen (1979) and Roback (1982) predict that local spending on amenities as well as local taxes are capitalized in local prices (wages, housing) and thereby affect the location choice of firms and households. We thus assess the policy's impact on various potential spatial equilibrium outcomes in what follows.

Figure 7: Effects on Broader Economic Outcomes



Notes: This graph plots the point estimates,  $\hat{\beta}_k$ , and corresponding 95% confidence intervals of the difference-in-differences model laid out in Equation (1), allowing for heterogeneous treatment effects by municipality size via an interaction term. The dependent variable refers to the value-added tax base in a municipality in Panel A, the number of establishments in Panel B, the working-age population in Panel C, and advertised asking prices for housing sales in Panel D. All outcomes are log-transformed. All regressions include municipality, MSA $\times$ year, city $\times$ year as well as size group $\times$ year fixed effects. Standard errors are clustered at the county level.

Panel A of Figure 7 shows that—despite posing an additional financial burden on local firms—larger municipalities see hardly any change in local economic activity (as approximated by the value-added tax base) after treatment. Even though these municipalities partly consolidated by setting higher local business tax rates, there is no significant adverse response in terms of profit shifting or reduced local economic activity. This picture is confirmed in Panel B, which indicates that the number of local establishments remains unchanged after treatment, too. While previous studies have shown that corporate tax increases can have sizable negative effects on local economic



activity (see, e.g., Giroud and Rauh, 2019), the estimated policy-induced tax increase (of around 2.5% relative to the mean) may be too small to outweigh firms' benefits accruing from agglomeration rents in more urban municipalities and trigger firm relocation (Baldwin and Krugman, 2004). For smaller municipalities, estimates for both outcomes are more volatile but also provide no evidence for reduced economic activity at the local level. In Appendix Table A.2 we show that this null effect on local economic activity can also be found for other measures of economic activity, such as (i) the (log) business tax base, (ii) the number of small and large plants, (iii) local employment figures, as well as (iv) local wages (by quartiles).

Turning to the household side in Panel C of Figure 7, we detect a clearer effect pattern. Post treatment, a negative effect on the size of the working-age population in smaller municipalities subject to treatment emerges and becomes statistically significant six to eight years after treatment. In the long run, estimates imply that population levels declined on average by around 1.7% in smaller *Stärkungspakt* municipalities compared to the control group. We reconcile this result with the predictions of standard spatial equilibrium models, where increases in local taxes and/or reductions in local amenities lead to lower equilibrium population levels. Estimates provided in Appendix Table A.3 further show that this effect appears to be driven by high- and medium-skilled resident workers. In contrast, we detect no corresponding effects for larger municipalities; a finding that may be rationalized by the fact that larger municipalities did not reduce spending on local public services and put a relatively lower financial burden on their residents.

As predicted by spatial equilibrium models, we further find that the decline in population levels in smaller municipalities subject to local austerity was accompanied by a lagged negative effect on local house prices. As indicated by Panel D of Figure 7, asking prices for houses and flats in smaller municipalities subject to treatment declined by around 5% compared to the control group in the medium to long run. This effect is mirrored by a negative, albeit smaller, effect on land prices, whereas the stock of housing remains unaffected (see columns (7) and (8) of Appendix Table A.3).

## 5 Welfare Implications

In a final exercise, we carefully assess the welfare implications of the *Stärkungspakt* policy and its fiscal and economic consequences as presented in Section 4. First, we focus on the budgetary perspective of local treasurers and calculate the average per capita loss or gain for different types of municipalities. Second, we assess the welfare implications of the *Stärkungspakt* at the individual level.

**Impact on Municipal Budgets.** We first take the perspective of local treasurers/policy makers and calculate the monetary gains and losses due to the *Stärkungspakt* policy for each municipality in NRW. More precisely, we derive the net impact of the policy on municipalities' local budgets in the medium to long run, i.e., over the period 2016–2018. Below, we present average per capita figures for three groups of municipalities: (i) the 61 municipalities subject to the *Stärkungspakt* policy, (ii) the 76 municipalities that were equally financially-distressed as those municipalities in the treatment group but ultimately not chosen (our control group), and (iii) the remaining 256 municipalities that were on (more or less) financially-sound grounds. The *Stärkungspakt* policy's consolidation grants

for the set of treated municipalities were financed via three distinct sources: reallocations within the state budget (*Landeshaushalt*), reduced fiscal equalization grants from the state government to local jurisdictions (*Schlüsselzuweisungen*),<sup>15</sup> and an additional solidarity surcharge on abundant untreated municipalities (*Solidaritätsumlage*). We quantify the impact of the latter two funding sources on municipalities' budget for each municipality in the state.

Panel A of Figure 8 shows the resulting average net impact of the policy on municipalities' annual fiscal balance between 2016 and 2018. We find that those municipalities which neither enter our control nor treatment group contributed around 12 EUR per capita to the *Stärkungspakt*, financed by roughly equal amounts through lower equalization grants and the implemented solidarity surcharge. Notably, the set of financially-distressed municipalities that serve as our control group contributed to the *Stärkungspakt* by roughly equal amounts and channels—by 15 EUR per capita on average. In contrast, municipalities subject to the policy clearly benefited: their financial loss accruing from lower fiscal equalization grants was more than offset by the targeted consolidation grants. These grants along with municipalities' own consolidation efforts (cf. Section 4) led treated municipalities to improve their annual fiscal balance by around 195 EUR per capita in the long run. The difference between the losses in our control group municipalities and the gains in the treatment group corresponds to the estimated treatment effect on municipalities' fiscal balance as presented above (see Panel A of Figure 4).

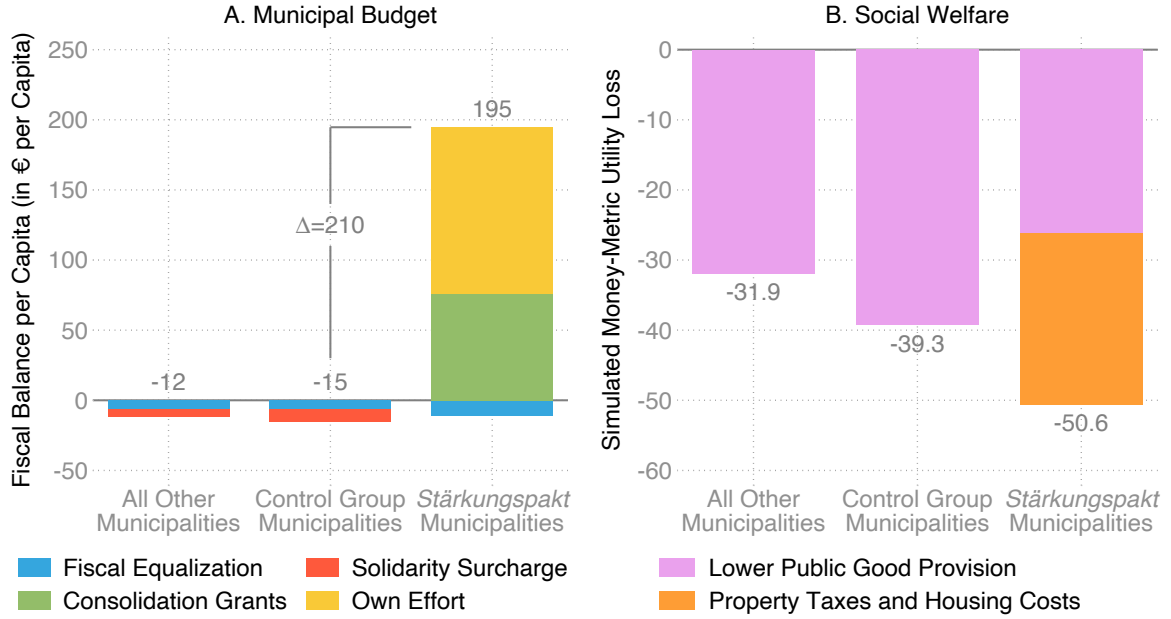
Panel A of Figure 8 thus reflects the policy-induced redistribution of public resources from richer to poorer municipalities, which might be generally justified from a fairness perspective. However, this simple accounting exercise also highlights one specific feature of the policy: municipalities subject to considerable fiscal strain but not targeted by the policy (our control group) had to fund the policy's consolidation grants for targeted municipalities. Given that these municipalities were in a very similar financial situation than the treated ones before reform implementation, this feature of the policy appears debatable on fairness grounds.

**Impact on Social Welfare.** In a second step, we investigate the welfare consequences of the *Stärkungspakt* for inhabitants residing in one of the three respective groups of municipalities. To this end, we set up a simple spatial equilibrium model and quantify the utility consequences of the estimated changes in local fiscal policy according to the framework by Löffler and Siegloch (2021). We assume that individuals reside in a given municipality  $m$  within NRW, enjoy housing  $h$  at rent  $r$  per  $m^2$ , private goods consumption  $x$ , as well as local and state-level public services,  $g_m^M$  and  $g^S$ , respectively. Individuals have to pay property taxes  $t_m$  and earn income  $y$ . We denote their utility function by  $U(h, x, g_m^M, g^S)$  and assume that the economy was in equilibrium before policy implementation. The money-metric utility effects for the average inhabitant of a given municipality  $m$  are then given by:

$$\Delta W_m = -h_m \Delta r_m - \Delta t_m + \Delta y_m + \delta^M \Delta g_m^M + \delta^S \Delta g^S, \quad (2)$$

<sup>15</sup> Each year, around nine billion EUR are distributed from the state government to sub-state jurisdictions in order to ease their varying fiscal needs (see, e.g., Baskaran, 2014). We compute the effects of cuts in fiscal equalization grants on municipal budgets by assuming that each municipality contributed to this financing channel of the *Stärkungspakt* in proportion to the amount of total fiscal equalization grants received.

Figure 8: Net Impact on Municipal Budgets and Social Welfare



Notes: This graph depicts the net impact of the *Stärkungspakt* on municipal budgets and welfare for three groups of municipalities in North Rhine-Westfalia: (i) non-distressed and abundant municipalities, (ii) control group municipalities, and (iii) treated municipalities. Panel A shows the average per capita gain or loss in municipalities' annual fiscal balance in 2016–2018 (in EUR). We decompose these changes according to different funding items. Panel B translates changes in local fiscal policy to money-metric changes in individual welfare. We simulate these changes according to Equation (2).

where  $h_m$  denotes the average floor space consumption of renters,  $\Delta r_m$  the change in per  $m^2$  rents, and  $\Delta t_m$  per capita changes in property tax payments.<sup>16</sup> We leave aside changes in incomes (i.e., set  $\Delta y_m = 0$ ) because the empirical results provide little evidence for such economic effects. Changes in individual utility are further influenced by variations in municipal and state-level public expenditures, indicated by  $\Delta g_m^M$  and  $\Delta g^S$  and expressed in per capita terms. The latter two components enter the money-metric utility changes weighted by individuals' valuation of public services relative to private good consumption. To calibrate these parameters, we assume that public services are provided optimally, which implies a marginal rate of substitution between public and private good consumption of one (i.e.,  $\delta^M = \delta^S = 1$ , as in Fajgelbaum et al., 2019). We assume that non-distressed as well as control municipalities reduce their spending on local public services in order to make up for the financial losses accruing from their contributions to the *Stärkungspakt*. For inhabitants of treated municipalities, we use our estimates as sufficient statistics and account for the observed changes in housing costs (according to Panel D of Figure 7), the additional property tax payments (based on Panel B of Figure 5), and municipalities' reduced spending on local public services (Table 2, column 2). For all three groups of municipalities, we also consider state budget contributions to the policy's consolidation grants as an additional 21 EUR per capita cut in public services  $g^S$ .

<sup>16</sup> This equation follows from Roy's identity and the envelope theorem. Let  $V(r, t_m, y, g_m^M, g^S) = U(h^*, x^*, g_m^{M*}, g^{S*})$  denote individuals' indirect utility. Equation (2) measures the change in individuals' indirect utility  $\Delta V$  due to the *Stärkungspakt* and its broader economic effects, scaled by individuals' marginal valuation of income  $\partial V / \partial y$ . Term  $\delta^M$  ( $\delta^S$ ) refers to the marginal rate of substitution between municipal-level (state-level) public good consumption and private good consumption. See Löffler and Sieglöch (2021) for a formal derivation of Equation (2).

Panel B of Figure 8 shows the resulting population-weighted average changes in money-metric utility for inhabitants in the three groups of municipalities. Inhabitants of non-distressed and control municipalities experience negative changes in utility of around 32–39 EUR. These are, however, moderate when being compared to individuals' average annual private consumption expenditures of around 20,000 EUR per capita. Inhabitants of treated municipalities face somewhat higher but still rather moderate utility losses of 51 EUR. Thus, the policy-induced reduction in housing costs cannot fully compensate for those utility losses associated with municipalities' reduced public spending and higher property tax rates (cf. Section 4).

Ultimately, we acknowledge that the overall welfare effect of the *Stärkungspakt* policy cannot be assessed in a static spatial equilibrium environment. The simple model introduced above neglects any future benefits that may accrue from fiscal consolidation, e.g., from lower future taxes, higher public services, or municipal autonomy. To account for households' expectations and their valuation of future local fiscal policy in a simple back-of-the-envelope calculation, we yet relate the simulated reductions in individual welfare to the estimated change in municipalities' annual fiscal balance (cf. Figure 4). The policy-induced money-metric utility losses of all inhabitants in NRW sum to 680 million EUR. To make up for these losses, the roughly 5.1 million inhabitants subject to the *Stärkungspakt* would have to value the estimated improvements in their municipality's local budget with a marginal rate of substitution between local budget consolidation and private good consumption of about 0.6.<sup>17</sup>

## 6 Conclusion

We study the fiscal and broader economic consequences of the *Stärkungspakt Stadtfinanzen*—a large-scale local austerity program for municipalities in North Rhine-Westphalia, Germany's most populous state. The program was implemented in 2011 and supported financially-distressed municipalities via intergovernmental transfer payments but obliged them to consolidate budgets net of transfers within a decade. For identification, we exploit the quasi-random assignment of the policy among equally financially-distressed municipalities by means of a dynamic difference-in-differences design.

The results of our analysis show that the local austerity program helped municipalities to considerably consolidate their budgets. Municipalities subject to treatment improved their annual fiscal balance by around 210 EUR (156 EUR) per capita and had a 44 (22) percentage points higher likelihood of reporting a balanced budget or surplus compared to the control group (excluding the intergovernmental transfers of the consolidation program). One EUR of consolidation grants resulted in a three EUR reduction in local deficits. Whereas consolidation was homogeneous across the distribution of treated municipalities, smaller and larger municipalities differed markedly in the type of consolidation strategies pursued: the former primarily consolidated their budgets by cutting spending on local public services, the latter by raising local taxes.

We further show that the austerity policy caused no negative effects on the local economy. Municipalities' economic output, as, e.g., approximated by the value-added tax base and local

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<sup>17</sup> If all inhabitants of *Stärkungspakt* municipalities valued the 210 EUR increase in their municipality's annual fiscal balance at a marginal rate of substitution between local budget consolidation and private good consumption of 0.63, these utility gains would amount to  $5,139,456 \cdot 210 \cdot 0.63 \approx 680$  million EUR and thus offset the simulated welfare losses.

number of firms, remained unchanged in response to treatment. In contrast, we find sizable and statistically significant negative effects of fiscal consolidation on population levels and house prices in smaller municipalities. We take these findings as support for spatial equilibrium and capitalization effects in the spirit of Rosen (1979) and Roback (1982) models.

Based on the derived set of results, we eventually assess the policy implications of the *Stärkungspakt* program. First, from a fairness perspective, it seems debatable that those municipalities that were equally financially stricken as the group of treated municipalities (our control group) had to partly finance the consolidation grants. Second, we show that residents of *Stärkungspakt* municipalities would need to value future gains from fiscal consolidation (e.g., due to lower future taxes, higher public services or municipal autonomy) quite strongly in order to justify the calculated social welfare losses due to the policy. Third, the state government largely overstated the benefits of the consolidation program. It claimed that annual deficits decreased by more than 90 percent, whereas our results imply that only about half of this effect can be actually attributed to the policy itself; and even less when netting out the targeted consolidation grants.<sup>18</sup> Overall, the policy helped municipalities to consolidate their budget at moderate costs. However, our results highlight that cutting amenities may be harmful for local governments as it makes these places less attractive to live in.

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<sup>18</sup> The former minister of the interior, Ralf Jäger, claimed that the *Stärkungspakt* policy was successful because total deficits of treated municipalities decreased from 2.2 billion EUR in 2010 to 86 million EUR in 2016 (MIK NRW, 2017). However, according to our estimates, only  $257 \times 5,143,058 = 1.322$  billion EUR are due the policy (derived as the product of the estimated treatment effect on municipalities' fiscal balance in 2016 and the total number of treated individuals in NRW), whereas the remaining 792 million EUR reflect general trends such as improvements in business cycle conditions.

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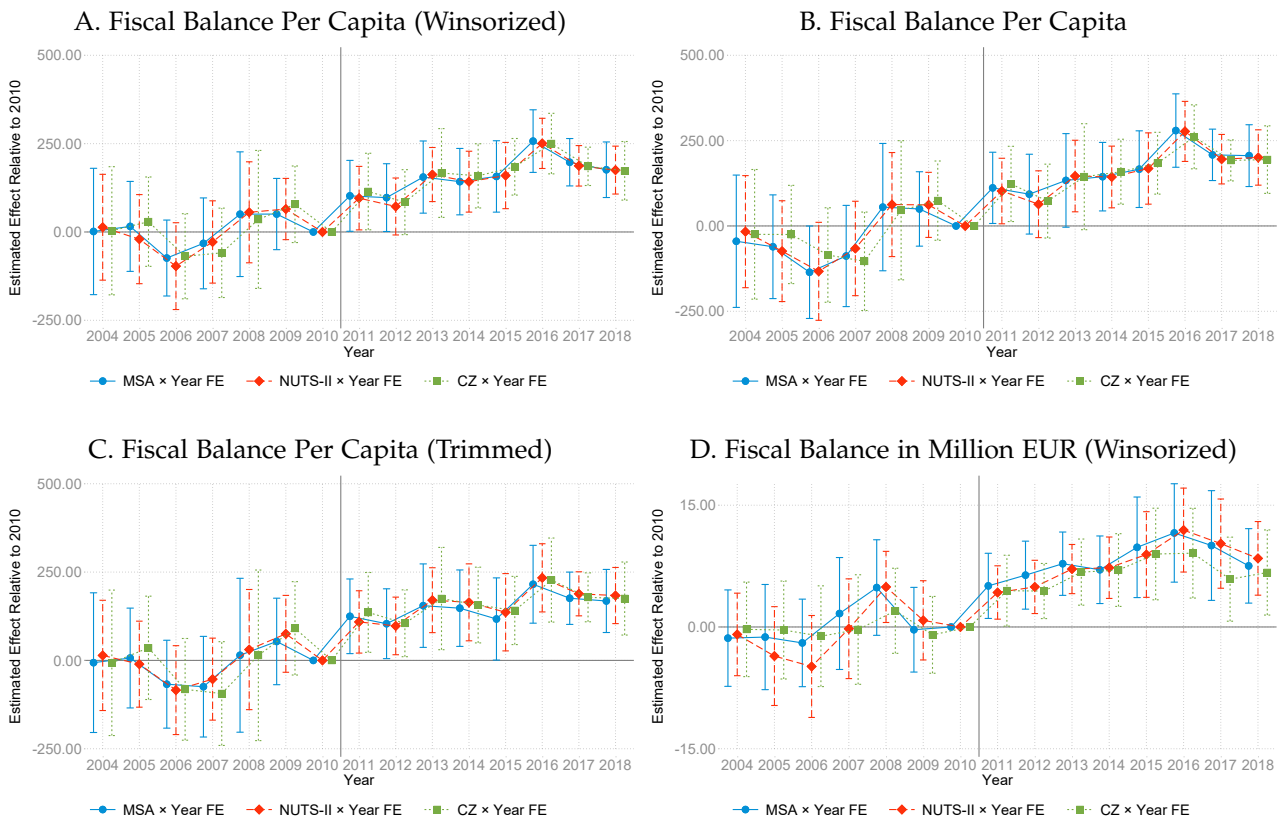
## A Appendix: Additional Figures and Tables

Table A.1: Descriptive Statistics

	All Municipalities	Not in Sample	In Sample	Treatment Group	Control Group
	(1)	(2)	(3)	(4)	(5)
<b>A. Sources of Revenue (in %)</b>					
<i>Local Taxes</i>	27.1	28.7	24.1	21.6	26.1
Local Business Tax	19.7	21.1	16.9	14.9	18.4
Local Property Tax	6.6	6.6	6.4	6.0	6.8
<i>Transfers</i>	44.7	45.1	44.1	44.5	43.8
Higher Levels of Government / Equalization Schemes	17.5	17.0	18.4	20.6	16.6
Apportionment of National Taxes	17.7	18.0	17.1	15.5	18.3
<i>Fees</i>	11.1	11.2	10.8	10.9	10.6
<i>Other Sources</i>	17.1	15.0	21.0	23.0	19.4
<b>B. Sources of Expenses (in %)</b>					
Remitted Taxes, Levies and Transfers	38.1	38.4	37.6	35.1	39.5
Public Local Services	20.8	20.7	20.8	21.1	20.5
Social Security	11.7	10.4	14.1	17.3	11.6
Infrastructure	13.8	14.2	13.1	12.8	13.3
Education & Science	8.3	8.7	7.6	6.8	8.2
Public Goods	5.9	6.1	5.5	5.3	5.7
Business Subsidies	1.5	1.5	1.3	1.4	1.2
<b>C. Budget</b>					
Annual Result (in EUR per capita)	-172.9	-105.8	-298.1	-392.6	-222.3
Share Positive Annual Surplus (in %)	12.1	15.1	6.6	3.3	9.2
Total Loans (per capita)	2,015.1	1,493.5	3,001.3	3,895.7	2,283.5
Short-Term Loans (per capita)	527.6	198.6	1,149.6	1,779.2	644.2
Long-Term Loans (per capita)	1,487.5	1,294.9	1,851.8	2,116.5	1,639.3
<b>D. Broader Outcomes</b>					
Business Tax Base (in M. EUR)	5.2	5.3	5.0	7.0	3.4
Value-Added Tax Base (in M. EUR)	3.5	3.5	3.7	6.1	1.7
Total Number of Plants (in Thousands)	1.0	1.0	1.2	1.7	0.8
Total Number of Workers (in Thousands)	15.1	13.8	17.7	26.3	10.8
Average Daily Wage	65.4	64.6	67.0	67.1	66.9
Population (in Thousands)	44.3	37.9	56.4	83.4	34.6
Average House Prices Per Sqm	1487.1	1475.7	1508.5	1558.6	1468.3

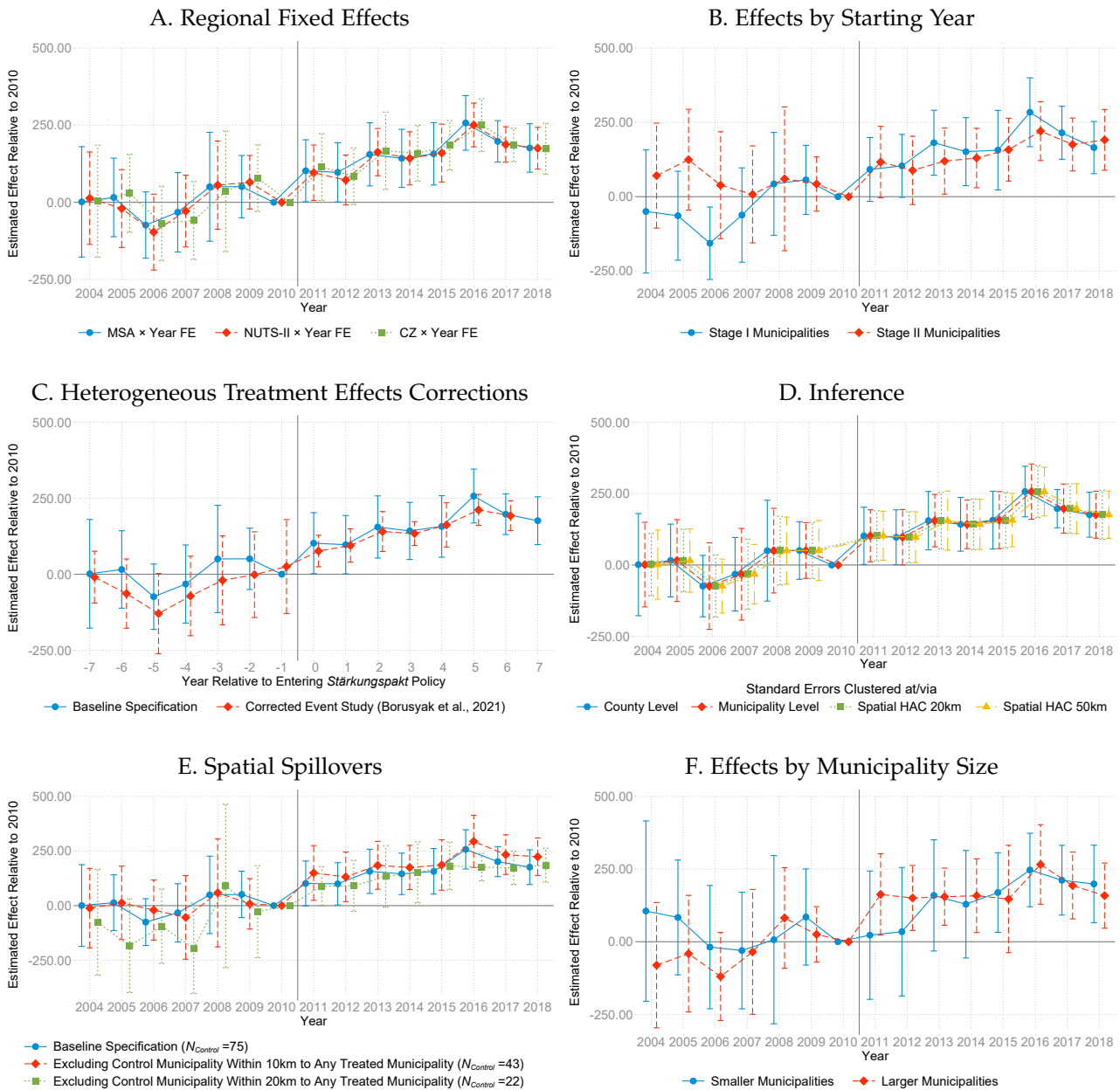
*Notes:* This table displays the mean of the respective outcomes in the pre-treatment year 2010. Column (1) provides the mean for all 396 municipalities in 2010 in NRW. Column (2) refers to 259 municipalities which are not in the sample of analysis, i.e., municipalities that are not part of the HSK or have an approved HSK, while Column (3) refers to the 137 municipalities in our sample which cover all municipalities subject to the HSK whose consolidation plan was not approved in 2010 but exclude three municipalities which entered the consolidation program in 2017. The Treatment Group (Column (4)) are 61 municipalities subject to the consolidation program. The Control Group in Column (5) represents 76 municipalities that did not participate in the consolidation program and whose HSK was not approved. Source: See description of the dataset used in Section 2.

Figure A.1: Effects on Fiscal Balance – Alternative Specifications of the Outcome Variable



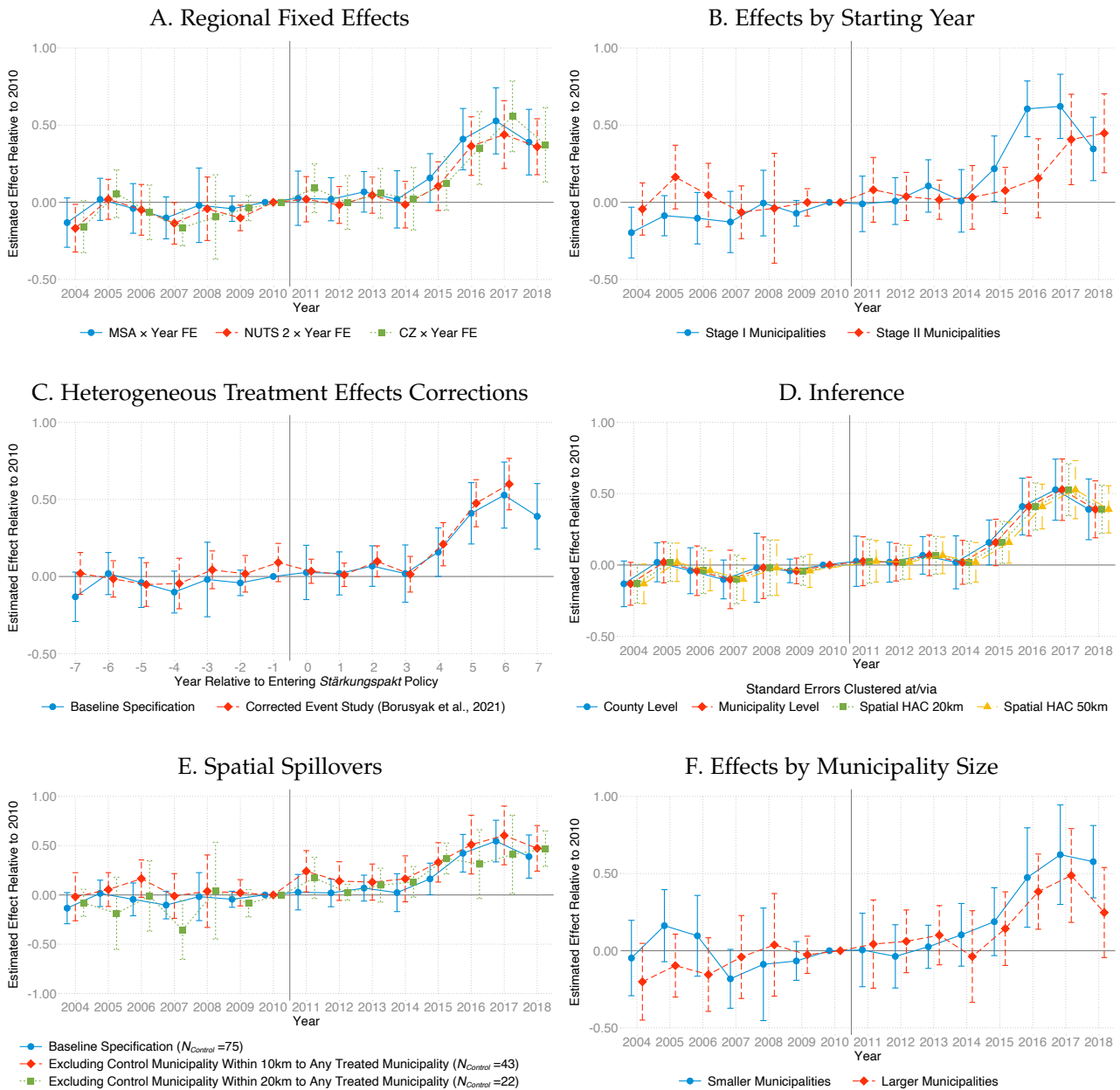
Notes: This graph plots the point estimates,  $\beta_k$ , and corresponding 95% confidence intervals of the difference-in-differences model as laid out in Equation (1). The dependent variable refers to municipalities' annual fiscal balance per capita in Panels A–C and annual fiscal balance in Million EUR in Panel D. The outcomes in Panel A and D are winsorized at the top and bottom 5%. The outcome in Panel C excludes those observations at the top and bottom 5% of the outcome distribution. All regressions include municipality fixed effects, city × year fixed effects as well as flexible controls for varying regional trends at different levels (as indicated in the graph). Standard errors are clustered at the county level.

Figure A.2: Effects on Fiscal Balance per Capita – Sensitivity Checks & Heterogeneity



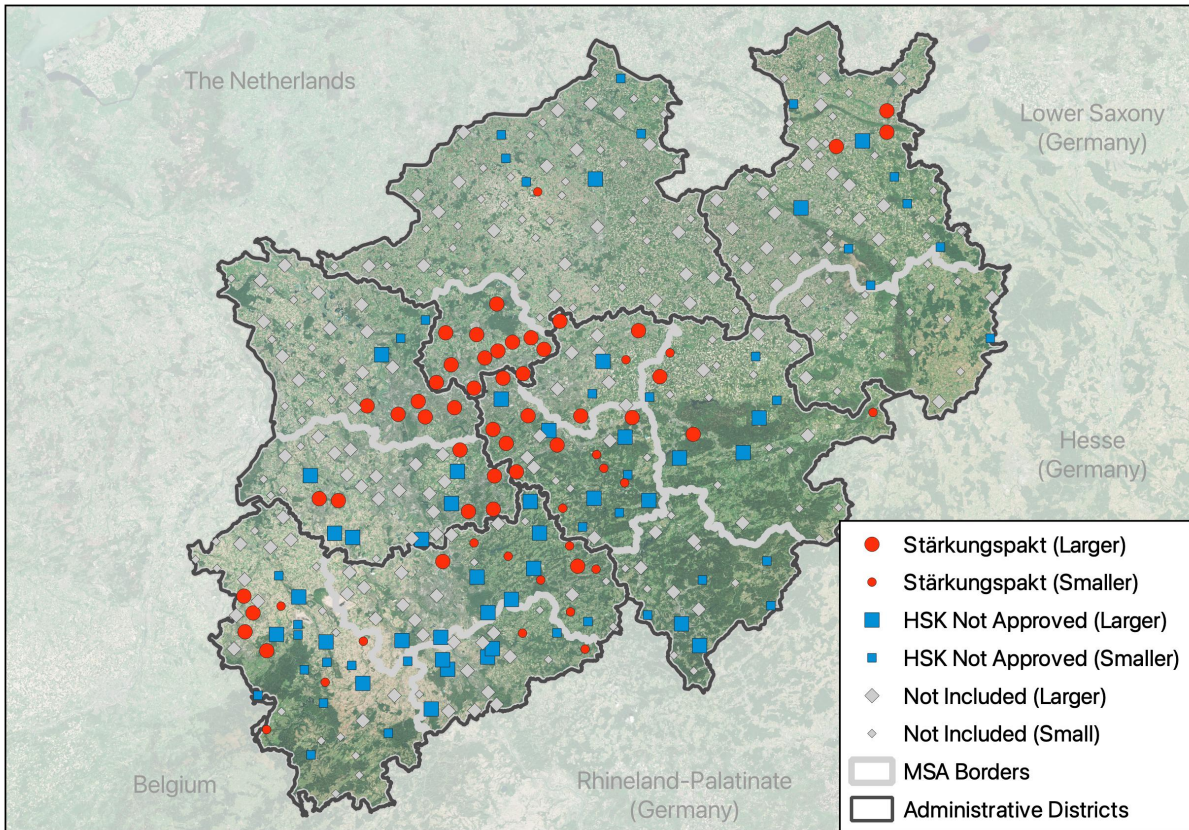
Notes: This graph plots the point estimates,  $\beta_k$ , and corresponding 95% confidence intervals of the difference-in-differences model as laid out in Equation (1). The dependent variable refers to municipalities' annual fiscal balance re-scaled by each municipalities' level of population in 2008 in all Panels. The regressions in Panel A include municipality fixed effects, city  $\times$  year fixed effects as well as flexible controls for varying regional trends at different levels (as indicated in the graph). Regressions in Panel B–F include municipality, MSA  $\times$  year, as well as city  $\times$  year fixed effects. The regressions in Panel F also include size group  $\times$  year fixed effects. In Panel B, the regressions allow for heterogeneous treatment effect of municipalities entering the consolidation program in stage I (2011) and stage II (2012), respectively. Panel C shows the baseline difference-in-differences design based on description in Equation (1) and the Event Study correction of two-way fixed effects models based on (Borusyak et al., 2021). In Panel D, inference is based on four alternative methods. In Panel E, we systematically exclude municipalities in the control group that are within 10(20)km to a treated municipalities to account for possible spatial spillovers. In Panel F, the regressions allow for heterogeneous treatment effects by municipality size via an interaction term. In Panels A, B, C, E and F, standard errors are clustered at the county level.

Figure A.3: Effects on Fiscal Surplus (Annual Fiscal Balance > 0) – Sensitivity Checks & Heterogeneity



Notes: This graph plots the point estimates,  $\beta_k$ , and corresponding 95% confidence intervals of the difference-in-differences model as laid out in Equation (1). The dependent variable refers to municipalities' probability of having an annual surplus in all Panels. The regressions in Panel A include municipality fixed effects, city  $\times$  year fixed effects as well as flexible controls for varying regional trends at different levels (as indicated in the graph). Regressions in Panel B–F include municipality, MSA  $\times$  year, as well as city  $\times$  year fixed effects. The regressions in Panel F also include size group  $\times$  year fixed effects. In Panel B, the regressions allow for heterogeneous treatment effect of municipalities entering the consolidation program in stage I (2011) and stage II (2012), respectively. Panel C shows the baseline difference-in-differences design based on description in Equation (1) and the Event Study correction of two-way fixed effects models based on (Borusyak et al., 2021). In Panel D, inference is based on four alternative methods. In Panel E, we systematically exclude municipalities in the control group that are within 10(20)km to a treated municipalities to account for possible spatial spillovers. In Panel F, the regressions allow for heterogeneous treatment effects by municipality size via an interaction term. In Panels A, B, C, E and F, standard errors are clustered at the county level.

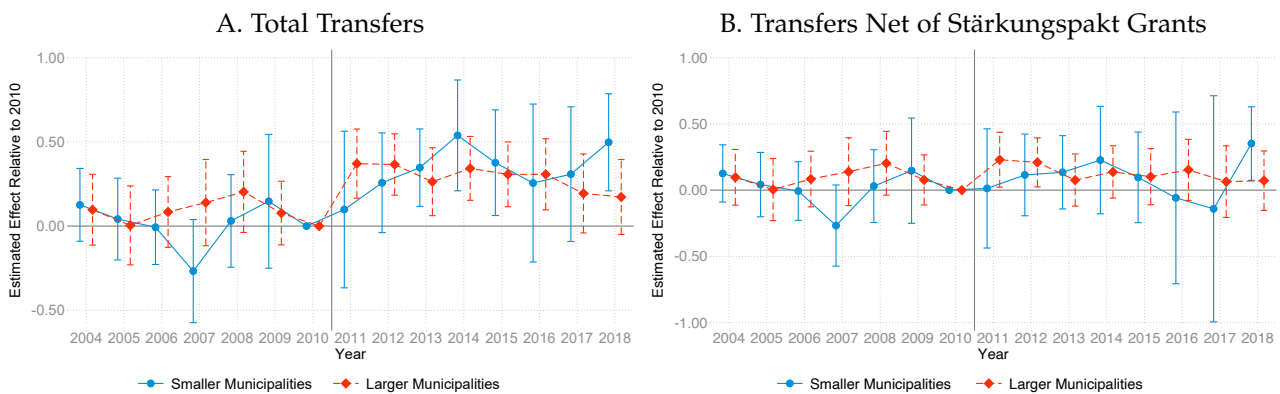
Figure A.4: Distribution of Treatment By Municipality Size



Notes: This map displays the 396 municipalities in the German state North Rhine-Westphalia. Symbols differentiate between smaller and larger cities as defined above. Colored in red are those municipalities that participated in the *Stärkungspakt*. Municipalities colored in blue indicate municipalities that were subject to the *HSK* in 2010 without approved budget plans, but not subject to treatment. Grey markers indicate other municipalities. The map further highlights the borders of the five administrative districts and 13 metropolitan statistical areas in NRW.

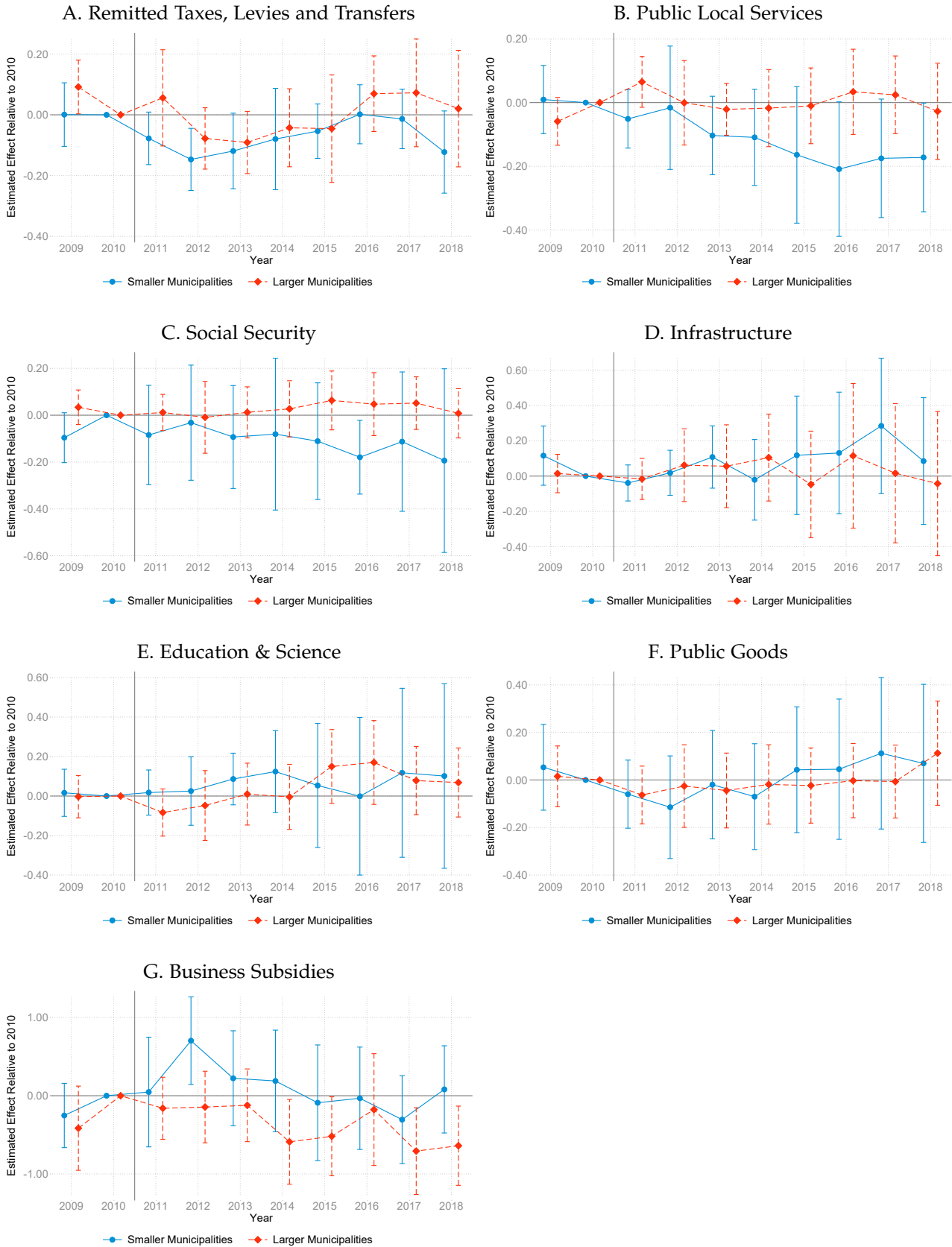
Maps: © GeoBasis-DE / BKG 2022 and European Union, Copernicus Sentinel-2 Data (2022).

Figure A.5: Effects on Transfers (Net of *Stärkungspakt* Grants)



Notes: This graph plots the point estimates,  $\beta_k$ , and corresponding 95% confidence intervals of the Diff-in-Diff model as laid out in Equation (1), allowing for heterogeneous treatment effects by municipality size via an interaction term. The dependent variable refers to total transfers received by the municipalities in Panel A and the transfers received by the municipalities minus the grants from the *Stärkungspakt* in Panel B. The outcomes are log-transformed. The regressions include municipality,  $MSA \times year$ ,  $city \times year$  as well as  $size\ group \times year$  fixed effects. Standard errors are clustered at the county level.

Figure A.6: Effects on Local Spending



Notes: This graph plots the point estimates,  $\beta_k$ , and corresponding 95% confidence intervals of the Diff-in-Diff model as laid out in Equation (1), allowing for heterogeneous treatment effects by municipality size via an interaction term. The dependent variable refers to municipalities' spending on remitted taxes, levies and transfers in Panel A, public local service in Panel B, social security in Panel C, infrastructure in Panel D, education and science in Panel E, public goods in Panel F and spending on business subsidies in Panel G. The outcomes are log-transformed. The regressions include municipality, MSA  $\times$  year, city  $\times$  year as well as size group  $\times$  year fixed effects. Standard errors are clustered at the county level.

Table A.2: Effects on the Local Economy

	VAT	Business	Number Of Plants (By Size)			Total	Daily Wage		
	Revenues (1)	Tax Base (2)	Total (3)	< 20 Empl. (4)	≥ 20 Empl. (5)	Jobs (6)	Mean (7)	P(25) (8)	P(75) (9)
Smaller Municipalities	0.034 (0.066)	-0.079 (0.118)	-0.001 (0.012)	0.002 (0.010)	0.014 (0.068)	-0.015 (0.033)	0.028 (0.027)	-0.015 (0.092)	0.023 (0.020)
Larger Municipalities	0.040 (0.049)	0.103 (0.117)	0.003 (0.012)	0.004 (0.012)	-0.007 (0.036)	0.001 (0.023)	0.009 (0.011)	0.035 (0.053)	0.005 (0.012)
Number of Observations	2,040	2,038	2,040	2,040	1,998	2,040	1,904	1,904	1,904
Outcome Mean	3,615,755	5,689,238	1,229	1,092	134	17,824	68	23	101

Notes: This table displays the long-run (2016–2018) average treatment effect of the Stärkungspakt on various economic outcomes derived from the difference-in-differences model as laid out in Equation (1). Outcomes in columns (1) and (2), municipalities' log VAT revenues and local business tax base, serve as measures of local economic activity. In columns (3)–(5), we investigate the effect of the policy on the number of local firms (of different size). In column (6), the treatment effect on the local number of jobs is given. Eventually, we present treatment effects on local wages in columns (7)–(9). All regressions include municipality, MSA  $\times$  year, city (kreisfreie Stadt)  $\times$  year, and size group  $\times$  year fixed effects. Standard errors are clustered at the county level. Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table A.3: Effects on Local Population and Real Estate Outcomes

	Population		Resident Workers (By Skill)			Real Estate Outcomes		
	Total (1)	Working-Age (2)	High (3)	Medium (4)	Low (5)	House Prices (6)	Land Prices (7)	Housing Stock (8)
Smaller Municipalities	-0.020** (0.008)	-0.018* (0.009)	-0.022 (0.021)	-0.017** (0.008)	0.011 (0.025)	-0.059* (0.033)	-0.027 (0.018)	-0.001 (0.003)
Larger Municipalities	0.002 (0.005)	0.006 (0.006)	-0.007 (0.021)	0.005 (0.007)	0.010 (0.017)	0.031 (0.030)	0.004 (0.021)	-0.002 (0.002)
Number of Observations	2,039	2,039	1,894	1,894	1,894	1,496	2,036	1,607
Outcome Mean	56,849	37,027	2,282	14,248	4,166	1,441	157	40,221

Notes: This table displays the long-run (2016–2018) average treatment effect of the Stärkungspakt on various population and real estate outcomes derived from the Diff-in-Diff model as laid out in Equation (1). In columns (1) and (2), we look at the effect of the Stärkungspakt on the local (working-age) population. In columns (3)–(5), we display the corresponding treatment effects on resident workers of different skill. Last, in columns (6)–(8) we display effects of the policy on real estate outcomes: house and land prices, as well as the local stock of housing. All regressions include municipality, MSA  $\times$  year, city (kreisfreie Stadt)  $\times$  year, and size group  $\times$  year fixed effects. Standard errors are clustered at the county level. Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .