Jurisdictional Fragmentation and Sprawl [*]

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Abstract

This paper explores the connection between jurisdictional fragmentation and sprawl. We utilize Finnish municipal mergers as a quasi-experiment which induces exogenous variation in the number of local jurisdictions in a given area. We are able to draw on rich register data providing granular location information for the full population of Finnish residents. We compare the location of new buildings (and their residents) in the actual mergers to the location of new buildings in a control group of hypothetical mergers simulated from the pre-merger municipality map in a difference-in-differences framework. When using our full sample, we do not find statistically significant effects on the location of newly constructed residential buildings. However, in smaller municipalities new single-family and row houses were built about 10% or 2 km closer to the new center. These effects materialize after two full council terms or roughly ten years and are driven by spatially compact and populous mergers.

Key words: Jurisdictional fragmentation, sprawl, municipality mergers.
JEL codes: C23, H70, R31, R38, R52.

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1 Introduction

Urban sprawl is associated with a myriad of problems ranging from long commutes and traffic congestion to poor air quality, large carbon emissions, and biodiversity loss (see, e.g., OECD 2018). Therefore, understanding the reasons behind sprawl is of crucial importance. Jurisdictional fragmentation and decentralized land use policy are often put forward as an explanation for sprawl (Burchfield et al. 2006; Cappelli et al. 2021). Fragmentation, i.e. a large number of independent jurisdictions within an urban area, may lead to a lack of coordination and unified planning resulting in inefficient land use and conflicting regulations. However, we still lack reliable causal evidence on this issue.

In this paper, we fill this gap by providing quasi-experimental evidence on whether jurisdictional fragmentation leads to sprawl and low-density residential development. Our research design is based on municipal mergers, which eliminate jurisdictional borders and reduce the number of jurisdictions making independent land use decisions in a given area. We use Finnish population-wide register data including granular residential location information spanning four years before and fourteen years after the mergers took place. These data allow us to identify new buildings, their location and type, and the number of residents in a given year.

We ask, are new residential buildings built closer to the new administrative center of the municipality (center of the largest pre-merger municipality in a merger) after the mergers take place compared to a control group of municipalities. More precisely, we compare the location of new buildings (and their residents) in the actual mergers to the location of new buildings in a control group of hypothetical mergers simulated from the pre-merger municipality map in a difference-in-differences (DID) framework.

Throughout our analysis, we analyze all buildings and a subsample of detached and row houses, which are the most common types of buildings in these municipalities. We also analyze land use in the largest municipality of each merger and the smaller merger partners separately. This division is relevant for two reasons. First, after a merger, there is a political power shift in land use policy from individual smaller municipalities toward the largest municipality in the merger (see Saarimaa and Tukiainen 2016). Second, prior research has shown (see Harjunen et al. 2021) that these same mergers led to a relocation of some local public jobs from small municipalities to the new administrative center. Therefore, the largest municipalities did not experience a change in the local administrative center whereas the smaller municipalities did. We also conduct heterogeneity analysis where we split the sample at the merger level with respect to its spatial compactness and the population of its largest pre-merger municipality.

When using our full sample, we do not find statistically significant effects on the location of newly constructed residential buildings. Specifically, there is no clear change in the proximity to the new administrative center of the post-merger municipality and the point estimates are quite imprecise. However, we find that in the smaller municipalities (as opposed to the largest municipality in the merger) new single-family and row houses were built about 10% or 2 km closer to the new center. These effects materialize after two full council terms or roughly ten years. This long lag reflects the fact that unifying local land use policy takes time as does the planning and construction of new buildings. We also find that the effect is driven by mergers resembling functional urban areas that are spatially compact and involve a relatively large municipality when measured at the pre-merger level. Overall, our results indicate that jurisdictional borders affect land use and can facilitate sprawl, but in the Finnish context land use policy reacts slowly to changes in these borders.

The current literature on the effects of jurisdictional fragmentation and sprawl provides mixed results and relies on research designs that are not ideal for causal inference. For example, Glaeser and Kahn (2004) and Burchfield et al. (2006) find that jurisdictional fragmentation is not associated with sprawl in the US (for a more recent discussion see Duranton and Puga 2015). More recently, Ehrlich et al. (2018) find that after controlling for population and GDP, countries with more municipalities have more residential sprawl when measured at the country level. Furthermore, Cappelli et al. (2021) show that an increase in the number of municipalities per capita is associated with a spatial expansion of urbanized areas in a cross-section of EU cities. We contribute to this literature by presenting findings from a quasi-experimental research design resulting in more credible causal estimates.

In addition to sprawl, jurisdictional fragmentation can also be connected to the overall housing supply.[1] Greenaway-McGrevy and Phillips (2023) exploit a major local jurisdictional change in Auckland to study the effects of upzoning on residential construction. They show that eliminating jurisdictional boundaries in the Auckland area in 2010 led to increases in building rights and housing construction in the late 2010s. Larsen and Kettel (2023) analyze the Danish 2006 local government reform where many small municipalities were forced to merge to fulfill a new minimum size requirement (20,000 inhabitants). They use housing permit data aggregated to the

[1]Favilukis and Song (2023) present theoretical models of zoning behavior when a metropolitan area consists of multiple jurisdictional entities.

post-merger municipality level and observe that housing permits decreased after merging. Tricaud (2024) employs French municipal data to analyze the effects of mandated municipal cooperation (inter-municipal community) on housing construction. Cooperating municipalities remain autonomous in some of their decision-making, but have to make joint decisions in some sectors like urban planning. Tricaud (2024) finds that municipalities that were forced to enter an inter-municipal community experienced a large increase in housing permits.[2] Overall, the results regarding jurisdictional fragmentation and housing supply seem to be mixed. Moreover, these papers focus on the quantity of new housing, whereas our interest lies in where this new housing gets built.

Political fragmentation within municipalities can also affect urban planning and zoning. For example, Mast (2022) and Hankinson and Magazinnik (2023) show that new housing construction decreased when US municipalities switched from at-large or single-district elections to district elections. They attribute the finding to the enhanced incentives of politicians to cater to the voters of their district rather than the electorate as a whole.

Some papers have used jurisdictional boundaries in boundary discontinuity designs to identify the effects of zoning and land use regulations (e.g., Turner et al. 2014; Gyourko and McCulloch 2023; Kulka et al. 2023). The results from these papers indicate that land use policy differs across neighboring jurisdictions and that these differences matter for residential construction, house prices, and residential sorting. These findings are consistent with our results as we show that land use policies change once jurisdictional boundaries are removed. Relatedly, Bordeu (2023) develops a quantitative spatial model describing how local governments within a metropolitan area tend to underinvest in infrastructure in areas near their boundaries. This is because a large share of the benefits from this infrastructure accrues outside their jurisdiction. A counterfactual with centralized decision-making increases welfare due to increased infrastructure investment and due to its more efficient spatial allocation.

Finally, we contribute to the literature analyzing the effects of municipality mergers. This literature has looked at the effects of mergers on various fiscal (e.g., Hinnerich 2009, Reingewertz 2012, Saarimaa and Tukiainen 2015, Blom-Hansen et al. 2016, Li and Takeuchi 2023) and political (e.g., Lassen and Serritzlew 2011; Saarimaa and Tukiainen 2016) outcomes. Some papers have also analyzed what happens to public

[2]However, Tricaud (2024) discovers significant heterogeneity in responses among municipalities. Those forced to cooperate experience a significant increase in the number of building permits, whereas no effect is observed in municipalities that chose to cooperate voluntarily.

services and economic activity within mergers. Harjunen et al. (2021) find that the same Finnish mergers we are studying led to the relocation of local public administrative and health sector jobs from small municipalities to the larger merger partners, and that the relocation correlates with the geographic political representation. Their analysis is at the pre-merger municipality level and lacks the spatial detail of our data. Egger et al. (2022) study the effects of mergers on spatial economic activity using night light data in Germany. They find that economic activity increases near the large absorbing municipalities and decreases in the small absorbed ones. We add to this body of literature by analyzing the effects of merging on sprawl, a very important yet neglected outcome.

The rest of this paper is organized as follows. Section 2 describes the institutional context, while the data and empirical approach are discussed in Section 3. The results are presented in Section 4 and Section 5 concludes.

2 Institutional setting

2.1 Finnish municipalities and mergers

Municipalities are the smallest self-governing administrative units in the Finnish government ladder.[3] Municipalities are responsible for providing health and social care, elementary schooling, and other local public goods, such as public transportation and waste management. Municipalities are allowed to cooperate in the provision of these services. The most important revenue source is the flat municipal income tax which the municipalities can set freely.[4] There is also a less important property tax and the municipalities receive part of the corporate income tax revenue from firms operating within their boundaries. A central government grant system, consisting of 20% of total revenue, is used to equalize local cost and revenue disparities.

Municipal councils are the main seat of power in the municipal decision-making. No official ruling coalition government is formed after the elections and councils decide by majority vote on an issue-by-issue basis. Municipal elections are held simultaneously in all municipalities and the council term lasts for four years. Our data span four council terms: 2005-2008 (elections held in October 2004), 2009-2012 (elections

[3]Up until 2022, Finland had a two-tier system and then a major reform introduced a third middle tier. This new tier took health and most social care services from the municipalities. This section describes the prior system that was in place during our analysis period.

[4]This tax rate varied between 16 and 21 percent in 2008.

held in October 2008), 2013-2017 (elections held in October 2012) and 2017-2021 (elections held in April 2017).[5] Each municipality has a single electoral district without geographic quotas. The elections use an open-list proportional representation system.

In the early 2000s, the central government encouraged municipalities to merge due to concerns over municipal finances and deteriorating age structure. Municipalities were facing increasing health and social care costs and at the same time decreasing tax bases. The government granted financial subsidies for merging municipalities, assured that government grants would remain unchanged during the initial five years after merging, and prohibited the municipalities from laying off their employees for financial reasons within the same five-year period following the merger. Merging was voluntary for the municipalities and a merger had to be approved by the councils of all participating municipalities (see Hyytinen et al. 2014).

The number of municipalities was 419 in 2007 and decreased to 336 in 2012. The most intense year of the mergers was 2009 when 32 mergers involving 99 municipalities occurred and 67 municipalities ceased to exist. We will focus on the 2009 mergers in our analysis.

2.2 Land use policy

The vast majority of urban planning and land use is controlled by the municipalities. The local master plan and the local detailed plan form the backbone of a municipality's land policy and have to be approved by the municipal council. The local master plan covers, for example, the location of residential, commercial, and industrial areas as well as traffic routes. The local detailed plans prescribe in detail where, what, and how much may be built.

Before merging, each municipality would dictate its land use policy. After the reform, the council of the new municipality would determine a common land use policy for the newly formed municipality, which includes carving up new local master plans and local detailed plans. The establishment of the local master plan usually takes several years and in many of the mergers in our sample, the new local master plan was approved during the second post-merger council term or after 2012. Thus, any major changes in land use policy are unlikely to happen in the short run.[6]

[5] From 2017 onward, the start of the council term was moved forward from January to June.

[6] We were able to find a new land policy program established after 2009 for 68% of the mergers in our sample. The median year for the establishment of such a plan was 2014.5. However, there is scant evidence provided regarding the geographical orientation of new construction.

3 Data and research design

3.1 Data

We use population-wide geo-coded register data from Statistics Finland spanning the years 2005–2022. In addition to rich socio-economic background variables, the data include granular residential location information for all individuals at the end of each year. We have the coordinates of the building if the building contains at least three households. If not, we have coordinates either for 250 square meters or one square kilometer grids, depending on the number of households within the grids. We can also classify buildings into detached houses, row houses, and multi-story apartment buildings. For each year, we define new buildings as those that are occupied by new residents for the first time in the register data. These data allow us to identify the type and size of new residential buildings and their distance to the new administrative center of the merger.

3.2 Research Design

3.2.1 Matching

As the mergers were voluntary, the merging municipalities are a selected sample that differs from those municipalities that chose not to merge (see Saarimaa and Tukiainen 2014). Thus, comparing the residential development in merging municipalities with non-merging ones could lead to selection bias. To address this selection issue, we follow Harjunen et al. (2021) and combine nearest neighbor matching with difference-in-differences methods. To obtain a control group, we first simulate all possible spatially contiguous hypothetical mergers that do not cross county borders. We then use nearest neighbor matching to match each actual merger with one control unit (placebo) with similar characteristics as measured before the merger and allow the control units to be matched with several mergers.

The matching is based on several merger and municipal-level characteristics. First, as the land use policies in a municipality are influenced by its population development, we want the mergers and their placebos to exhibit similar population levels and growth rates before the reform. Second, land use is also affected by the spatial compactness of the merger. To address this, we include the median distance of the population to the post-merger municipality center and the population-weighted mean distance from the center of other pre-merger municipalities to the center of the largest pre-merger municipality.

Thirdly, larger municipalities are likely to have more weight in post-merger decision-making so we include the Herfindahl-Hirschman concentration index to find placebos with similar population distributions as the actual mergers. Fourthly, municipalities often provide services in cooperation. Therefore, we want to have placebos with comparable cooperation history as it can indicate easier collaboration in land use and planning. Finally, we do exact matching based on the number of participating municipalities in the merger. That is, for each merger involving two municipalities, we find the match from the subset of hypothetical mergers that also consist of two municipalities.

We only use 25 of the 32 mergers of 2009. First, we exclude three mergers in which some or all of the participating municipalities were part of another new merger within a few years. Second, we exclude one merger where the merging municipalities did not share a border, another one where the municipalities were scattered in an archipelago, and a third one where the number of participating municipalities (10) was substantially larger than in any other merger making it difficult to construct a placebo. Finally, we omit one merger due to a data error in the unique building identifier within one municipality.[7] The map in Figure 1 displays the actual mergers and their placebos.

[7]In addition, we have excluded municipalities located in the counties of Kainuu, Lapland, and Åland from the pool of possible controls. No mergers took place in these counties in 2009, Kainuu had a county experiment around the same time and Lapland and Åland are geographical outliers. Moreover, we have also excluded the Helsinki Metropolitan Area from our analysis because it is distinctly different from the rest of the country.

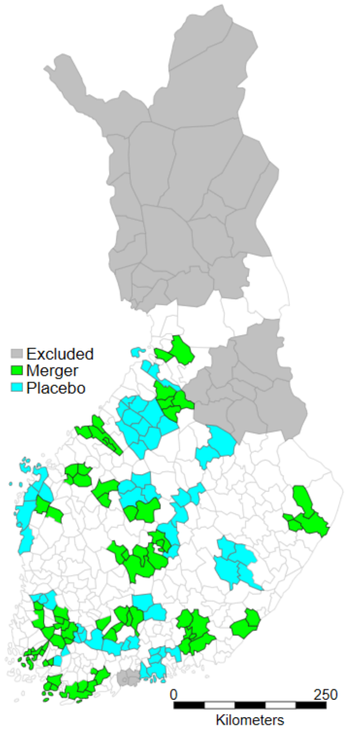
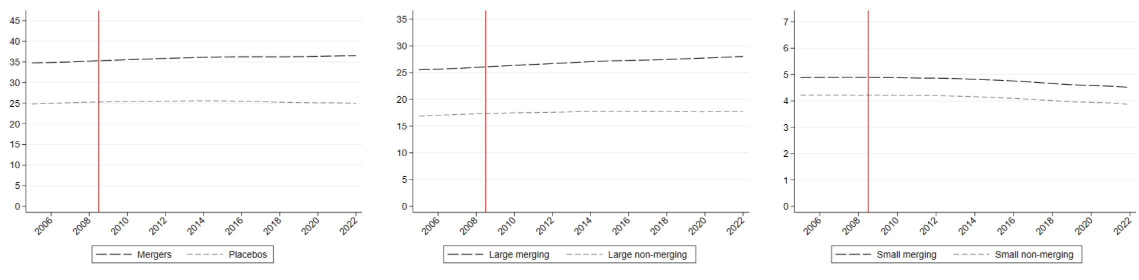


Figure 1: Mergers and their matched placebos.

For our control group to present a credible counterfactual, it is important that the population growth rates are similar between the actual and the placebo mergers given their influence on land use. The population trends for the mergers and placebos at the post-merger municipal level are shown in Panel 2a in Figure 2. A level difference is evident, but the matching has been able to find suitable placebos for the mergers, at least with regard to population growth. A similar pattern emerges when examining separately the large or small pre-merger municipalities as shown in Panels 2b and 2c in Figure 2.



(a) Post-merger mun. (b) Large pre-merger mun. (c) Small pre-merger mun.

Figure 2: Population trends in actual and placebo mergers 2005–2022.

We present descriptive statistics for the treatment group, the matched control group, and the non-matched control group in Table A1 in the appendix. The nearest neighbor matching produces a control group, which is much more similar to the actual mergers than all the hypothetical mergers. However, the actual mergers are spatially more compact than the matched placebo mergers. Finally, Table A2 presents the descriptive statistics for our main outcome of interest for the different subsamples we analyze.

3.2.2 Econometric framework

Our econometric set-up is a difference-in-differences (DID) where we compare municipalities that merged in 2009 (treatment group) to a set of non-merging municipalities (control group) obtained through nearest neighbor matching as explained above. The outcome of interest is the proximity of new residential buildings to the center of the largest municipality in the merger taking into account the number of people residing in the new buildings. Our first specification is the following dynamic DID model where the treatment takes place at the same time for all treated units and the control group consists of never-treated units:

$$log(dist_{imt}) = \sum_{\substack{s=2005 \\ s\neq 2008}}^{2022} \delta_s \mathbb{1}_{\{s=t\}} \mathbb{1}_{\{merger_m=1\}} + \gamma_t + \theta_m + u_{imt}. \tag{1}$$

The outcome $log(dist_{imt})$ measures the log distance to the center of the largest municipality in the merger of individual i living in a building constructed in year t in pre-merger municipality m at the end of year t. $\mathbb{1}(.)$ denotes an indicator function: the first of these takes the value one at certain years and is zero otherwise, while the second equals one for municipalities merging in 2009 and zero otherwise. We also control for year, γ_t, and pre-merger level municipality fixed effects, θ_m, and u_{imt} is the error term. We allow the error terms to be correlated within pre-merger municipalities, and thus, cluster the standard errors at the pre-merger municipality level.

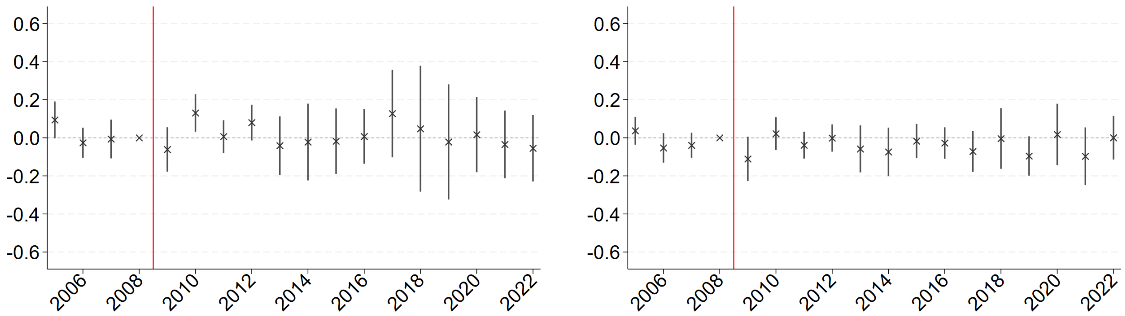
In addition to yearly effects, we also consider three post-treatment periods, which coincide with post-merger council terms. These models take the form:

$$\begin{aligned} ln(dist_{imt}) = {} & \delta_1 \mathbb{1}_{\{merger_m=1\}} \mathbb{1}_{\{t\geq 2009\ \&\ t\leq 2012\}} + \delta_2 \mathbb{1}_{\{merger_m=1\}} \mathbb{1}_{\{t\geq 2013\ \&\ t\leq 2016\}} \\ & + \delta_3 \mathbb{1}_{\{merger_m=1\}} \mathbb{1}_{\{t\geq 2017\}} + \gamma_t + \theta_m + u_{im}, \end{aligned} \tag{2}$$

where the time indicators $\mathbb{1}$ refer to four-year council terms instead of years. This model also includes year, γ_t, and pre-merger municipality, θ_m, fixed effects.

4 Results

We start by presenting dynamic DID graphs based on Eq. (1). Figure 3 presents the effect of merging on the location of new buildings and their residents separately for all buildings (Panel A) and detached and row houses (Panel B). The pre-treatment trends are parallel in both groups. Neither the all-buildings sample nor the detached and row houses sample reveals statistically significant effects of the mergers on the distance of new buildings to the new administrative center. The point estimates are fairly close to zero. The confidence intervals are larger for the all-buildings sample, most likely because apartment buildings are much less common, but contain many residents per building leading to more noise in the data. The point estimates are often close to zero in the full sample and tend to be negative in the smaller sample, but vary somewhat across the years in both samples. When using all the merging municipalities, we find no evidence of the merger effect, but the results do not allow us to confidently rule out effects either.



(a) All buildings

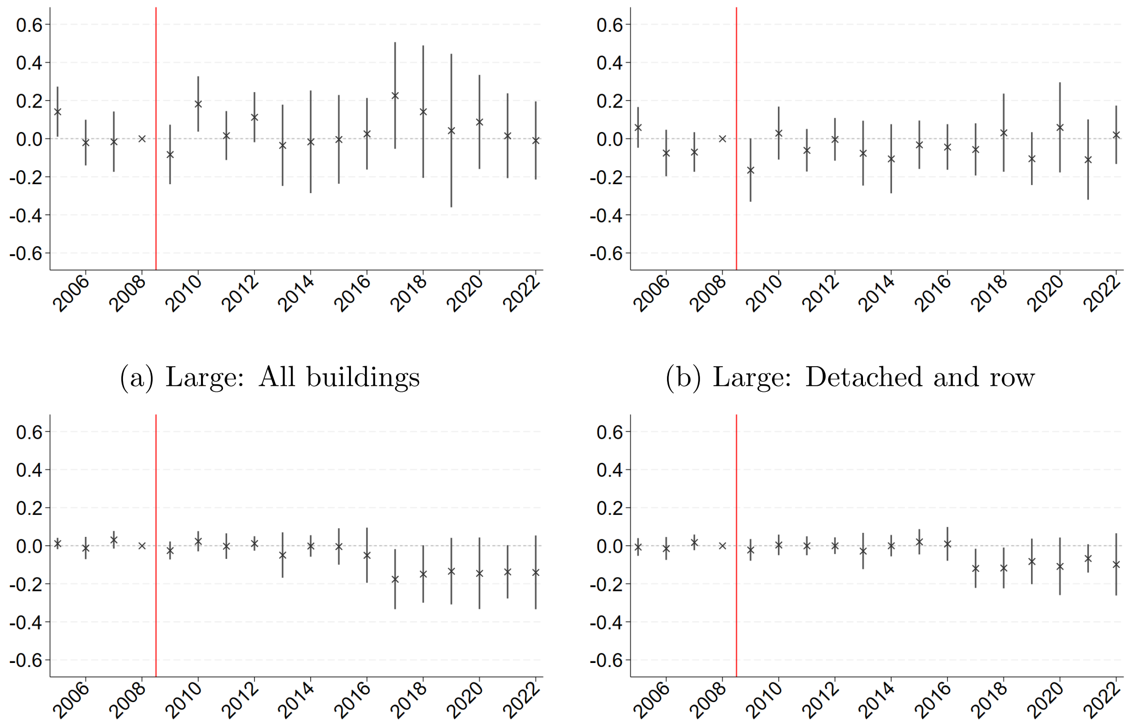
(b) Detached and row

Note: The figures plot coefficients from a dynamic DID regression, where the outcome (log distance to the center of the post-merger municipality) is regressed on year fixed effects, pre-merger municipality fixed effects, and treatment × year fixed effects, omitting the last year before the reform. Dots and whiskers illustrate the point estimate and the 95% confidence intervals of the treatment × year coefficients. Standard errors are clustered at the pre-merger municipality level. The number of observations in panels is 404,520 in 3a and 309,195 in 3b.

Figure 3: Effect of merging on location of new buildings.

Next, we split our sample and run the dynamic DID models separately for the largest municipalities and for the smaller municipalities in the mergers. These results are presented in Figure 4. For the large municipalities (Panels 4a and 4b), the results resemble those of the full sample for both all buildings and detached and row houses. Again, the pre-treatment trends are parallel, but post-merger point estimates are insignificant and noisy.

In Panels 4c and 4d we turn to the smaller pre-merger municipalities. The pre-treatment trends seem parallel and up until 2016, no effect is observable in either building category. These estimates can be considered quite precisely estimated zeros. After 2017, however, a systematic, fairly large, and mostly statistically significant effect is detectable. Moreover, the confidence intervals are narrower than for the large pre-merger municipalities. This long lag reflects the fact that unifying local land use policy takes time as does the planning and construction of new buildings.



(a) Large: All buildings

(b) Large: Detached and row

(c) Small: All buildings

(d) Small: Detached and row

Note: The figures plot coefficients from a dynamic DID regression, where the outcome (log distance to the center of the post-merger municipality) is regressed on year fixed effects, pre-merger municipality fixed effects, and treatment × year fixed effects, omitting the last year before the reform. Dots and whiskers illustrate the point estimate and the 95% confidence intervals of the treatment × year coefficients. Standard errors are clustered at the pre-merger municipality level. The number of observations in panels are 296,207 in 4a, 209,797 in 4b, 108,313 in 4c and 99,398 in 4d.

Figure 4: Effect of merging on location of new buildings, large vs. small pre-merger municipalities.

To get a more accurate understanding of the effect magnitude and gain statistical power, we estimate difference-in-differences models with three after-merger periods: 2009–2012, 2013–2016, and 2017–2022. The three periods correspond to the first three new municipal council terms after the merger. We present the results in Table 1. The results are naturally similar to the figures above that presented the corresponding yearly effects. We observe no statistically significant effects on the proximity of new buildings to the post-merger municipality center in either building class for the full sample (Columns 1 and 4) or for the sample of large municipalities (Columns 2 and 5). This is true for all of the post-merger council terms. But again, the estimates are quite imprecise.

Lastly, we use the sample of small pre-merger municipalities and observe no change in the proximity to the center of the post-merger municipality for the first two council terms (Columns 3 and 6). However, in the third council term, we observe large and statistically significant effects in both samples. As expected, the result is more precise in panel B for the detached and row houses samples. That point estimate indicates that the new buildings are constructed on average 9.8% or roughly 2 km closer to the new administrative center. The 95% confidence intervals correspond to a lower bound of 0.1 km (0.1%) and an upper bound of 3.7 km (19%).[8]

To gain more insight into the mechanisms behind our results, we analyze a subsample of mergers that resemble functional urban areas and compare the results to mergers where the municipalities are more equally populated and spatially dispersed. We do this by splitting our sample based on the size of the largest municipality in the merger and the spatial compactness of the merger. More specifically, we split our sample based on the median population (13,058) of the largest municipality in 2008. The results in Figures A1 and A2 and Tables A3 and A4 show that the results reported above are driven by mergers that involve a large municipality.

When dividing our sample based on the median distance of residents to the post-merger administrative center (7.17 km in 2008), we find that the results are evident in the spatially compact mergers, but not in the subsample of spatially dispersed mergers. These results are presented in Figures A3 and A4 and Tables A5 and A6 in the appendix.[9]

To sum up, Finnish municipal mergers do not induce dramatic changes in the proximity of new buildings to the administrative center of post-merger municipality on average. However, we observe a fairly large but gradual effect when focusing on

[8]As a robustness check, we alter the level of fixed effects and clustering. Instead of the pre-merger municipal level for both, we use post-merger municipal levels for both and find similar, but somewhat larger effects (not reported).

[9]One might be concerned the subsample divisions described above produce identical groups. Yet, of the 12 mergers in the subsample including a large municipality, only 7 are also in the subsample of spatially most compact mergers. Correspondingly, of the 13 mergers not including a large municipality, 7 are also in the subsample of spatially most dispersed mergers.

Table 1: Effect of merging on location of new buildings by council term.

Panel A: All buildings			
Outcome:	(1)	(2)	(3)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	0.024	0.032	-0.006
	(0.030)	(0.038)	(0.014)
Treated*2013–2016	-0.037	-0.038	-0.039
	(0.062)	(0.076)	(0.042)
Treated*2017–2022	-0.003	0.054	-0.154*
	(0.081)	(0.089)	(0.078)
Observations	404,520	296,207	108,313
R2	0.521	0.143	0.750
Outcome mean	1.592	1.158	2.779
Outcome mean (km)	8.56	4.79	18.86
Panel B: Detached and row houses			
Outcome:	(4)	(5)	(6)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	-0.017	-0.027	-0.004
	(0.032)	(0.045)	(0.013)
Treated*2013–2016	-0.033	-0.044	-0.005
	(0.039)	(0.052)	(0.024)
Treated*2017–2022	-0.027	-0.004	-0.098**
	(0.032)	(0.040)	(0.047)
Observations	309,195	209,797	99,398
R2	0.585	0.217	0.737
Outcome mean	1.885	1.449	2.805
Outcome mean (km)	10.15	5.84	19.23

Note: Individual-level data on residential building occupants between 2005 and 2022 are from Statistics Finland. All models include pre-merger municipality and year fixed effects. Standard errors (in parentheses) are clustered at the pre-merger municipal level. Statistical significance is denoted by *** (1%), ** (5%), and * (10%).

the small pre-merger municipalities separately. Finally, sub-samples based on the total population and the spatial compactness of the post-merger municipality show that the results arise from larger and more compact mergers.

5 Conclusions

This paper explores the connection between jurisdictional fragmentation and sprawl. We utilize Finnish municipal mergers as a quasi-experiment which induces exogenous variation in the number of local jurisdictions in a given area. To the best of our knowledge, this is the first paper to provide quasi-experimental evidence on this important issue. Moreover, we are able to draw on rich register data providing granular location information for the full population of Finnish residents.

In our analysis, we compare the location of new buildings (and their residents) in the actual mergers to the location of new buildings in a control group of hypothetical mergers simulated from the pre-merger municipality map in a difference-in-differences (DID) framework. When using our full sample, we do not find statistically significant effects on the location of newly constructed residential buildings. However, we do find that in smaller municipalities new single-family and row houses were built about 10% or 2 km closer to the new center. These effects materialize after two full council terms or roughly ten years, which is on par with the findings of Greenaway-McGrevy and Phillips (2023). This long lag reflects the fact that unifying local land use policy takes time as does the planning and construction of new buildings.

We conclude by offering some thoughts on the external validity of our results. Our results indicate that jurisdictional borders affect land use and can facilitate sprawl, but at least in the Finnish context land use policy reacts slowly to changes in these borders. Whether this is the case in other countries with different land use policies and local political institutions is an open question and more research is needed from different institutional settings. Furthermore, our results come from a setting with relatively small and sparsely populated municipalities. At the same time, the effect we document is driven by mergers that are spatially compact and involve one relatively large municipality. This suggests that our results may extend to more urbanized settings.

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Appendix A: Supplementary material

Table A1: Matching results.

	Non-matched	Matched	Merger
Panel A: Mergers of size 2			
No. of mergers	221	13	13
Total population (1,000s)	23.52	20.23	29.23
Median distance of voters to center	27.23	18.71	15.28
Pop. w. mean dist. to large center	27.09	18.32	14.56
Herfindahl-Hirschman index of population	0.59	0.69	0.69
Cooperation prior to 2009	0.21	0.38	0.46
Large mun. pop. growth rate (2000–2008)	-0.00	0.05	0.09
Small mun. pop. growth rate (mean, 2000–2008)	-0.02	-0.03	-0.02
Panel B: Mergers of size 3			
	Non-matched	Matched	Merger
No. of mergers	331	6	6
Total population (1,000s)	40.36	25.71	43.24
Median distance of voters to center	32.26	20.24	14.81
Pop. w. mean dist. to large center	32.15	21.66	14.81
Herfindahl-Hirschman index of population	0.45	0.46	0.53
Cooperation prior to 2009	0.06	0.33	0.50
Large mun. pop. growth rate (2000–2008)	0.01	0.11	0.20
Small mun. pop. growth rate (mean, 2000–2008)	-0.01	0.02	0.03
Panel C: Mergers of size 4			
	Non-matched	Matched	Merger
No. of mergers	490	4	4
Total population (1,000s)	60.24	25.87	21.88
Median distance of voters to center	35.09	24.46	20.40
Pop. w. mean dist. to large center	36.11	24.60	21.26
Herfindahl-Hirschman index of population	0.38	0.41	0.47
Cooperation prior to 2009	0.01	0.50	0.50
Large mun. pop. growth rate (2000–2008)	0.02	-0.01	0.01
Small mun. pop. growth rate (mean, 2000–2008)	0.00	-0.05	-0.03
Panel D: Mergers of size 6			
	Non-matched	Matched	Merger
No. of mergers	1067	2	2
Total population (1,000s)	95.55	57.85	77.15
Median distance of voters to center	38.36	26.40	16.17
Pop. w. mean dist. to large center	40.42	26.88	17.24
Herfindahl-Hirschman index of population	0.30	0.32	0.40
Cooperation prior to 2009	0.00	0.00	0.00
Large mun. pop. growth rate (2000–2008)	0.03	0.03	0.02
Small mun. pop. growth rate (mean, 2000–2008)	-0.00	0.00	-0.01

Note: The table presents results for nearest neighbor matching based on merger size, merger population, the median distance of voters to the center of the largest pre-merger municipality, population-weighted mean distance from other municipality centers to the center of the largest pre-merger municipality, Herfindahl-Hirschman Index of pre-merger municipality populations, cooperation within the post-merger municipality before 2009, and the population growth rates (2000–2008) of the large and small pre-merger municipalities, respectively.

Table A2: Distance (km) to the center of the new administrative center.

Panel A: Treatment group, All buildings			
	All	Large	Small
Observations	230,176	176,720	53,456
Mean	6.87	4.45	14.90
Standard deviation	7.42	4.25	9.65
Panel B: Control group, All buildings			
	All	Large	Small
Observations	174,344	119,487	54,857
Mean	10.79	5.31	22.72
Standard deviation	10.19	5.16	8.00
Panel C: Treatment group, Detached and row houses			
	All	Large	Small
Observations	158,188	109,553	48,635
Mean	8.70	5.68	15.48
Standard deviation	8.06	4.74	9.71
Panel D: Control group, Detached and row houses			
	All	Large	Small
Observations	151,007	100,244	50,763
Mean	11.67	6.02	22.83
Standard deviation	10.24	5.32	8.26

Note: The table presents descriptive statistics for our outcome of interest in different subgroups using data from 2005–2022.

Table A3: Effects by council term, mergers involving a large municipality.

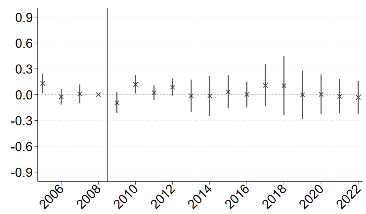
Panel A: All buildings			
Outcome:	(1)	(2)	(3)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	0.008	0.009	-0.015
	(0.030)	(0.031)	(0.017)
Treated*2013–2016	-0.029	-0.026	-0.051
	(0.075)	(0.092)	(0.046)
Treated*2017–2022	-0.001	0.063	-0.176**
	(0.082)	(0.087)	(0.078)
Observations	329,450	244,417	85,033
R2	0.521	0.133	0.762
Outcome mean	1.577	1.165	2.760
Outcome mean (km)	8.32	4.73	18.67
Panel B: Detached and row houses			
Outcome:	(4)	(5)	(6)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	-0.038	-0.054	-0.012
	(0.034)	(0.047)	(0.016)
Treated*2013–2016	-0.034	-0.045	-0.012
	(0.047)	(0.060)	(0.026)
Treated*2017–2022	-0.035	-0.010	-0.115**
	(0.032)	(0.040)	(0.049)
Observations	239,624	162,839	76,785
R2	0.603	0.213	0.746
Outcome mean	1.916	1.503	2.792
Outcome mean (km)	10.16	5.94	19.11

Note: Individual-level data on residential building occupants between 2005 and 2022 are from Statistics Finland. Included are 12 post-merger municipalities with the population of the largest pre-merger municipality above the median of 13,058 (in 2008), and their placebos. All models include pre-merger municipality and year fixed effects. Standard errors (in parentheses) are clustered at the pre-merger municipal level. Statistical significance is denoted by *** (1%), ** (5%), and * (10%).

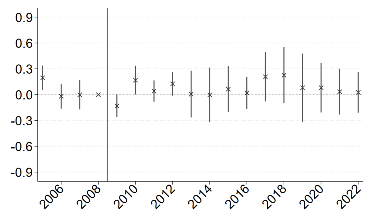
Table A4: Effects by council term, mergers not involving a large municipality.

Panel A: All buildings			
Outcome:	(1)	(2)	(3)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	0.045	0.051	0.027
	(0.055)	(0.081)	(0.023)
Treated*2013–2016	-0.092	-0.140	0.031
	(0.062)	(0.087)	(0.033)
Treated*2017–2022	0.146	0.191	-0.013
	(0.121)	(0.158)	(0.027)
Observations	73,705	51,106	22,599
R2	0.555	0.188	0.723
Outcome mean	1.641	1.113	2.836
Outcome mean (km)	9.44	5.08	19.30
Panel B: Detached and row houses			
Outcome:	(4)	(5)	(6)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	0.039	0.044	0.025
	(0.058)	(0.089)	(0.024)
Treated*2013–2016	-0.035	-0.061	0.028
	(0.060)	(0.088)	(0.032)
Treated*2017–2022	0.034	0.046	-0.006
	(0.089)	(0.124)	(0.028)
Observations	68,206	46,274	21,932
R2	0.573	0.194	0.723
Outcome mean	1.762	1.253	2.837
Outcome mean (km)	9.93	5.46	19.37

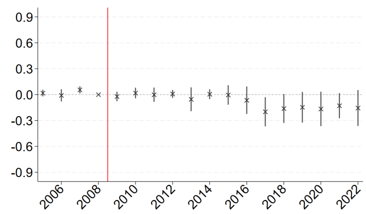
Note: Individual-level data on residential building occupants between 2005 and 2022 are from Statistics Finland. Included are 13 post-merger municipalities with the population of the largest pre-merger municipality below the median of 13,058 (in 2008), and their placebos. All models include pre-merger municipality and year fixed effects. Standard errors (in parentheses) are clustered at the pre-merger municipal level. Statistical significance is denoted by *** (1%), ** (5%), and * (10%).



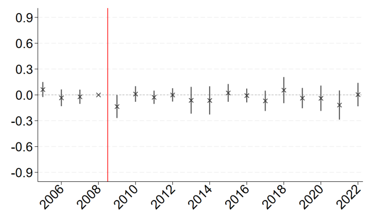
(a) All: All buildings



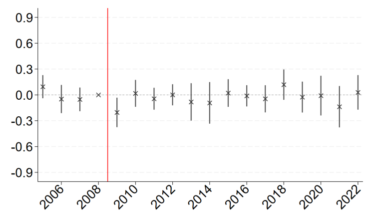
(b) Large: All buildings



(c) Small: All buildings



(d) All: Detached & row



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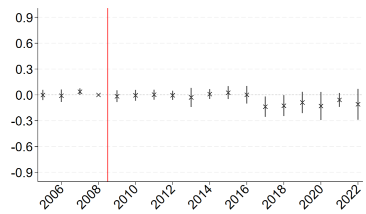
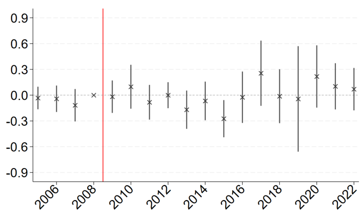


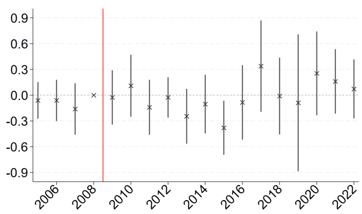
(f) Small: Detached & row

Note: The figures plot coefficients from a dynamic DID regression, where the outcome (log distance to the center of the post-merger municipality) is regressed on year fixed effects, pre-merger municipality fixed effects, and treatment $\times$ year fixed effects, omitting the last year before the reform. Dots and whiskers illustrate the point estimate and the 95% confidence intervals of the treatment $\times$ year coefficients. Standard errors are clustered at the pre-merger municipality level.

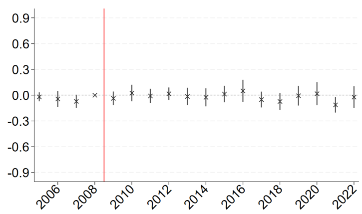
Figure A1: Effect of merging on location of new buildings, mergers involving a large municipality.



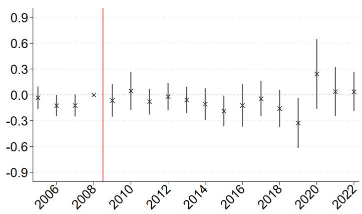
(a) All: All buildings



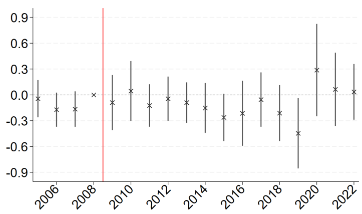
(b) Large: All buildings



(c) Small: All buildings



(d) All: Detached & row



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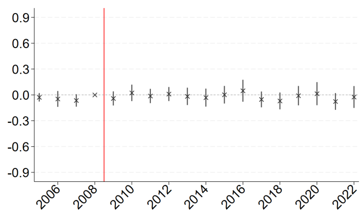


(f) Small: Detached & row

Note: The figures plot coefficients from a dynamic DID regression, where the outcome (log distance to the center of the post-merger municipality) is regressed on year fixed effects, pre-merger municipality fixed effects, and treatment $\times$ year fixed effects, omitting the last year before the reform. Dots and whiskers illustrate the point estimate and the 95% confidence intervals of the treatment $\times$ year coefficients. Standard errors are clustered at the pre-merger municipality level.

Figure A2: Effect of merging on location of new buildings, mergers not involving a large municipality.

Table A5: Effects by council term, spatially dispersed mergers.

Panel A: All buildings			
Outcome:	(1)	(2)	(3)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	-0.011	-0.017	-0.003
	(0.035)	(0.047)	(0.018)
Treated*2013–2016	-0.028	-0.058	0.020
	(0.089)	(0.133)	(0.028)
Treated*2017–2022	-0.169	-0.182	-0.020
	(0.122)	(0.136)	(0.032)
Observations	149,001	91,892	57,109
R2	0.606	0.138	0.740
Outcome mean	1.870	1.191	2.962
Outcome mean (km)	11.57	5.31	21.64

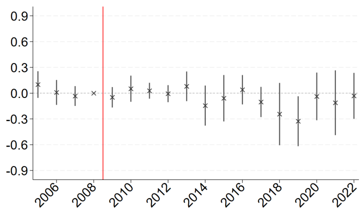
Panel B: Detached and row houses			
Outcome:	(4)	(5)	(6)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	-0.078**	-0.137**	0.000
	(0.033)	(0.051)	(0.019)
Treated*2013–2016	-0.021	-0.055	0.026
	(0.062)	(0.097)	(0.026)
Treated*2017–2022	-0.036	-0.045	-0.028
	(0.048)	(0.073)	(0.032)
Observations	125,217	73,497	51,720
R2	0.626	0.157	0.732
Outcome mean	2.071	1.437	2.970
Outcome mean (km)	12.68	6.20	21.90

Note: Individual-level data on residential building occupants between 2005 and 2022 are from Statistics Finland. Included are 12 post-merger municipalities where the average distance from citizens to the post-merger municipality center is above the median of 7.17 km (in 2008), and their placebos. All models include pre-merger municipality and year fixed effects. Standard errors (in parentheses) are clustered at the pre-merger municipal level. Statistical significance is denoted by *** (1%), ** (5%), and * (10%).

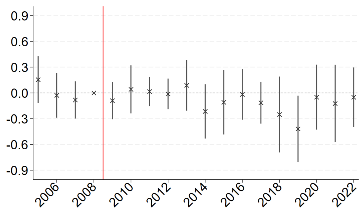
Table A6: Effecs by council term, spatially compact mergers.

Panel A: All buildings			
Outcome:	(1)	(2)	(3)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	0.056	0.071	-0.008
	(0.043)	(0.053)	(0.020)
Treated*2013–2016	-0.060	-0.049	-0.094
	(0.062)	(0.066)	(0.057)
Treated*2017–2022	0.092	0.153	-0.245***
	(0.089)	(0.100)	(0.084)
Observations	254,154	203,631	50,523
R2	0.424	0.148	0.710
Outcome mean	1.423	1.140	2.567
Outcome mean (km)	6.75	4.55	15.59
Panel B: Detached and row houses			
Outcome:	(4)	(5)	(6)
ln(dist. to center)	All	Large	Small
Treated*2009–2012	0.027	0.040	-0.007
	(0.042)	(0.054)	(0.016)
Treated*2013–2016	-0.046	-0.045	-0.039
	(0.041)	(0.049)	(0.035)
Treated*2017–2022	-0.013	0.023	-0.154**
	(0.039)	(0.045)	(0.060)
Observations	182,613	135,616	46,997
R2	0.527	0.263	0.696
Outcome mean	1.753	1.453	2.617
Outcome mean (km)	8.35	5.64	16.17

Note: Individual-level data on residential building occupants between 2005 and 2022 are from Statistics Finland. Included are 13 post-merger municipalities where the average distance from citizens to the post-merger municipality center is below the median of 7.17 km (in 2008), and their placebos. All models include pre-merger municipality and year fixed effects. Standard errors (in parentheses) are clustered at the pre-merger municipal level. Statistical significance is denoted by *** (1%), ** (5%), and * (10%).



(a) All: All buildings



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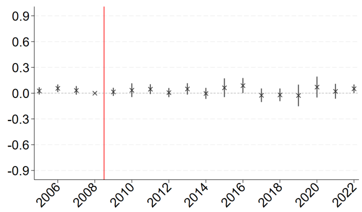
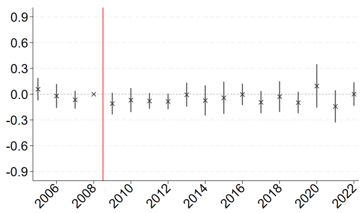
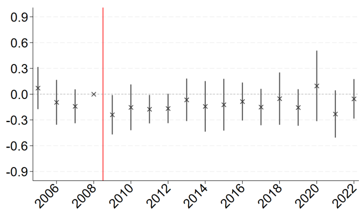


(c) Small: All buildings



(d) All: Detached & row



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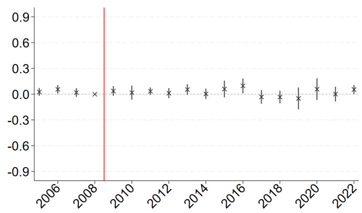
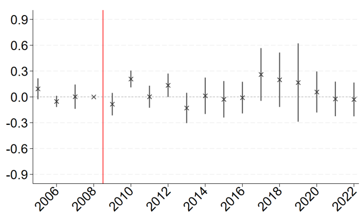


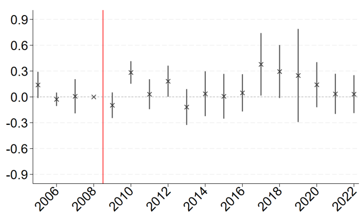
(f) Small: Detached & row

Note: The figures plot coefficients from a dynamic DID regression, where the outcome (log distance to the center of the post-merger municipality) is regressed on year fixed effects, pre-merger municipality fixed effects, and treatment × year fixed effects, omitting the last year before the reform. Dots and whiskers illustrate the point estimate and the 95% confidence intervals of the treatment × year coefficients. Standard errors are clustered at the pre-merger municipality level.

Figure A3: Effect of merging on location of new buildings, spatially dispersed mergers.



(a) All: All buildings



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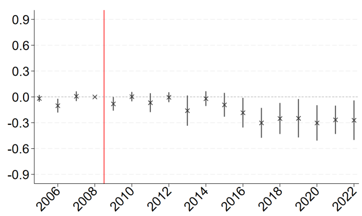

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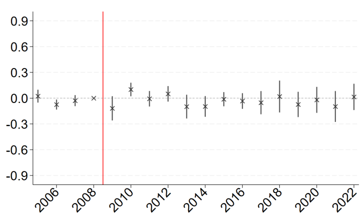

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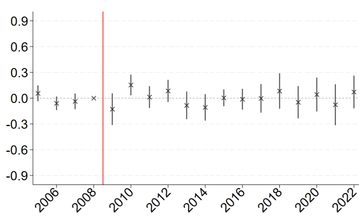

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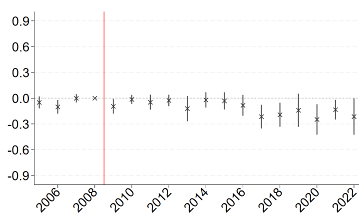

(f) Small: Detached & row

Note: The figures plot coefficients from a dynamic DID regression, where the outcome (log distance to the center of the post-merger municipality) is regressed on year fixed effects, pre-merger municipality fixed effects, and treatment × year fixed effects, omitting the last year before the reform. Dots and whiskers illustrate the point estimate and the 95% confidence intervals of the treatment × year coefficients. Standard errors are clustered at the pre-merger municipality level.

Figure A4: Effect of merging on location of new buildings, spatially compact mergers.