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Does size matter? Evidence from municipal splits

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Abstract

We contribute to the limited knowledge of the consequences of municipal splits by estimating how break-ups of seven Swedish municipalities affected per capita expenditures. To predict what would have happened had the break-ups not taken place, we apply the matrix completion method with nuclear norm minimization. We find that smaller municipalities not necessarily imply higher per capita expenditures. Instead, expenditures increase in some cases, are unaffected in others, and in others, decrease. The results point to the complex nature of territorial reforms and underscore the perils of policy recommendations that take uniform outcomes of either amalgamations or break-ups for granted.

KEYWORDS

jurisdictional size, local governments, matrix completion, municipal expenditures, municipal splits, territorial reforms

1 | INTRODUCTION

For a long period of time, amalgamation of municipalities has been high on political agendas across the globe (e.g., Blom-Hansen et al., 2016). The overarching rationale is almost exclusively economic. By merging smaller units into larger, policymakers hope to reap the benefits of economies of scale and make local governments more financially viable. That said, parallel to this general trend, bottom-up driven campaigns – particularly in Central and Eastern Europe, but also in Sweden and Spain – have pushed in the opposite direction (Swianiewicz, 2021).[1] While economic considerations occasionally motivate municipal splits, cultural and democratic arguments typically take the center stage in campaigns advocating for break-ups.

To date, existing empirical work on territorial reforms has predominantly focused on amalgamations and only to a limited extent on municipal splits (for state-of-the-art reviews, see Swianiewicz, 2020; Tavares, 2018; Gendzwill et al., 2021, and Galizzi et al., 2023). This is unfortunate since municipal splits, by their very nature, are bottom-up driven – rather than orchestrated top down – and not mainly motivated by efficiency concerns. Hence, findings from the amalgamation literature cannot simply be inverted and expected to be valid for splits as well. Moreover, although theoretical arguments highlight that expected effects are likely to be context specific – depending on, e.g., initial size (with respect to both population and surface area), population density, and the motives behind the reform – the few studies that do set out to estimate causal effects of municipal splits, as well as the majority of the papers analyzing municipal amalgamations, have paid little to no attention to heterogeneous effects.[2]

The present paper adds to the incomplete knowledge of the effects of municipal splits as well as contributes to the overarching question about size and efficiency, by estimating heterogeneous effects of seven municipal splits that took place in Sweden during the 1980s. Since these cases differ in their initial conditions with respect to geographical location, population size and population density, we are able to investigate the break-ups case by case and discuss the findings in their specific contexts. This, in turn, facilitates a more granular understanding of when per capita expenditures are likely to be affected (and in what direction), as well as give indications about to what extent findings from the amalgamation literature are valid for drawing conclusions about expected effects of municipal splits.

Our focus is Sweden, a mature democracy in Western Europe. Sweden, we maintain, is well-suited to analyze from a size and efficiency perspective, not least because local government in Sweden is organized in accordance with the so called Nordic model where municipalities have a broad portfolio of responsibilities that is accompanied with strong local self-government (e.g., Bouckaert & Kuhlman, 2016; Ladner et al., 2021). Consequently, Swedish municipalities are responsible for the lion's share of public spending. Therefore, the question of how to provide municipal services efficiently is of utmost importance. Moreover, Sweden has experienced numerous secession campaigns and municipal break-ups over the past fifty years, making it a rare exception among mature democracies since the number of municipalities in Sweden today is greater than in the 1970s.

To estimate what would have happened in the original municipalities had they *not* split, we apply the Matrix Completion with Nuclear Norm Minimization (MC-NNM) estimator suggested by Athey et al. (2021). Since the MC-NNM estimator exploits patterns over time, as well as across units, it well-suited in a setting such as ours, where the observed period before treatment (in our case the splitting of the municipalities) is relatively short.[3] In addition, estimating heterogenous treatment effects are straightforward. The quantitative analysis is complemented by a qualitative analysis. We explore what the local newspapers wrote about the 14 new municipalities, how these new units fared after going separate ways, and combine this with quotes from top-level local politicians, as well as descriptive statistics of how tax rates, political majorities and expenditures evolved. Thanks to this explorative analysis, we are able to form a clearer picture of the events after the break-ups, which facilitates the understanding of the heterogeneous effects found in the different cases.

[1]Various terms have been used to describe this phenomenon in the literature, for instance 'de-amalgamation', 'de-merger', 'municipal divorce', 'split', and 'break-up'. In this paper, we alternate between the terms 'splits', 'break-ups', and 'secessions'.

[2]Two rare exceptions from this overarching trend should be mentioned: First, Hanes and Wikström (2010) who analyze whether mandatory and voluntary municipal mergers in Sweden had differential effects on local growth post-amalgamations. Second, Bolgherini and Paparo (2023) who, in a country-comparative study, show how the different processes of bringing amalgamations about have varying effects on democracy after the amalgamations are implemented.

[3]To our knowledge, this paper is the first to employ MC-NNM to estimate causal effects of territorial reforms. Earlier work has relied either on the difference-in-differences estimator or on the synthetic control method. Whereas the first method relies heavily on the parallel-trend assumption, the second requires access to a relatively long pre-period. For a detailed discussion of different causal panel data methods and how these relate to each other, see Athey et al. (2021).

When all is said and done, our findings support the predictions that we should expect nonuniform and heterogeneous effects when territorial reforms take place. In the case of the splits we analyze, expenditures increase in some municipalities, are unaffected in others, and in others they decrease. More to the point, per capita expenditures tend to decrease in densely populated metropolitan areas near the capital of Sweden, while splits in nonmetropolitan regions present a more complex picture. When it comes to per capita expenditures on municipal administration, we find that splits tend to increase such expenses, implying loss of economics of scale. Thus, our results resemble those found in the amalgamation literature where evidence of the relation between size and overall economic efficiency is mixed, but where it is shown that savings can be made in administration.[4] Moreover, our findings point to the importance of evaluating effects of municipality break-ups – and, by implication, amalgamations – in their specific contexts and on a case-by-case basis. This underscores a fundamental conclusion: the perils of placing strong hopes in territorial reforms having uniform effects with the capacity of solving a wide range of complex issues. Instead, the devil is in the details, as indicated by our explorative analysis.

Our findings contribute to the knowledge of the effects of territorial reforms in several ways. First, our paper adds to the very limited evidence of municipal splits. To date, there are only two studies aimed at estimating causal effects of break-ups (Lima & Silveira Neto, 2018; Swianiewicz & Łukomska, 2019).[5] These papers study contexts that are very different from the Swedish one (Poland and Brazil), and our paper is thus the first focusing on a mature democracy that, in addition, is very decentralized. Second, our findings speak to the vast literature on municipal amalgamations by showing that the conclusions reached when analyzing municipal secessions resemble those reached when analyzing municipal mergers. A priori, it is far from obvious that this should be the case, given the often very different reasons for municipal amalgamations on the one hand, and secessions on the other. Third, our paper highlights the importance of analyzing territorial reforms in their specific contexts. This conclusion supports theoretical predictions that effects are likely to be contextually dependent and contingent on, e.g., initial population and surface size, population density, and the motives for the reforms. Finally, by combining quantitative and qualitative methods, our analysis illustrates how one can go about to explain heterogeneous effects. This manner of conducting work is in line with what Abadie et al. (2015) had in mind when they developed the synthetic control method.[6]

The paper proceeds as follows. The next section outlines the theoretical expectations about size and per capita expenditures expressed in the previous literature. In Section 3, we provide context for our cases by introducing the Swedish setting. In Section 4, our data is described and descriptive statistics for the seven analyzed municipal splits is presented. In Section 5, the empirical strategy employed to estimate causal effects is presented. After that, in Section 6, we turn to our main findings on how municipal splits affect municipal expenditures (both in total and on administrative spending), as well as on how the revenue side is affected. In Section 7, we provide an explorative case-by-case-analysis to further shed light on the mechanisms at hand. Finally, in Section 8, the main findings are summarized and we discuss their implications, both in relation to existing research and in relation to policymakers considering implementing territorial reforms.

[4]While a few studies have found that per capita expenditures decrease after amalgamations (most notably Reingewertz (2012) on Israeli data), the main message from earlier work is that total per capita expenditures largely remain unaffected by amalgamations (see Tavares, 2018; Gendzwill et al., 2021; Galizzi et al., 2023).

[5]Swianiewicz and Łukomska (2019) found that municipal splits in Poland resulted in higher per capita spending on administration, which mirrors what has been observed in the amalgamation literature. Their findings on effects on operating surplus are, however, inconclusive. Lima and Silveira Neto (2018) instead studied effects on expenditures of a major Brazilian reform in which many new municipalities were created and found that expenditures increased after the splits were made.

[6]This way to conduct research, Abadie et al. (2015, p. 495) maintain, "opens the door to precise quantitative inference in small-sample comparative studies, without precluding the application of qualitative approaches … the synthetic control method allows researchers to put 'qualitative flesh on quantitative bones'".

2 | WHAT TO EXPECT FROM MUNICIPAL SPLITS?

The debate on the optimal size of political units has a long history, dating back at least to ancient Greece and the writings of Aristotle and Plato. Ever since, arguments favoring either small or large units have co-existed. The question has been extensively debated and studied by scholars from various disciplines, most prominently political science and economics.

Although there are valid arguments for and against small and big units respectively, the dominant view in contemporary policy debates has for long been that the larger the unit is, the better it will perform economically. There are strong theoretical arguments supporting this view. First, there might be economies of scale, leading to less expensive delivery of public services in larger municipalities (Hirsch, 1959). Second, there might be economies of scope involving cost advantages that amalgamated units may gain due to an enhancement in the variety of goods and services they can provide to their citizens (Dollery & Crase, 2004). Third, larger units may have stronger recruitment power and find it easier to hire well-educated and well-qualified staff, thereby enabling a more efficient and cheaper provision of services (e.g., Dahl & Tufte, 1973). And fourth, the larger the unit, the stronger bargaining power this unit may have in negotiations vis-á-vis private suppliers of goods and services as well as vis-á-vis the state, thereby reducing purchase prices through more advantageous agreements.

However, there are several arguments in favor of smaller units too. For instance, it may be harder for voters in large municipalities to monitor politicians, which could increase the scope for rent-seeking. Also, the larger the municipality, the more complex the coordination and communication between different parts of the municipality's bureaucracy may become, giving rise to inefficiencies and resulting in suboptimal service provision. Moreover, the bigger and stronger the bureaucratic organization gets, the costlier and more difficult it will be to supervise and steer, which in turn might contribute to organizational slack. As a result, bureaucracies in larger units run the risk of increasing their budgets to a level well above what is efficient. And lastly, in municipalities with larger populations, preferences are likely to be more heterogeneous. This implies a need for providing a broader scope of goods and services, which could lead to an increase in total expenditures.

The argument that larger municipalities' economies of scale can be offset by imprecise matching of services to local preferences is intimately linked to arguments associated with the polycentric view, i.e., the notion that systems with many independent decision-making units are preferable to systems with few (e.g., Ostrom et al., 1961). The competition that is assumed to arise between municipalities in polycentric metropolitan regions can lead to efficiency gains through, for instance, reduced rent-seeking. This mechanism is akin to the one highlighted in theoretical models of yardstick competition, where voters are hypothesized to use spending levels in neighboring municipalities as a yardstick against which to evaluate how efficiently their own elected politicians provide goods and services (e.g., Bordignon et al., 2004; Brennan & Buchanan, 1980). That said, the argument for having many and small municipalities is likely to be more relevant for densely populated metropolitan areas, implying that efficiency-enhancing outcomes are far from being obvious in sparsely populated rural regions (e.g., Ostrom et al., 1961).

In addition, as discussed by Blesse and Baskaran (2016), the relationship between expenditures and size might be U-shaped, with an initial increase in service provision efficiency as the political unit grows, and decreasing efficiency as the unit eventually becomes too large, ultimately reaching a point of diseconomies of scale (e.g., D'Inverno et al., 2022; Byrnes & Dollery, 2002; Turley et al., 2018). Moreover, size not only in terms of population size, but also in terms of territorial size and population density, is likely to have an impact on the potential for cost-efficiency. Taking advantage of economies of scale in service provision will probably be harder to realize in geographically large but sparsely populated regions, where distances between towns and settlements are great.[7]

[7]Whether the pros or the cons of larger units dominate is likely also depending on the type of goods and services that are provided by the unit. Since different services have different cost functions, it is unreasonable to expect scale economies to be uniform across the variety of services that municipalities provide. For instance, much of what Swedish municipalities do – childcare and elderly care – are labor-intensive and have an inherent local logic, hence, unlikely to generate economies of scale (Dollery & Fleming, 2006).

To complicate matters even further, it is reasonable to assume that the rationale behind the territorial reform may affect the final outcomes. While municipal amalgamations are typically orchestrated top-down and aimed at reducing spending, municipal splits are almost exclusively initiated bottom-up and the motives behind them vary considerably. At least three underlying drivers have been highlighted in previous research (see, e.g., Erlingsson, 2005; Swianiewicz, 2021). First, splits can be initiated through a *cultural push*, stemming from the notion of borders having been inappropriately drawn from the beginning or as a result of a previous amalgamation. This is particularly evident in cases where the unit has previously undergone a coerced merger, as inhabitants in the part of the new unit that used to be a self-governing municipality may develop sentiments of disappointment and distrust towards the new municipal center. Second, break-ups can be initiated through a *political push*, when a political party that makes up a minority in the municipal council of the larger unit is particularly strong in one specific sub-municipal geographical district. Under such circumstances, dissatisfaction might spread if citizens in the smaller part of the municipality come to feel that they are stuck as a permanent minority and their needs are never met by the municipality. Third, break-ups can come about because of an *economic push*, when districts with a higher per capita income (generally correlated with fewer immigrants, a lower number of inhabitants on social welfare programs, and a lower unemployment rate) wish to secede to ensure that their tax base will be used exclusively to further the welfare of their specific district.

Much of the theoretical discussion concerns potential effects on efficiency in service provision, i.e., whether the same level of service can be delivered at a lower cost. That said, per capita expenditures could very well also change because of changing economic circumstances or political preferences. The latter, we argue, is particularly likely when secessions are initiated by the political push mentioned above.

To sum up, making theoretical predictions about whether per capita expenditures will increase or decrease after a split is far from being a straightforward task. Rather, the inventory of perspectives above highlights that effects are likely to be contextually dependent. We should not, for instance, expect outcomes to be the same when municipal break-ups in densely populated metropolitan regions are compared with break-ups in sparsely populated rural regions. Nor should we expect the same outcomes of break-ups of (relatively) small municipalities compared with break-ups of (relatively) large ones. Similarly, whether the driver for secession is cultural, political, or economic is likely to matter for how the break-up affects municipal expenditures. Lastly, we should not expect effects of municipal mergers and effects of municipal break-ups to be fully symmetric mirror-images of each other since the underlying rationales for carrying out these two types of territorial reform as a rule are very different.

3 | THE SETTING

When comparative international indices have measured the level of decentralization and capacity of local governments, Sweden regularly ranks among the top nations (e.g., Ladner et al., 2021; Sellers and Lidström, 2007). Since the expansion of the welfare state, Swedish municipalities have been given responsibilities to provide the bulk of Sweden's welfare services and given the right to collect a local income tax. In the period analyzed in this paper (1974–1987), Swedish municipalities were responsible for providing childcare, individual and family care, provision and maintenance of local infrastructure (e.g., roads, parks, water supply and waste management), as well as cultural services (e.g., public libraries, sports centers, and various recreational areas). Besides tax revenues, their activities were financed through intergovernmental grants and, to a smaller extent, user fees.

The current Swedish municipal structure is the outcome of two extensive territorial reforms that took place in 1952 (*Storkommunreformen*) and between 1962 and 1974 (*Kommunblocksreformen*). These reforms radically changed the landscape of Swedish local government, reducing the number of municipalities from 2,498 to 278 in just 22 years. The philosophy behind the amalgamations was inspired by Walter Cristaller's (1933/1966) central-place theory primarily aiming to identify larger towns and cities that were charged with the task of providing goods and services for the surrounding settlements. To make certain that the newly formed municipalities were able to fulfill their task, the government inquiries that preceded the reforms stated that the new and amalgamated municipalities should as a minimum have 8,000 inhabitants (SOU, 1961:9). Since these major reforms, Sweden has experienced numerous secession campaigns and municipal break-ups over the past fifty years, making it one of few countries in the developed world where the number of municipalities today is greater than in the 1970s.

The secession process is strictly regulated and involves several steps. A request for changing a municipality's borders – in our case, through a break-up – can be put forth by a group of citizens or by the municipality's council itself. If the request is voiced by a group of citizens, the council in the affected municipality gets a chance to take a stand on the issue. Thereafter, an in-depth assessment is carried out by an independent evaluator, which results in a recommendation to the Swedish government on whether to accept or decline the demand for secession. In the assessment, two factors are of particular importance. First, will the prospective municipalities be financially viable on their own, i.e., is the tax base large enough to support the responsibilities municipalities are by law required to carry out? Second, are the citizens that would be affected by the secession in favor of a break-up, i.e., is there public support for the split? The government makes the final decision on the matter.

Regarding the amalgamations from 1962 and forward, the government's initial plan was that all amalgamations were to be made on a voluntary basis. However local resistance, and an ensuing slow reform progress, made the government abolish the voluntarism principle in 1969. Ultimately, several of the remaining amalgamations up until 1974 were enforced from above (Erlingsson et al., 2021). In the immediate wake of these two waves of amalgamations, a counter-mobilizing grassroots' movement emerged, typically having its origins in protests against being merged in the first place. Inhabitants in sub-municipal territories that had formerly been municipalities on their own complained about the lack of democratic influence in the larger municipalities and that their needs were not being given enough consideration by the new municipal council (see, e.g., Kolam & Ekman, 1992; Lundmark, 1980; SOU, 1993:90). In some municipalities, local protest groups with the intention to reclaim the status as self-governing municipalities were formed.

In 1976, the Social Democratic government, which had orchestrated the amalgamation reforms in the 1960s and 1970s, was replaced by a center-right government, which comprised the parties that had been opposed to coerced amalgamations. The new government had a more generous interpretation of the rules surrounding secessions declaring already in the governmental declaration on October 8 in 1976 that "The government is prepared to positively consider petitions for changes in the municipal structure that are that are motivated by concerns for the local democracy" (Hagård, 1990, p. 9).

Hence a window of opportunity opened up for the local campaign groups striving for self-sufficiency. In 1979, the new center-right government granted two requests of municipal secessions (Åsele/Dorotea; Vadstena/Motala), a decision that paved the way for additional requests, whereof five were approved in 1982 (Vaxholm/Österåker; Salem/Botkyrka; Vara/Essunga; Norsjö/Malå; Vännäs/Bjurholm).[8] Although economic viability and local support *de jure* were equally important conditions for the government to approve on a municipal split, the government that made the final decision about these seven municipal splits *de facto* weighed local support (and hence democratic arguments) stronger, as indicated by the quote above.[9] This meant that in several cases, the government went against the recommendation of assessments that judged that the new smaller municipalities would have problems in carrying out their municipal duties.

From our own reading of the cases, as well as what has been suggested in previous research (e.g., Kolam & Ekman, 1992; Lundmark, 1980; SOU, 1993:90), we conclude that these seven secessions were mostly motivated by a cultural push, and that the most prevalent and important arguments for them to be ultimately accepted by the government was the democratic one.

[8]Brief descriptions of the history leading up to the secessions are provided in the online appendix. See, also, Lundmark (1980) for an account of the decisions made in 1979.

[9]This interpretation is supported by the fact that the government rejected a request from Härjedalen because of lack of local support – 68% against in a local referenda (Lundmark, 1980).

In 1982, the Social Democrats regained control over the government and declared that they were going to be more restrictive with municipal partitions. Since then, only five additional secessions have been approved, whereas approximately 40 have been denied (Brink, 2003; Erlingsson, 2005). Hence, there existed a window of 6 years when citizens dissatisfied with the outcome of the municipal amalgamations had an opportunity to be successful in regaining their status of self-governing municipalities.

Why did these seven cases succeed and no other municipalities where similar feelings of dissatisfaction existed? One major explanation put forth by Kolam and Ekman (1992) is that what was crucial for whether a request for a secession came about was whether there were a number of engaged individuals that had the motivation, energy, and resources to start the process, and that such political entrepreneurs – who solved an important collective action problem for the secessionists – were absent in many other municipalities.[10] In some other cases, similar campaigns were present, but their requests for secessions came too late and were decided on by the more restrictive government led by the Social Democrats.[11]

4 | DATA AND DESCRIPTION

Our data covers all Swedish municipalities in the period 1974 (the first year in which the new municipal structure post-amalgamations was in place) to 1987. It includes information on municipal expenditures (in total and on administration), population size, proportion of children and elderly, land area, tax rate, tax base and intergovernmental grants (see the online appendix for data sources). After having removed two municipalities,[12] we are left with 276 municipalities (see Table 1 for descriptive statics). The municipalities varied considerably in size, both with respect to number of inhabitants and land area. Whereas the average number of inhabitants was around 30,000, the median was considerably lower (16,000), and as many as 31 municipalities had fewer than 8,000 inhabitants. There was also considerable variation in municipal per capita expenditures, intergovernmental grants, and tax base.

As a first examination of the relationship between municipal size and municipal expenditures, we plot average municipal expenditures per capita (in total and on administration), over the period 1974–1987, for each municipality, against average population size (in logarithms) in that municipality (see Figure 1). As is evident from Figure 1, per capita expenditures are in fact higher in the largest municipalities, indicating diseconomies of scale. The fitted line suggests that per capita expenditures increase with population size for municipalities with more than 22,000 inhabitants. Per capita expenditures on administration, on the other hand, are considerably higher in the smallest municipalities, indicating economies of scale up to slightly above 13,000 inhabitants.

In the empirical analysis, we will focus on the seven municipal splits that were decided on in 1979 and 1982. Table 2 shows descriptive statistics for these municipalities both before and after the break-ups, whereas Figure 2 displays their geographical location. From these statistics, we conclude that there is no clear unifying theme for the municipalities that broke up. Geographically they were scattered across the entire country. Some were smaller than average, other larger. Some had higher per capita expenditures than average, some lower. In addition, the initiating parts were not necessarily the richer parts (in some cases, the opposite was true). Hence, as already suggested above, economic motivations are unlikely to have been the main driver behind the splits.

[10]Hagård (1990) reports that the action group working for Vadstena's secession from Motala spend more than 100 h in meetings, supporting the view that individual efforts were crucial. For exposés about the campaigns for freeing Vadstena from Motala and Salem from Botkyrka, see Hagård (1990) and Kalderén (2020), respectively.

[11]For instance, when the Social Democrats regained the power in September 1982, an assessment of the secession of Burträsk from Skellefteå was already initiated. The newly elected minister however early made it clear that he was not in favor of a break-up and the request was later denied in 1984 (Norra Västerbotten 1982a,d,e, September 20, November 13 and 16).

[12]We exclude Bara municipality, which only existed between 1974 and 1977, and Gotland, a municipality that also has the regional responsibilities of the Swedish meso-tier *Landsting*.

TABLE 1 Descriptive statistics, 1974.

	Mean	St dev	Min	Max
Population	29,313	54,076	4,130	681,131
Area	1,479	2,559	8.7	19,447
Inhabitants/m^2	112	383	0.33	3,692
Children and elderly, share	0.43	0.02	0.32	0.50
Tax base	632,137	129,467	335,111	1,285,104
Tax rate	14.16	1.13	10.10	22.25
Intergovernmental grants	8,163	2,330	3,936	59,835
Municipal expenditures, total	25,097	5,664	13,335	59,834
Municipal expenditures, adm.	1,031	420	397	2,608

Note: Land area is given in square meters, whereas tax base, grants and expenditures are given in SEK (2017) per capita. Children is defined as younger than 19 years old and elderly as older than 64.

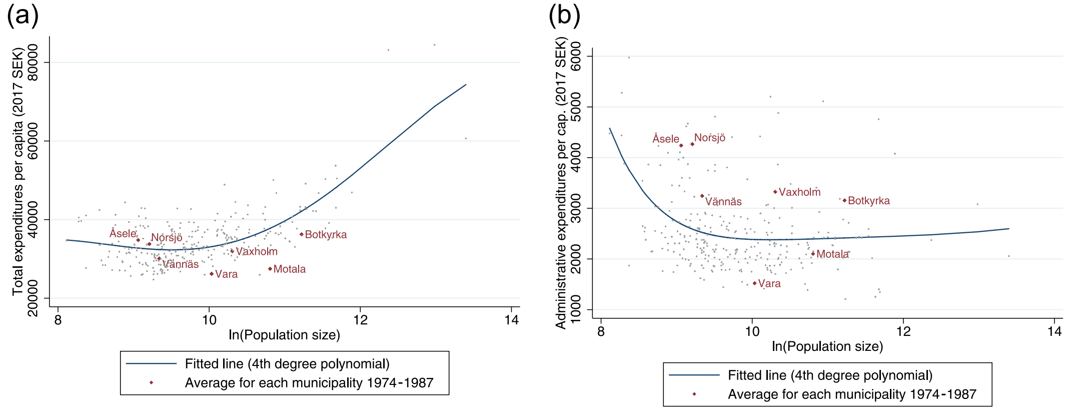

FIGURE 1 Per capita expenditures (in total and on administration) and population size. The seven municipalities (indicated by their names) that that underwent a split during the observed period are named as they were before the split and defined in terms of their initial jurisdiction.

Two of the cases – Botkyrka/Salem and Vaxholm/Österåker – are located in the larger Stockholm metropolitan region. Botkyrka/Salem was the most populous and most densely populated municipality among our cases (circa 78,000 inhabitants), while Vaxholm/Österåker was approximately equal in size to the Swedish average (circa 31,000 inhabitants). Hence, both the initial municipalities had a population size well above the 22,000 that, according to the pattern shown in Figure 1 indicates diseconomies of scale. In both cases, the part of the municipality that initiated the break-up was relatively small (with respect to both population size and geographical area), and in both cases, the seceding parts were deemed financially viable on their own in the assessments that were conducted before the break-ups. Notably, Vaxholm is considerably more economically well-off than the abandoned part (Österåker) in terms tax base.

Next, we have two medium-sized municipalities in the south-central part of Sweden: Motala/Vadstena and Vara/Essunga. What distinguishes these two from our other cases is that they are extremely multi-cored with 10 and 14 villages within the municipal borders respectively that qualify as population centers. Although fairly populous (especially

TABLE 2 Descriptive statistics. Municipalities experiencing a split.

	Presplit	Postsplit	
		Abandoned	Initiating
	Botkyrka	**Botkyrka**	**Salem**
Population size	78,361	66,062	12,775
Land area (km^2)	251	197	55
Population density (Pop./km^2)	312	336	234
Share children and elderly (%)	41	40	46
Turnout in municipal election	85	83	90
Vote share left-wing parties, S + V (%)	53	59	43
Tax base	871,107	870,390	862,079
Municipal expenditures, total	39,619	39,966	38,417
Municipal expenditures, adm.	4,250	4,932	3,981
Intergovernmental grants	15,052	14,090	12,845
	Vaxholm	**Österåker**	**Vaxholm**
Population size	30,743	25,039	6,061
Land area (km^2)	367	310	57
Population density (Pop./km^2)	84	81	106
Share children and elderly (%)	44	44	41
Turnout in municipal election	90	91	91
Vote share left-wing parties, S + V (%)	38	39	43
Tax base	852,677	821,261	944,795
Municipal expenditures, total	35,916	36,420	34,295
Municipal expenditures, adm.	4,082	4,385	4,463
Intergovernmental grants	11,620	13,166	6,943
	Motala	**Motala**	**Vadstena**
Population size	49,742	41,945	7,564
Land area (km^2)	1,175	992	182
Population density (Pop./km^2)	42	42	41
Share children and elderly (%)	45	45	46
Turnout in municipal election	91	90	91
Vote share left-wing parties, S + V (%)	51	54	45
Tax base	778,568	749,116	782,275
Municipal expenditures, total	32,475	34,608	28,784
Municipal expenditures, adm.	1,769	1,964	3,234
Intergovernmental grants	8,996	10,541	8,575

	Vara	Vara	Essunga
Population size	22,963	17,054	5,973
Land area (km^2)	937	701	237
Population density (Pop./km^2)	24	24	25
Share children and elderly (%)	47	47	48
Turnout in municipal election	90	90	91
Vote share left-wing parties, S + V (%)	22	25	27
Tax base	677,634	694,355	659,345
Municipal expenditures, total	29,382	31,574	29,792
Municipal expenditures, adm.	1,671	1,738	1,997
Intergovernmental grants	9,910	9,835	10,956
	Norsjö	**Norsjö**	**Malå**
Population size	9,931	5,610	4,267
Land area (km^2)	3,390	1,753	1,611
Population density (Pop./km^2)	3	3	3
Share children and elderly (%)	44	44	44
Turnout in municipal election	88	88	89
Vote share left-wing parties, S + V (%)	51	50	61
Tax base	784,630	768,269	733,357
Municipal expenditures, total	36,605	38,852	39,207
Municipal expenditures, adm.	4,721	4,978	6,026
Intergovernmental grants	12,213	12,603	14,085
	Vännäs	**Vännäs**	**Bjurholm**
Population size	11,472	8,152	3,255
Land area (km^2)	1,851	534	1,317
Population density (Pop./km^2)	6	15	2
Share children and elderly (%)	45	44	48
Turnout in municipal election	90	91	90
Vote share left-wing parties, S + V (%)	44	52	37
Tax base	709,457	756,397	668,028
Municipal expenditures, total	34,908	39,522	31,381
Municipal expenditures, adm.	3,656	4,165	3,740
Intergovernmental grants	13,588	14,224	18,203
	Åsele	**Åsele**	**Dorotea**
Population size	8,743	4,744	3,935
Land area (km^2)	7,118	4,315	2,802

(Continues)

TABLE 2 (Continued)

	Åsele	Åsele	Dorotea
Population density (Pop./km^2)	1	1	1
Share children and elderly (%)	46	46	46
Turnout in municipal election	91	88	91
Vote share left-wing parties, S + V (%)	55	59	59
Vote share center party, C (%)	22	21	19
Tax base	700,239	690,523	661,406
Municipal expenditures, total	37,279	40,104	35,630
Municipal expenditures, adm.	3,812	6,436	4,284
Intergovernmental grants	16,506	16,852	16,752

Note: Tax base, grants and expenditures are given in SEK (2017) per capita. Children are defined as below age 19 and elderly as over 64. Turnout and vote share for left-wing parties refer to the 1977-election for Botkyrka and Motala (presplit) and the 1979-election for Vaxholm, Vara, Norsjö, Vännäs och Åsele (presplit), the 1979-election for Botkyrka, Salem, Motala and Vadstena (post-split) and the 1982-election for Vaxholm, Österåker, Vara, Essunga, Norsjö, Malå, Vännäs, Bjurholm, Åsele and Dorotea (post-split).

Motala/Vadstena with its 50,000 inhabitants, well above 22,000), both municipalities can be described as being in the hinterland of larger cities in their respective regions. In both cases, the seceding part made up a smaller part of the older municipality, which resulted in it ending up with fewer than 8,000 inhabitants. The assessment preceding the Motala/Vadstena-split concluded that whereas the newly formed Vadstena could be expected to manage well on its own, financial problems were to be expected for the remaining parts of Motala. The corresponding assessment for Vara and Essunga predicted that both parts would have to raise their tax rate to manage after a break-up.

The remaining three cases were all located in the more sparsely populated rural north of Sweden, i.e., a part of Sweden that has experienced severe de-population over a long period of time. In addition to being sparsely populated, all three municipalities were originally small in terms of population size (Norsjö/Malå 10,000; Vännäs/Bjurholm 11,000; Åsele/Dorotea 9,000). In all cases, the assessments that preceded the splits concluded that the different parts of the original municipalities could not be expected to be financially viable on their own. After the break-ups, the six new municipalities had a population below or just at 8,000 inhabitants.

To get a first indication of how expenditures were affected by these municipal splits, in Figure 3, we show the ratio between per capita expenditures in the seven municipalities that experienced a split and the average expenditures in the municipalities that remained intact. A ratio of 1 indicates that the municipality had identical per capita expenditures as the average (nontreated) municipality. The left graph displays the evolution for the two municipalities that were split in 1980 and the right for those that were split in 1983. Here, and when estimating causal effects, we define the municipalities that underwent a split in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities.[13] Also, we denote each municipality with the name it had before the split.

The general trend in Sweden during this period was one of municipal sector growth and increasing per capita expenditures. Vaxholm (split into Vaxholm/Österåker) follows this trend closely, but this is not true for the other six cases, where per capita expenditures developed quite differently in the years that preceded the break-ups. One

[13]If we assume that a municipality, A, has been split into two municipalities, B and C, expenditures after the split are thus calculated as (expenditures$_B$ + expenditures$_C$)/(population$_B$ + population$_C$).

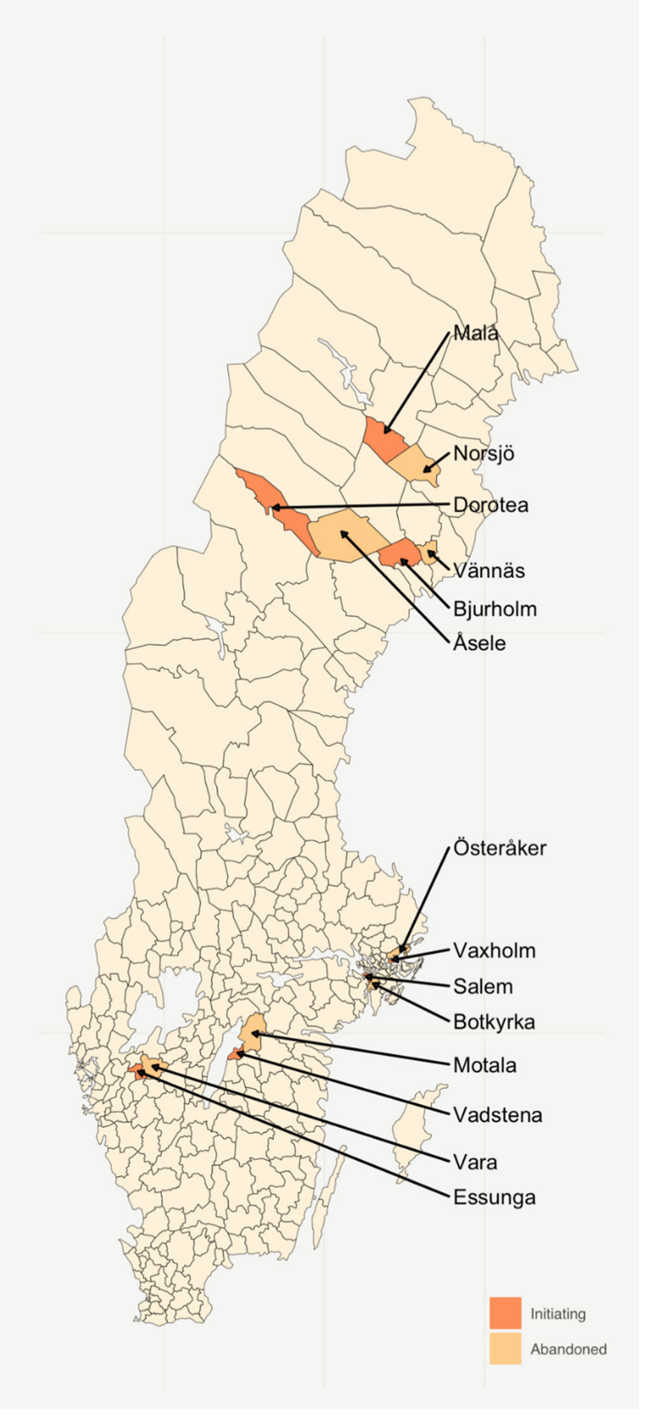

FIGURE 2 Geographical location of municipalities that experienced a secession.

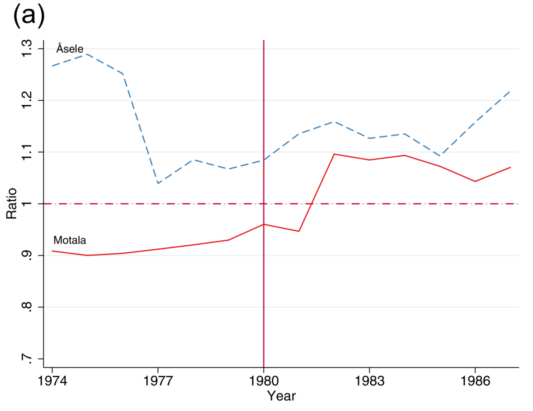

FIGURE 3 Per capita expenditures in municipalities experiencing a secession and average per capita expenditures in municipalities that remained intact (ratio). The left graph displays the evolution for the two municipalities that were split in 1980 and the right for those that were split in 1983, where the line indicates the first year when the new parts made up municipalities on their own. The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities.

conclusion we draw from the pattern in Figure 3 is that a difference-in-differences approach, where all unaffected municipalities are used as controls, would most likely result in biased estimates, since it would be difficult to argue that the parallel trends assumption holds. Next, we describe the empirical strategy that we instead apply to estimate causal effects of the seven municipal splits.

5 | EMPIRICAL STRATEGY

When investigating how municipal splits affect municipal expenditures, we are faced with the classical missing counterfactual problem – we cannot observe how expenditures would have evolved in the original municipalities, had they not been split.[14] Moreover, it is not random which municipalities broke up, since they first have to submit a formal request for a secession and then get it approved by the government. In Section 3, we argue that the secessions that we analyze were primarily driven by the cultural push, which makes us less worried that they were caused by expectations of increasing or decreasing per capita expenditures. Also, in the final decision, the government tended to emphasize democratic arguments and pay comparatively less attention to assessments of the long-term financial viability of the new and smaller units. Similar discontent as in the seven municipalities that later broke up existed in many other newly merged municipalities, but the citizens in these parts did not manage to form protest groups and engage in the collective action needed or did not manage to file a request before the center-right government lost power to the Social Democrats. Hence, we argue that there is, a priori, no strong reason to worry about endogeneity issues, and that there are potentially many municipalities that could make up a valid control group.[15]

[14]In the rest of this section, municipalities that have undergone secessions will be denoted "treated municipalities".

[15]It could be tempting to consider those municipalities that requested, but were denied, a secession to be suitable candidates for a comparison group. However, we argue that these municipalities are most likely the *least* suitable, since the fact that they their requests were denied indicates that they were different than those that were accepted.

To estimate the counterfactual, we opted for the Matrix Completion with Nuclear Norm Minimization (MC-NNM) estimator, as suggested by Athey et al. (2021).[16] The intention of the MC-NNM-estimator is to select a set of control municipalities that exhibit similar patterns in the data as the treated municipalities, and thereby limit potential endogeneity issues. In contrast to the more familiar synthetic control method (see Abadie, 2021, for a review), which assumes that patterns in data are stable over units and imputes the missing outcomes for treated units using weighted average outcomes for control units, the MC-NNM estimator takes advantage of both the cross-section and time-series variation in data and is hence likely to perform better in settings where the pre-period is relatively short.[17] In that aspect, the MC-NNM estimator is similar to the two-way fixed effects model but, by building on factor models and interactive fixed effects models, the estimator allows for unobserved time-varying confounders.[18]

The starting point for our estimations is thus the following, linear, factor model:

$$Y = L^* + \gamma_i^* + \delta_t^* + \epsilon_{it},$$

where $\mathbf{Y}$ is the outcome under no-treatment, γ_i^* and δ_t^* are unit, respectively time fixed effects and ϵ_{it} is random noise. Athey et al. (2021) propose estimating the matrix $\mathbf{L}^*$ by the following estimator:

$$(\hat{\mathbf{L}}, \hat{\Gamma}, \hat{\Delta}) = \underset{\mathbf{L},\Gamma,\Lambda}{\arg\min}\left\{\frac{1}{|O|}\|\mathbf{P}_O(\mathbf{Y} - \mathbf{L} - \Gamma\mathbf{1}_T - \mathbf{1}_N\mathbf{\Delta})\|_F^2 + \lambda\|\mathbf{L}\|_*\right\}, \tag{1}$$

where $|\mathcal{O}|$ is the number of observed entries, $\mathcal{O}$ is a set of indices (i, t) corresponding to the non-missing entries in Y_{it}, $\mathbf{P}_{\mathcal{O}}(\mathbf{A})$ takes any matrix $\mathbf{A}$ and replaces all elements whose indexes are not in $\|\mathbf{L}\|_*$ with 0, $\|\|_F^2$ is the squared Frobenius norm, and λ is the regularization term on the nuclear norm $\|\mathbf{L}\|_*$ chosen through cross validation.[19] As suggested by Athey et al., we estimate Equation (1) using the algorithm suggested by Mazumder et al. (2010).

The estimated treatment effects (on the treated) are given by the difference between the observed outcomes for the treated municipalities and the outcomes imputed by the estimator. When measuring outcomes after the splits, we maintain the presplit municipal borders. For example, per capita expenditures after the splits are calculated as the sum of expenditures in the new municipalities divided by the sum of the populations in these municipalities.

In our application, we estimate annual treatment effects ($\hat{\alpha}_{it}$) for each treated municipality given by:

$$\hat{\alpha}_{it} = Y_{it} - \hat{Y}_{it},$$

where i denotes municipality, t year and Y_{it} and $\hat{Y}_{it}$ observed and imputed outcomes, respectively. The estimated treatment effects for $t < T_0$, where T_0 denotes the first period after the split, will be informative of how successful the empirical strategy is (and give us an indication of whether there are any anticipation effects). Moreover, we

[16]The MC-NNM estimator sets out to impute missing elements in a matrix by searching for a low-dimensional matrix structure in the data. This is achieved through minimizing the mean squared error, adding a penalty term to avoid overfitting, between the observed outcomes and the outcomes predicted by another (low-rank) matrix.

[17]The theoretical prediction that MC-NNM outperforms SC is supported by Monte-Carlo evidence in Athey et al. (2021).

[18]Athey et al. (2021) show that, in a setting where one unit is treated in one (the last) period, several different causal approaches (horizontal regression, vertical regression, synthetic control and the difference-in-differences regression) can be expressed as maximizing the same objective function but under different restrictions. The MC-NNM estimator does not impose any restrictions, but instead achieves identification through regularization. Liu et al. (2024) compare the MC-NNM estimator to the interactive fixed effect counterfactual estimator and find that the former outperforms the latter unless the factors are strong and sparse. As opposed to the MC-estimators from the computer science literature, that typically assume the missing data to be random, the MC-NNM-estimator imposes specific structures in the missing and allows for regularized unit and time fixed effects.

[19]The regularization parameter, λ, is chosen in the following way: First, draw $K = 5$ random subsets $\mathcal{O}_k \in \mathcal{O}$. Second, select a sequence of candidate regularization parameters $\lambda_1, \ldots, \lambda_L > 0$, with large enough λ_1. Third, for each subset $\mathcal{O}_k$, estimate $\{\hat{L}(\lambda_k, \mathcal{O}_k), \ldots, (\lambda_L, \mathcal{O}_k)\}$ and evaluate the average squared error on $\mathcal{O}/\mathcal{O}_k$. Finally, choose the largest λ at which the root mean squared error (RMSE) is within one standard error of the minimal RMSE. We set the cross-validation ratio to 0.8, L to 100, apply 400 iterations for each fixed value of λ and use a stopping rule of 0.00001.

calculate the averages of the estimated annual effects for the first five[20] years following the split as well as the corresponding averages for the 5 years preceding the split:

$$\bar{\hat{\alpha}}_{i,\,pre} = \frac{1}{5}\sum\nolimits_t \hat{\alpha}_{i,t} \quad \text{for} \quad t < T_0,$$

$$\bar{\hat{\alpha}}_{i,\,post} = \frac{1}{5}\sum\nolimits_t \hat{\alpha}_{i,t} \quad \text{for} \quad t \geq T_0.$$

The question of how to conduct inference when applying matrix completion methods has not yet been settled.[21] For that reason, we apply two different methods and interpret the overall results holistically. First, we estimate confidence intervals through block bootstrapping, selecting block length using the procedure suggested by Politis and White (2004). Second, we calculate standardized p-values ($\hat{p}_{std}$) for the two-sided hypothesis test that $\hat{\alpha}_{it} = 0$ for each $t \geq T_0$, where i denotes the 'treated' municipality and j the municipalities that remained intact, as suggested by Abadie et al. (2010) and Kumar and Liang (2018):

$$\hat{p}_{std} = \Pr\left(\frac{|\hat{\alpha}_{j,t\geq T_o}|}{RMSPE_j^{pre}} \geq \frac{|\hat{\alpha}_{i,t\geq T_o}|}{RMSPE_i^{pre}}\right) \forall \quad j \in O.$$

Whereas the confidence intervals are acquired through bootstrapping, the standardized p-values are obtained by estimating placebo effects for each of the nontreated municipalities and then calculating the fraction of such effects greater than or equal to the effect estimated for the treated unit, taking the match quality into account by standardizing the estimated effects with the pretreatment Root Mean Square Errors (RMSE).[22] Which of the two performs best in terms of size and power remains an open question.

6 | RESULTS

In light of the theoretical arguments for small versus large jurisdictions, we should not expect homogenous effects of the seven break-ups given that the analyzed municipalities display such varying characteristics and are located in distinctly different parts of the country, and furthermore, in both metropolitan and rural regions. Therefore, we will estimate the causal effects of each municipal split separately. First, we investigate how the municipal break-ups affected total municipal expenditures per capita. We thereafter turn to effects on expenditures on administration, the spending category where economies of scale are most likely to appear. Finally, we investigate potential effects on the revenue side by focusing on municipal tax base and intergovernmental grants.

The left panel of Figure 4 shows the evolution of per capita expenditures in i) municipalities undergoing a split (treated), ii) municipalities not undergoing a split (the pool of potential controls), and iii) the predicted counterfactual for the treated municipalities, whereas the right panel shows estimated treatment effects and 95% confidence intervals. As already mentioned, municipal per capita expenditures after the splits are calculated as the sum of expenditures in the new municipalities divided by the sum of the populations in these municipalities. In line with this, we use the name that the municipalities had before the splits.

[20]5 years being the longest period of time we were able to observe both before and after the municipal break-ups in all of the seven cases.

[21]Athey et al. (2021) conclude that studying the asymptotic distribution of the estimator is beyond the scope of their paper, but suggest using resampling methods to view statistical fluctuations. Liu et al. (2024) rely on non-parametric block bootstrap and jackknife and find that these perform well in cases where sample sizes are reasonable (e.g., $T = 20$, $N = 100$).

[22]When calculating the standardized p-values, we estimate placebo effects for one of the nontreated units at the time. We thus compare the treatment effects for the treated units, estimated jointly, to the placebo effects, estimated one by one. The number of replications is therefore limited by the number of existing municipalities. When estimating the placebo effects, we remove the treated municipalities from our sample.

The top two panels show the results for Botkyrka and Vaxholm, both located in the larger Stockholm metropolitan region. After having compared actual per capita expenditures in the treated municipalities with the predicted counterfactuals, we conclude that they were similar before the break-ups took place, indicating that the empirical strategy is successful. However, once the splits had taken place, observed per capita expenditures were lower than the predicted counterfactual (i.e., than they would have been had the municipality remained intact), implying that expenditures decreased

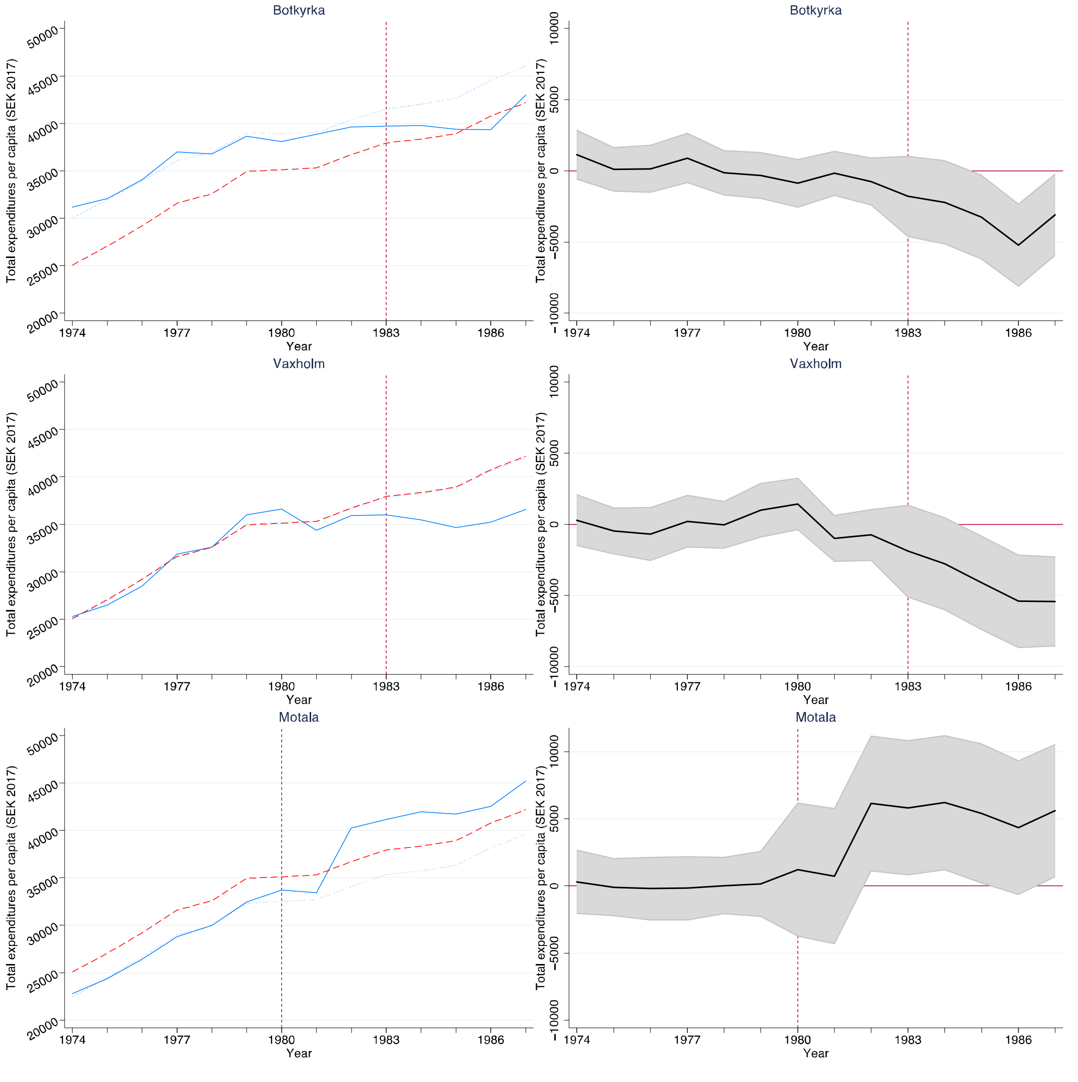

FIGURE 4 Observed and counterfactual outcomes (left), and estimated treatment effects (right): Per capita expenditures. The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities. The solid blue line shows how expenditures evolved in the treated municipality, while the thin blue dotted line shows the estimated counterfactual expenditure trajectory. The dotted red line shows the corresponding evolution in the municipalities not experiencing a split. The solid black line shows the estimated annual treatment effects of the treated. The 95-percent confidence intervals (grey area) are estimated by taking $\hat{\alpha}_{it} \pm 1.96$ the standard error of the distribution of 999 block bootstrap replicates of $\hat{\alpha}_{it}$. Table C.1 in the online appendix provides estimated effects and standardized p-values, by year. The estimations are carried out using Jason Poulos' forked version of MCPanel, available at https://github.com/jvpoulos/MCPanel.

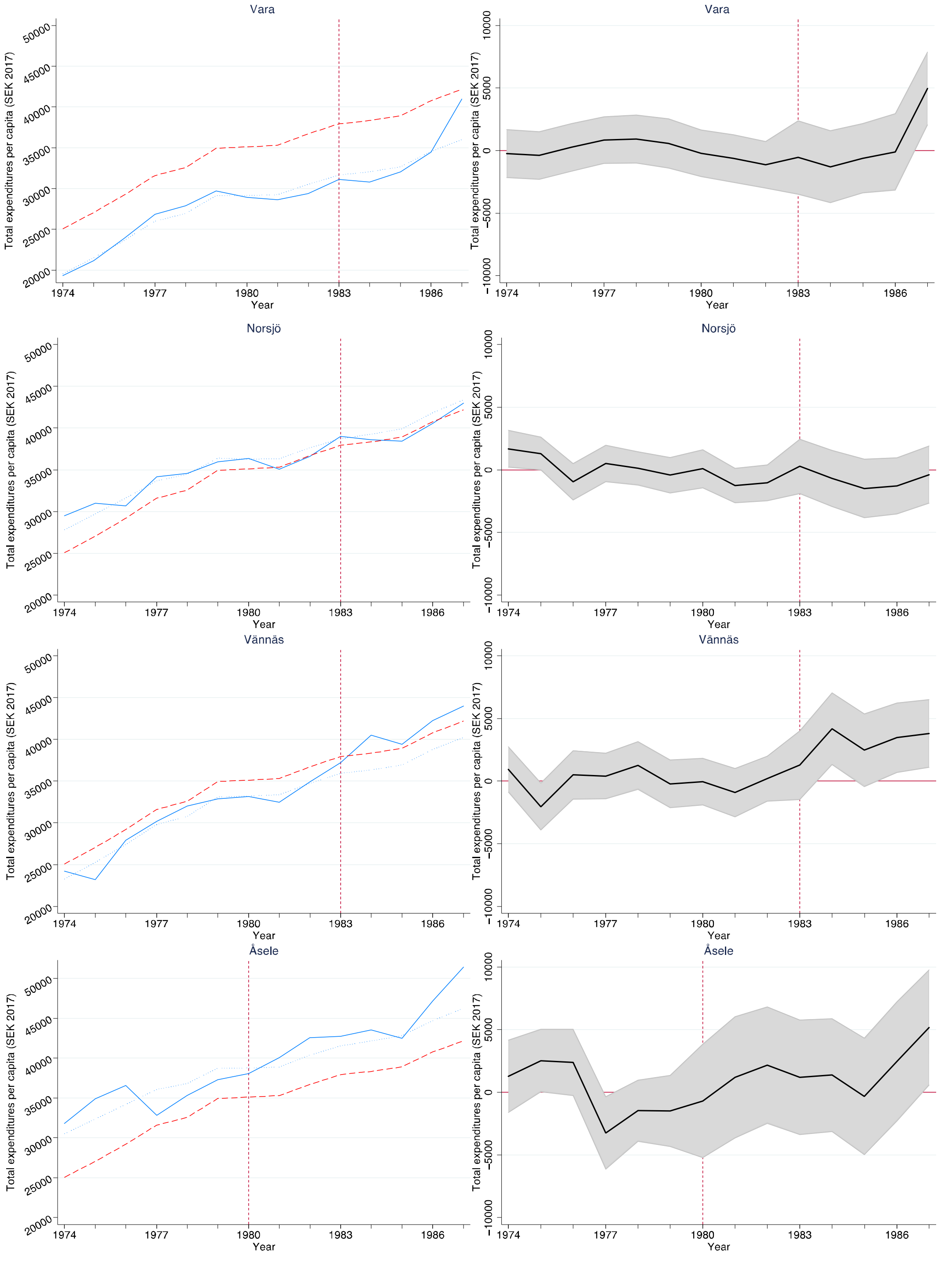

FIGURE 4 Continued

TABLE 3 Estimated treatment effects and standardized *p*-values, 5-year averages: Per capita expenditures.

	Botkyrka	Vaxholm	Motala	Vara	Norsjö	Vännäs	Åsele
Average annual effect – Pre	−457	129	0	−97	−505	45	0
Average annual effect – Post	−3,177	−3,920	4,020	482	−713	3,034	1,047
Baseline	39,715	36,006	32,475	31,112	39,006	37,199	37,276
$RMSE^{pre}$	636	772	486	658	974	939	2,036
Stand. p-value – Pre	0.70	0.32	1.00	0.49	0.50	0.54	0.03
Stand. p-value – Post	0.12	0.22	0.00	0.39	0.83	0.20	0.97

Note: The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities. Baseline refers to the year before treatment (1979 for Motala and Åsele, and 1982 for the other five municipalities). The estimations are carried out using Jason Poulos' forked version of MCPanel, available at https://github.com/jvpoulos/MCPanel. Standardized p-values calculated by the method described in Kumar and Liang (2018). Averages and p-values calculated using five years before and after the break-ups. $RMSE^{pre}$ calculated for the whole pre-period (not only five years before the break-up).

following the break-ups. Four years after the break-ups, these effects amount to circa −5,000 SEK. The effects are statistically significant at the five percent level.

The next two panels show that the splits did not result in lower per capita expenditures in the more peripheral and multi-cored municipalities of Motala and Vara. In Motala, per capita expenditures instead increased by around 5,000 SEK, the estimated effects being statistically significant at the five percent level for most years after the break-up. In Vara, per capita expenditures were unaffected the first 4 years after the split. After that, they increase by 5,000 SEK in year five. The point estimates for the presplit period are close to zero for both Vara and Motala, indicating that the empirical strategy works well also for these two cases.

The bottom three panels show the results for the three smaller municipalities in the north of Sweden. There is no indication of the split having affected expenditures in Norsjö, whereas in Vännäs, per capita expenditures increased by around 3,500 SEK as a consequence of the break-up. In the case of Norsjö, there are indications that the empirical strategy is less successful in predicting the counterfactual outcome for the first 2 years, but for 1976–1982, predicted expenditures follow observed expenditures closely. For Åsele, the point estimates for the presplit period are relatively large and fluctuate between bordering on statistically significant positive and statistically significant negative, making us reluctant to draw any conclusions about causal effects for the Åsele case.

Next, we calculate the averages of the estimated annual effects for the first 5 years following the splits, as well as the corresponding averages for the 5 years preceding the splits. Table 3 displays these averages, baseline per capita expenditures (measured the year before the splits), the RMSE for the presplit period, as well as standardized p-values for the pre- and post-splits periods respectively. Reassuringly, presplit effects are all small, especially compared to the baseline, implying that our empirical strategy is successful. However, in the case of Åsele, the standardized p-value for the presplit period is as low as 0.03, reinforcing our concerns about drawing conclusions about the causal effects of the break-up in this municipality.[23]

In Botkyrka and Vaxholm, annual per capita expenditures decreased by on average around 3,200 SEK and 3,900 SEK respectively, corresponding to 8% and 11%, respectively, of the baseline per capita expenditures before the splits. In Motala and Vännäs, expenditures instead increased by around 4,000 SEK and 3,000 SEK respectively, which compared to the baseline corresponds to an increase of 12% and 8% respectively. In Vara and Norsjö, there are no indications of expenditures having changed because of the break-ups. Here, the estimated effects are very

[23]Note that the average annual presplit effect of zero for Åsele reflects averaging over negative and positive annual effects.

small compared to the baseline and the standardized p-values are high, indicating that the effects are also statistically insignificant.

The spending category where economies of scale are most likely to be present is administration. For this spending category, there is also less concern that changes in expenditure level capture changes in service quality rather than in efficiency. Figure 5 shows the annual evolution of per capita expenditures on administration as well as estimated annual treatment effects, while Table 4 shows 5-year averages.

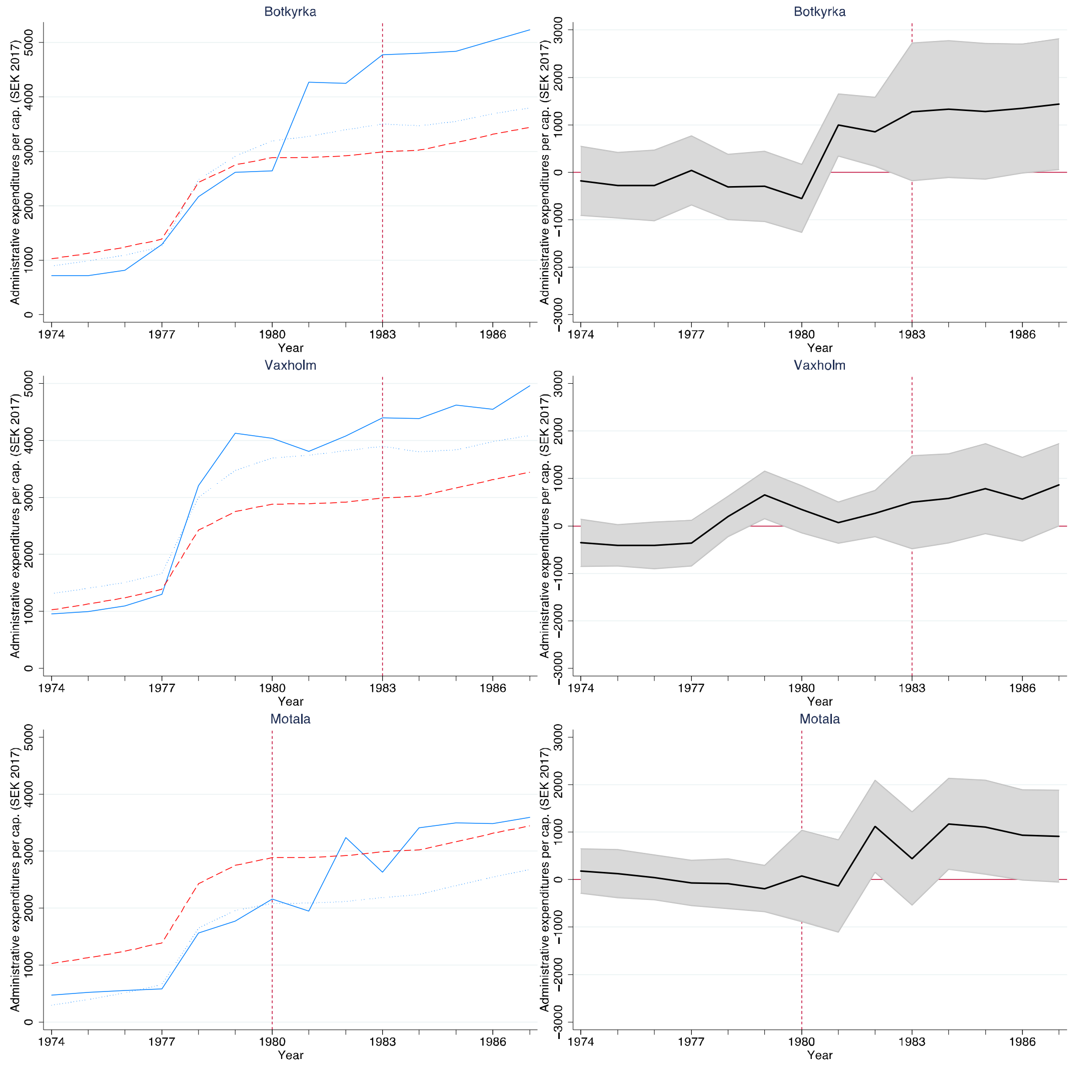

FIGURE 5 Observed and counterfactual outcomes (left), and estimated treatment effects (right): Per capita expenditures on administration. The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities. The solid blue line shows how expenditures evolved in the treated municipality, while the thin blue dotted line shows the estimated counterfactual expenditure trajectory. The dotted red line shows the corresponding evolution in the municipalities not experiencing a split. The solid black line shows the estimated annual treatment effects of the treated. The 95-percent confidence intervals (grey area) are estimated by taking $\hat{\alpha}_{it} \pm 1.96$ the standard error of the distribution of 999 block bootstrap replicates of $\hat{\alpha}_{it}$. Table C.2 in the online appendix provides estimated effects and standardized p-values, by year The estimations are carried out using Jason Poulos' forked version of MCPanel, available at https://github.com/jvpoulos/MCPanel.

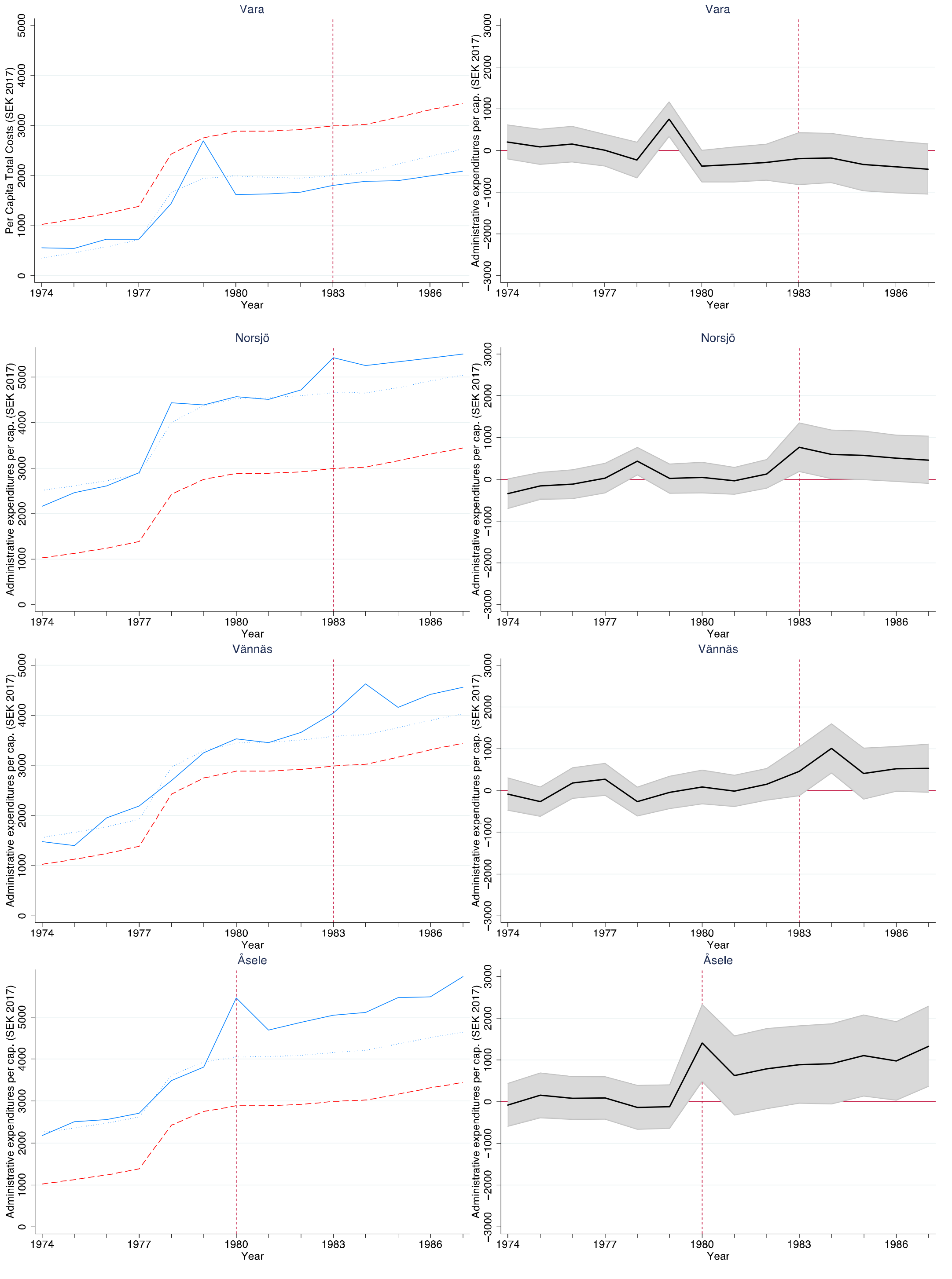

FIGURE 5 Continued

TABLE 4 Estimated treatment effects and standardized *p*-values, 5-year averages: Per capita expenditures on administration.

	Botkyrka	Vaxholm	Motala	Vara	Norsjö	Vännäs	Åsele
Average annual – Pre	138	307	0	−91	118	−19	0
Average annual effect – Post	1,335	661	537	−308	581	586	924
Baseline	4,778	4,401	1,769	1,805	5,430	4,044	3,812
$RMSE^{pre}$	515	374	122	336	202	178	542
Standardized p-value – Pre	0,09	0,18	0,64	0,14	0,39	0,66	0,71
Standardized p-value – Post	0,46	0,50	0,11	0,91	0,30	0,15	0,05

Note: The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities. Baseline refers to the year before treatment (1979 for Motala and Åsele, and 1982 for the other five municipalities). The estimations are carried out using Jason Poulos' forked version of MCPanel, available at https://github.com/jvpoulos/MCPanel. Standardized p-values calculated by the method described in Kumar and Liang (2018). Averages and p-values calculated using five years before and after the break-ups. $RMSE^{pre}$ calculated for the whole pre-period (not only five years before the break-up).

From these results, it is evident that per capita expenditures on administration increased because of the municipal splits, except in the case of Vara, where the expenditures were unaffected (the point estimates are negative, but the standardized p-value is as high as 0.91). That Vara is a bit of an outlier in terms of per capita expenditures on administration is also indicated by Figure 1. The effects correspond to between 11% and 30% and are thus economically significant, indicating that the municipal break-ups resulted in loss of economies of scale. Since the effects remain 5 years after the break-up, they cannot only be explained by increasing expenditures on administration due to an initial need to create an administration in the newly created municipalities. It is worth noting, however, that in Botkyrka the increase in administrative expenditures happened already a couple of years before the municipal split.

So far, we have focused on the expenditure side, ignoring potential effects on revenues. A municipality split may affect municipal revenues as well, for example by making the resulting municipalities come out as either winners or losers with respect to the amount of intergovernmental grants they receive, or by attracting or repelling a certain type of inhabitants, which would affect their tax base (and in turn, their tax revenues). Changing economic circumstances may in turn change the demand for municipal services, and if so, changing per capita expenditures may not necessarily be a result of changes in efficiency. To investigate whether the municipalities became richer or poorer, we therefore estimate effects on the per capita amounts of intergovernmental grants the municipalities received and the municipalities' tax bases, see Table 5.[24]

Most of the estimated effects are both economically small and statistically insignificant – however, the estimates for Åsele and Botkyrka should be interpreted with some caution, given the low standardized p-values for the pre-period. Two exceptions are Motala and Vännäs. Motala experienced an almost 15% increase in intergovernmental grants, whereas Vännäs experienced an increase in the tax base, although modest in size (4%). Hence, decreasing per capita expenditures in Botkyrka and Vaxholm cannot be explained by lower revenues, whereas the increasing per capita expenditures in Motala and Vännäs could potentially have been caused by increasing revenues.

[24]Figures D.1 and D.2 in the online appendix show the observed, counterfactual, and estimated treatment effects on intergovernmental grants and tax base.

TABLE 5 Estimated treatment effects and standardized *p*-values, 5-year averages: Per capita intergovernmental grants and tax base.

	Botkyrka	Vaxholm	Motala	Vara	Norsjö	Vännäs	Åsele
Intergovernmental grants							
Average annual effect – Pre	675	200	0	−259	−4	42	0
Average annual effect – Post	−304	−269	1,304	16	286	227	924
Baseline	12,315	10,283	8,996	8,258	13,190	13,973	16,506
$RMSE^{pre}$	1,500	471	331	447	538	388	3,085
Standardized p-value – Pre	0,07	0,53	0,37	0,33	0,20	0,29	0
Standardized p-value – Post	0,94	0,62	0,29	0,99	0,88	0,59	0,99
Tax base							
Average annual effect – Pre	7,292	5,689	0	537	−6,157	2,903	0
Average annual effect – Post	42,970	25,320	−16,351	−1,228	−24,711	28,245	15,853
Baseline	871,107	852,677	778,567	677,633	784,630	709,457	700,239
$RMSE^{pre}$	24,811	16,983	10,427	5,649	15,832	7,458	13,814
Standardized p-value – Pre	0,09	0,19	0,41	0,71	0,25	0,90	0,22
Standardized p-value – Post	0,52	0,62	0,59	0,93	0,55	0,05	0,72

Note: The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities. Baseline refers to the year before treatment (1979 for Motala and Åsele, and 1982 for the other five municipalities). The estimations are carried out using Jason Poulos' forked version of MCPanel, available at https://github.com/jvpoulos/MCPanel. Standardized p-values calculated by the method described in Kumar and Liang (2018). Averages and p-values calculated using five years before and after the break-ups. $RMSE^{pre}$ calculated for the whole pre-period (not only five years before the break-up).

How do our results compare to those that we would have found, had we instead applied the synthetic control approach? The left panels in Figure 6 compare the estimated treatment effects (5-year averages) from Tables 3–5 with the corresponding effects obtained using the synthetic control method, with and without covariates.[25] The right panels show the RMSE for the pre-period, which is informative about how well the method predicts the counterfactual in the pre-period and hence gives an indication of the overall performance of the estimator. As expected, the MC-NNM estimator outperforms, or performs equally well as, the SC-estimator in terms of pre RMSE in all but one case. In most cases however, the point estimates are quite similar.

As mentioned in Section 5, conducting inference in the MC-NNM framework is still an open question. One way to evaluate how likely it is that the estimated effects are true treatment effects and not the outcome of random noise is to compare these effects with corresponding placebo effects for the nontreated municipalities. Figure D.5 in the online appendix shows the resulting graphs. Our reading of the results is that they support the conclusions that we have drawn so far.

As a final sensitivity analysis, we remove all treated units' neighboring municipalities from the sample, since municipal break-ups may cause spillover effects in nearby municipalities, for example in terms of individuals

[25]Figures D.3 and D.4 in the online appendix compare the annual estimates obtained by the different estimators.

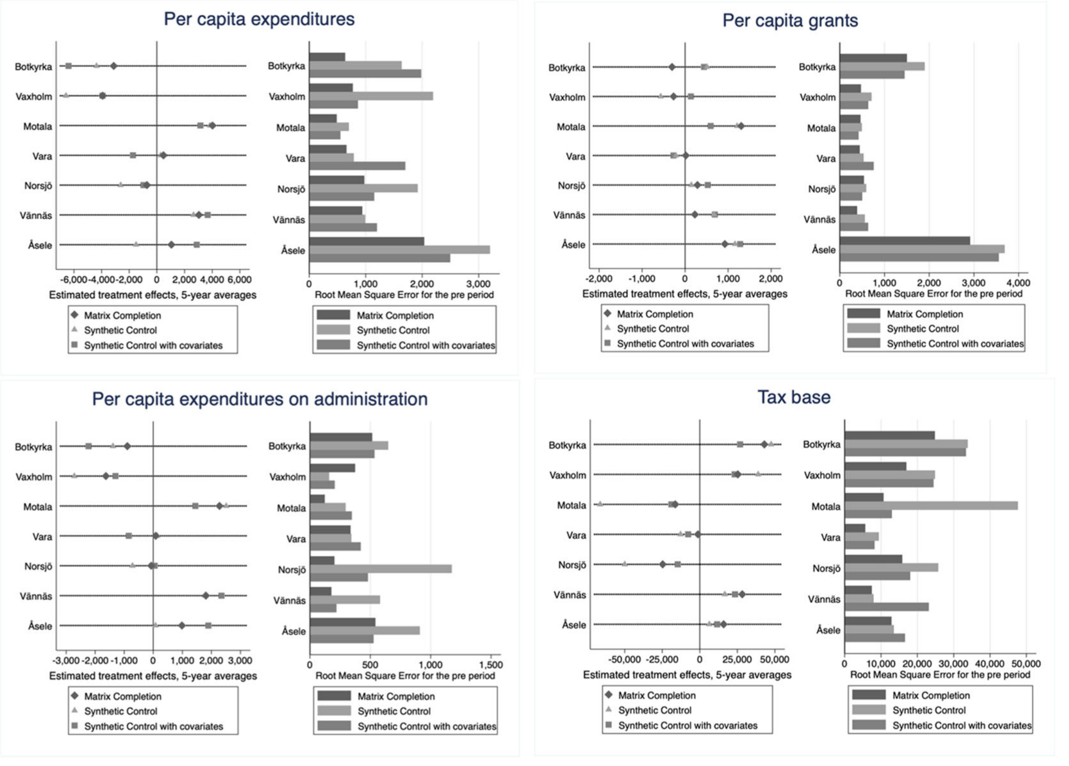

FIGURE 6 Matrix completion vs Synthetic control method, estimated treatment effects, 5-year averages, and goodness of fit. The municipalities that underwent a split are named as they were before the split, and defined in terms of their initial jurisdiction, i.e., we divide the sum of expenditures in the two new municipalities by the sum of the populations in the two new municipalities. Covariates include: Tax base, total population, area, share of kids and elderly, and vote share for let wing parties (S + V). Synthetic Control estimated as suggested by Abadie et al. (2010) using the STATA package *synth*. Matrix Completion estimations carried out using Jason Poulos' forked version of MCPanel (used in Athey et al., 2021), available at https://github.com/jvpoulos/MCPanel.

relocating to or from neighboring municipalities. This does, however, not affect the point estimates, see Figures D.6 and D.7 in the online appendix.

7 | EXPLORATIVE ANALYSIS OF THE EVENTS AFTER THE SECESSIONS

When summarizing how the seven municipal splits affected per capita expenditures, the picture is mixed. Expenditures decreased in the two cases that are located in the Stockholm metropolitan area (Botyrka and Vaxholm), increased in two cases (Motala and Vännäs) and were unaffected in two (Vara and Norsjö). (For the seventh case, Åsele, we are not able to draw any conclusions due to a less successful performance of the empirical strategy). How should we understand these differing results? One potential explanation to decreasing expenditures in the two first is their initial size: both Botkyrka and Vaxholm initially had more than 22,000 inhabitants (where, according to Figure 1, diseconomies of scale are likely to begin to kick in). However, also Motala was initially large (50,000 inhabitants), but did instead experience increasing per capita expenditure after the break-up.[26] Potentially, loss of economics of scale could explain increasing per capita expenditures in Vännäs, where the two newly formed municipalities had few inhabitants (8,000 and 3,250 respectively). However, the two municipalities that were the result of the split of Norsjö were even smaller (5,600 and 4,250), and here per capita expenditures did not increase. Nor did per capita expenditures in Vara, where the part that left only had 7,500 inhabitants after the split. Hence, on its own, municipal size is unable to explain the heterogenous effects found.[27]

Another possible reason why per capita expenditures change after a territorial reform is a change in preferences. Since the territorial reforms we are interested in were initiated by groups of voters dissatisfied with their current situation, this scenario seems relevant to our setting. If so, changes in expenditures may be driven by changes in welfare ambitions rather than in efficiency. Table 6 shows the political majorities in the seven and later the 14 municipalities for the period from 1974 until 1986. In three out of the seven cases, the political majority changed in one of the new municipalities following the break-up. The left-wing bloc in old Botkyrka and old Motala lost power to the center-right coalition in Salem and Vadstena, whereas the left-wing coalition won the majority in Vännäs once Bjurholm seceded. Assuming that left-wing politicians (and voters) generally have a stronger preference for municipal services than center-right politicians (see, e.g., Ågren et al., 2007, for Swedish evidence supporting this assumption), decreased per capita expenditures in Botkyrka, and increased in Vännäs, can potentially be explained by the change in political majority. However, the same logic cannot be applied to make sense of the increase in per capita expenditures in Motala, since the center-right coalition won the majority in the municipality that initiated the split in the election following the secession.

To further understand whether the changed political majority can help explain our findings, or if the explanation might be a different one, we next focus on what happened in the different specific cases (i.e. in the fourteen new municipalities) after the municipal break-ups. We do this by exploring the local media at the time to form a better picture of the major decisions taken in the new elected municipal councils. As a complement to this explorative analysis, Table 6 presents the tax rates in the old and new municipalities, whereas Figure 7 shows how per capita expenditures evolved over time, before and after the municipal break-ups, in the different parts of the original municipalities.

Let us start with the two cases in the larger Stockholm area. In the first election for the new municipal councils in Botkyrka/Salem, the Social Democrats kept their own majority in Botkyrka, whereas the center-right coalition won the majority in Salem. The assessment preceding the municipal split had predicted that Salem would have to increase the tax rate to manage on their own. However, it turned out that Salem could keep the same tax rate as before the split (although some user fees were increased). One explanation to this was that Salem did not invest in a new office building for the municipal administration. Instead, the goal of the local politicians was to reduce the tax rate in 1985, and this was later achieved. (DN Runt Stan, 1983e, November 23; 1984e, October 3).

> *Next year, we will lower the tax rate with 1 krona. We hope for a sequel. But services do not have to deteriorate. During 1983 and 1984 we built up various funds. There is no longer a need for this*. Christian Öhlin (Chairman of the municipal board, Salem), October 3, 1984.

[26]One possible explanation is that Motala is located in a less prosperous geographical region that does not exhibit the characteristics typically associated with polycentric metropolitan regions, as outlined in Section 2.

[27]It is legitimate to ask whether expenditures could increase in seceding municipalities since newly created municipalities might also need to undertake major investments to be able to provide public goods. However, there are strong reasons to believe that the municipalities that seceded from a larger municipality shortly after the amalgamation reforms were in no immediate need of large public project investments. As Askim et al. (2020) and Tavares (2018) demonstrate in their literature reviews, 'hoarding', or'common pool effects', are common before amalgamation: municipalities tend to increase their debt and spend their cash reserves to invest in public projects in their specific territory just before a merger. This general pattern has been confirmed in Sweden too, see, e.g., Jonsson (1983), Jordahl and Liang (2010) and Tyrefors Hinnerich (2009).

TABLE 6 Tax rate and political majority, before and after the municipal splits.

	Botkyrka	Salem	Vaxholm	Österåker	Motala	Vadstena	Vara	Essunga	Norsjö	Malå	Vännäs	Bjurholm	Åsele	Dorotea
1974	14		14		15		14		14.4		14.5		15.1	
1975	15.3		15.2		15.5		14.5		15.25		15		16.1	
1976	16		15.7		16		14.5		15.75		15		16.1	
1977	16		15.7		16		14.5		16.75		15		17.1	
1978	16.5		15.7		16		15		16.75		16		18.6	
1979	16.5		15.7		16		15		16.75		16		18.6	
1980	16.5		15.7		16	16	15		16.75		16		18.6	18.6
1981	16.5		15.7		16.5	16	15		17.75		16		18.6	18.6
1982	16.5		15.7		17	16	15		17.75		16.5		18,6	19,1
1983	16.5	16.5	15.7	15.7	17	16	15.75	15.9	17.75	17.75	17.5	17.5	19.6	19.1
1984	16.5	16.5	15.7	15.7	17	16	15.75	15.9	17.75	17.75	17.5	17.5	19.6	19.1
1985	16.5	15.5	15.7	15.7	17.25	16	15.5	15.5	17.75	17.75	17.5	17.5	19.6	19.1
1986	16.4	15.5	15.1	15	17.25	16	15.5	15.5	17.75	17.75	17.5	17.5	18	18
1987	15.9	15.25	14.9	14.5	17.25	16	15.5	15.5	17.75	17.75	17.5	17.5	18	18

Note: Blue color denotes center-right wing majority, whereas red color denotes left wing majority.

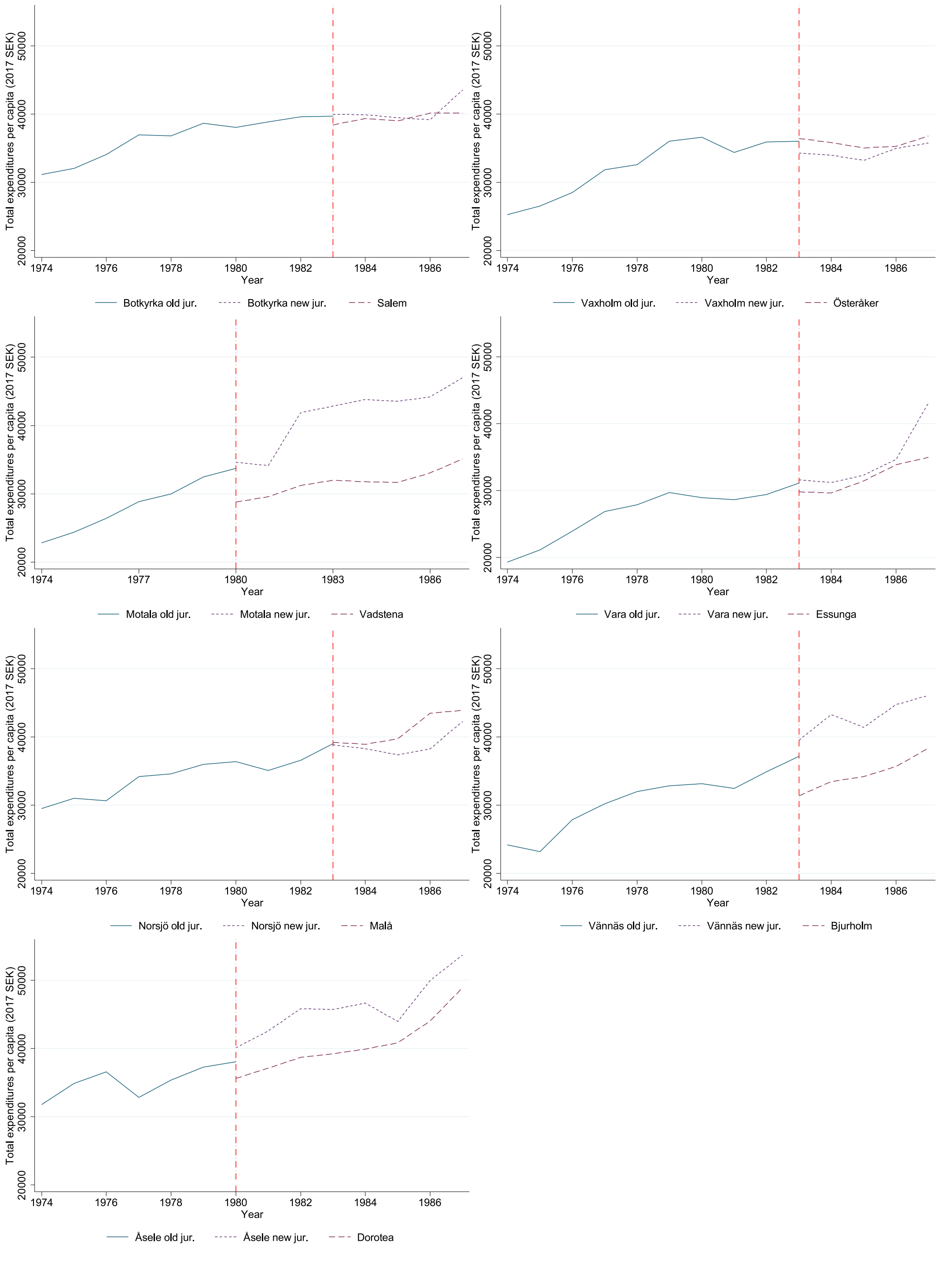

FIGURE 7 Evolution of per capita expenditures over time.

The economic situation was tougher for the remaining Botkyrka, which suffered from large loans taken up in the 1970s. However, thanks to an improved economic situation, the Botkyrka politicians did not have to increase taxes, and were even able to lower them both in 1986 and 1987. (DN Runt Stan, 1984c,e, May 30; October 3).

> *The recovery has clearly exceeded expectations. We are on our way to a full recovery*. Sven-Ivar Jansson (Financial officer, Botkyrka) May 30, 1984.

Looking at the evolution of per capita expenditures (Figure 7), there are no indications that these evolved differently in the two new municipalities after the break-up. They follow each other closely, and compared to the presplit period, the increase in expenditures seems to have ceased. Is this an effect of higher efficiency, or did it come at the cost of lower service ambitious? The politicians in power in Salem claimed that the service level was not deteriorating (DN Runt Stan, 1983e, November 23; 1984e, October 3). However, there are indications that increasing per capita expenditures came at the cost of not expanding childcare facilities as needed.[28]

In Vaxholm/Österåker, the center-right coalition that had been in power in the larger municipality also won the first election in both of the newly formed municipalities. Already from the very start, politicians in both Österåker and Vaxholm made clear that they were not intending to raise taxes after the break-up (DN Nord, 1981, December 24).

> *… as long as I'm involved, there will be no talk of any tax increases. If necessary, there will be further cuts*. Stefan Cronberg (Chairman in the larger Vaxholm, representing the Österåker part) December 24, 1981.

> *Tax increases will not be considered for Vaxholm's part*. Torsten G Jansson (active in the campaign for a free Vaxholm) December 24, 1981.

The tax rate also remained on the presecession level in both municipalities the first 3 years, but already in 1983, the politicians in both municipalities announced that they had the ambition of reducing tax rates in years to come, something that was realized in 1986 (DN Runt Stan, 1983b,c, September 15). Instead, both municipalities increased user fees (DN Runt Stan, 1983a,d, September 1; October 13). As in Botkyrka and Salem, there are indications that not increasing per capita expenditures (see Figure 7) came at the cost of not expanding childcare services.[29]

In Motala/Vadstena, the Social Democrats lost their own majority in Motala, but remained in power supported by the left party, whereas the center-right coalition won the Vadstena election. Although the initial goal in Motala was to not raise the tax rate, the municipality soon ran into economic problems, lacking the tax revenues from Vadstena and receiving less tax equalizing grants than expected (Motala Tidning 1979a, September 21). In 1980, it become clear that the tax rate would have to be increased in 1981, despite additional tax equalizing grants (Motala Tidning, 1980a,b,d,f, February 6, October 3 and 12; November 25).

> *We had not expected to have to raise the tax in the municipality before 1985. Now we are forced to either slow down the pace in terms of both finances and service. Or raise taxes earlier*. Per Ekelin (municipal councilor, Motala) February 6, 1980a.

Vadstena, on their hand, managed much better and could maintain the same tax rate as before the break-up, which also had been the initial ambition (Motala Tidning 1979b,c, October 13, November 30; 1980c,e, October 9

[28]According to an investigation of Statistics Sweden, Botkyrka and Salem were second worst in the Stockholm area when it came to providing childcare slots. (DN Runt Stan 1984d, May 30)

[29]Österåker planned for having more children at the existing facilities (DN Runt Stan 1984a, March 15), whereas Vaxholm encouraged parents to start own childcare facilities (DN Runt Stan 1984b, April 5).

and November 21). From Figure 7, it is also clear that per capita expenditures increased in Motala after the split but decreased in Vadstena. A governmental report that evaluated the break-up of Motala and Vadstena concluded that Motala had difficulties in reducing the expenditures when Vadstena left, but that the service level in the two municipalities did not deteriorate (Kommundepartementet, 1981).

In the first election after the Vara/Essunga-divorce, the center-right parties kept their majority in both municipalities. The assessment preceding the break-up had predicted that both municipalities would have to increase their tax rate in the case of a split, and this was also what happened (Göteborgsposten 1982, November 3; 1983, January 3). Comparing the evolution of per capita expenditures (Figure 7), we conclude that those in the two newly formed municipalities follow each other very closely after the secession.

Turning next to the first case in the north, Malå/Norsjö, the Social Democrats had the political majority with support of the left party before the split. In the first elections after the break-up, the Social Democrats gained a majority of their own in Malå, whereas the left party kept their king-maker role in Norsjö. The assessment preceding the split had predicted that both municipalities would run into economic problems, but it turned out that neither had to raise their tax rate, although some user fees were increased. The rescue for both municipalities seems to have been the existence of money in the tax stabilization funds. (Norra Västerbotten, 1982b,c,f, October 18, November 11 and 27; 1983b,c,d,e,f,g,h, September 10 and 15, October 18 and 20, November 2, 28 and 29).

> *But it is not entirely correct to say that we have managed to divide the municipality without a tax increase*. Lennart Gustavsson (municipal councilor, Malå), November 11, 1982.

> *We have utilized both the tax stabilization fund and the investment fund* Östen Eriksson (municipal councilor, Norsjö), October 18, 1983.

Looking at Figure 7, we conclude that per capita expenditures were somewhat lower in Norsjö than in Malå after the break-up. From the reports in local media, it is not obvious why, except that Malå built a new office building for the local administration, something which made out the biggest part in the municipal budget (Norra Västerbotten 1982c, November 11). As opposed to the situation in Vännäs/Bjurholm (see below), the split, involving agreements on how to divide economic resources, seems to have been relatively smooth (Norra Västerbotten 1983a, June 28).

Finally, turning to Vännäs/Bjurholm, we conclude, by looking at Figure 7, that per capita expenditures are considerably lower in Bjurholm after the split compared to Vännäs, where the left-wing coalition won the majority in the municipal council after the split. In Bjurholm, the center-right coalition remained in power. Both municipalities faced financial problems soon after the split and were forced to increase tax rates (Västerbottenskuriren 1982a,b,c,d, September 11, October 28, November 4 and 30).

> *Next year, we might need to borrow to cover operating expenses*. Henrik Bask (Chief administrative officer, Bjurholm), November 30, 1982.

> *S intends to raise the tax by one crown for two reasons: Firstly, we can complete the agreement with Bjurholm more quickly. Secondly, we need to borrow less*. Rolf Thomasson (member of the budget preparation committee, Vännäs), October 28, 1982.

An underlying reason to the economic hardship suffered by both municipalities may have been that they had difficulties in agreeing on how to divide assets and liabilities, which resulted in mediators having to be called in (Västerbottenskuriren 1983a,b,c,d,e, August 10, 18, 25, 26 and 31).

To conclude, it does not seem like changes in political preferences can, in themselves, explain the decrease in per capita expenditures found in the metropolitan Stockholm region, given that Botkyrka and Salem followed similar paths after the split, and given that there was no change in power in Österåker and Vaxholm. Instead, it seems like the municipalities simply became more efficient after the break-ups, but that this increased efficiency potentially came at the cost of not expanding childcare slots. Nor do the increasing expenditures in the north seem to be politically motivated since tax rates increased both in left-wing-led Vännäs and in the center-right-led Bjurholm. It is more likely that the preceding assessment was correct, i.e., that the smaller municipalities would suffer from losing economies of scale. That Norsjö and Malå coped better might have been a consequence of a better initial economic situation. When it comes to Motala/Vadstena, our reading of the material in the press and in the governmental report is that Motala suffered from the loss of Vadstena and that the increasing per capita expenditures do not reflect an increase in the service level, despite receiving more intergovernmental grants.

8 | CONCLUDING DISUCSSION

We have analyzed how municipal break-ups affect municipal expenditures. Focusing on the seven municipal splits – resulting in 14 new and smaller municipalities – that were undertaken in the early 1980s, we found no uniform support for the dominant view, i.e., that a movement from larger to smaller municipalities leads to higher per capita expenditures. Instead, we find evidence of a heterogeneity of outcomes. Expenditures increase in some places, are unaffected in others, and in yet others, decrease. More specifically, per capita expenditures tended to decrease following splits in municipalities located in densely populated areas close to the greater Stockholm metropolitan region, whereas they either increased or remained unaffected in municipalities located in more sparsely populated regions of Sweden. That said, when we purely focus on spending in central administration, we indeed find consistent evidence of break-ups leading to increased costs. This result is in line with the literature on municipal amalgamations as well as previous work on municipal secessions in Brazil, which point to a realization/loss of economies of scale in central administration as jurisdictions become larger/smaller.

Given the inventory of theories on municipal size and expenditures, the heterogeneity of our findings comes as no surprise: Initial conditions in terms of population size, surface area, population density as well as politics and other contextual factors, are expected to affect the final economic outcomes of both break-ups and amalgamations. Hence, the patterns that are observed point to the importance of evaluating potential effects of territorial reforms – and this pertains to municipal break-ups as well as amalgamations – on a case-by-case basis. Had we just treated our cases in the aggregate, and ignored the potential heterogeneity of effects, we would have arrived at the erroneous conclusion that the territorial reforms that took place in Sweden in the early 1980s did not affect municipal expenditures. Furthermore, our paper points to the strength of combining quantitative and qualitative analysis to fully understand why effects differ in ways that cannot simply be explained by population size.

To conclude, our findings underscore the perils of policy makers propagating territorial reforms as universal, one size fits all, or silver bullet solutions to complex and multi-faceted societal challenges. The findings thus highlight that policymakers may be naïve placing their bets on sweeping and all-encompassing amalgamation reforms to enhance efficiency and cut municipal expenditures. In fact, it would not be unreasonable to advocate splits in certain geographical regions of a country, and amalgamations in others. By implication, they also highlight the difficulties of predicting the ultimate outcome of territorial reforms. This applies to both those reforms that increase and those that decrease municipal size.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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