JOURNAL OF REGIONAL SCIENCE

JOURNAL OF REGIONAL SCIENCE, VOL. 56, NO. 4, 2016, pp. 659–682

THE EFFECTS OF LOCAL GOVERNMENT AMALGAMATION ON PUBLIC SPENDING, TAXATION, AND SERVICE LEVELS: EVIDENCE FROM 15 YEARS OF MUNICIPAL CONSOLIDATION*

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ABSTRACT. We study how municipal amalgamation affects local government spending, taxation, and service provision in the Netherlands. Employing different models, different control groups, and a number of robustness tests, we find no significant effect on aggregate spending or taxation, although spending on administration is reduced. We explore whether this finding might hide amalgamation effects working in opposite directions for different types of municipalities (e.g., small versus large, or homogeneous versus heterogeneous), cancelling each other out. This does not seem to be the case. We also investigate whether amalgamation leads to better public services instead of lower spending, but find no evidence.

1. INTRODUCTION

There is much debate on the optimal size of jurisdictions. According to Oates' (1972) decentralization theorem, smaller jurisdictions are better able to tailor local public goods to local preferences and costs. Decentralization is more beneficial where preference heterogeneity is bigger. However, internalizing spillovers and reaping economies of size calls for jurisdictions that are sufficiently large.

The lowest level of territorial government is often formed by municipalities or local governments. Average municipality size varies remarkably (Warner, 2006; Hoorens, 2008): it is low in the Czech Republic (1,640 inhabitants) and France (1,720) and high in the United Kingdom (140,000). Average population size is 7,400 in the United States and 5,400 in the European countries.

Local government size is far from constant, however. Apart from natural population growth and decline, consolidations are quite common in developed countries in the last few decades and have drastically changed average jurisdiction size. For example, Belgium consolidated the number of municipalities from 2,359 to 596 in 1977, New Zealand restructured over 230 units of local government into 74 territorial local authorities in 1989, and Israel amalgamated 23 out of a total of 264 municipalities into 11 new

*The authors thank Marloes van Gelder, Lieneke Janzen, and Erik Merkus for excellent research assistance, and the referees, the editor, Hristos Doucouliagos, Arnt-Ove Hopland, Krisztina Kis-Katos, Aljar Meesters, Eduardo Di Porto, Yaniv Reingewertz, Wouter Vermeulen, and participants of the Second World Congress of the Public Choice Societies, Miami, 2012, and of the 69th Annual Congress of the IIPF, Taormina, 2013, for their valuable comments on previous versions of this paper.

Received: October 2014; revised: April 2015, September 2015; accepted: November 2015.

 DOI: 10.1111/jors.12268

municipalities in 2003.[1] As part of the Danish administrative reform of 2007, 270 municipalities were amalgamated into 98 new ones. Local government amalgamation is currently being considered in both Norway and Finland.

Surprisingly, the effects of such measures are not well known. Often, amalgamation is primarily aimed at exploiting economies of size. The empirical evidence underpinning this, however, is weak. This paper studies the effects of municipal amalgamation on local expenditures and public service levels in the Netherlands. In many countries, amalgamations were part of a national reform that included a vast number of simultaneous amalgamations, and that sometimes involved new task assignments or new financial arrangements as well. That makes it difficult to isolate the effects of amalgamation. The Dutch approach is different. In almost every single year in the last decades, a small number of amalgamations took place. This makes the Dutch case attractive for econometric research.

Although previous studies in this field rely on static models, in a closely related field, the study of political business cycles, the use of dynamic models is standard. We also use dynamic panel data models, because expenditure levels are strongly influenced by budgets set in the previous year. We also test whether our results are robust to using two other specifications: a model including spatial spending interaction and a model using an instrumental variable that reflects the increase in size through amalgamation, instead of just the fact that amalgamation took place. Potential cost savings of amalgamations may take a few years to materialize. Therefore, we distinguish between short-term and long-term effects.

We find no significant effect on total per capita spending before or after amalgamation. Spending on the municipality's administration does go down after amalgamation, but not enough to affect total spending. There is no effect of amalgamation on local tax revenue.

However, this does not rule out the possibility that amalgamation does in fact affect municipal spending. That is because amalgamation might affect different groups of municipalities differently, resulting in an average effect that is insignificant for the population as a whole.

In the first place, amalgamation might reduce per capita spending of small municipalities (operating under economies of size), but increase spending of large municipalities (diseconomies of size). To test this, we estimate the influence of population size on the amalgamation effect. Second, differences in preferences might lead to increased spending, if the newly formed municipality adapts the level of each public service to the level of the municipality that had the highest standard in that field before amalgamation. This might prevent certain municipalities from attaining efficiency gains, whereas municipalities with more homogeneous political preferences would have less difficulty in this regard. To study this, we estimate the influence of political heterogeneity on the amalgamation effect. Finally, we test whether the amalgamation effect depends on the number of amalgamating municipalities. We find that neither jurisdiction size, nor preference heterogeneity or number of amalgamating municipalities influences the effect of amalgamation on aggregate spending.

One might hypothesize that amalgamation does save money, but that spending does not go down because the money is now spent for other purposes. Instead of lowering taxes, local governments may increase service levels. To shed more light on this, we study the effect of amalgamation on house prices. Through capitalization, improved public services accompanied by constant spending levels should be observable through an increase in

[1]In this paper, the words amalgamation and consolidation are used interchangeably.

house prices. We first estimate average house prices which are corrected for differences in house characteristics by running a hedonic regression based on a panel data set of 1.7 million transactions. We then test whether these house prices rise after amalgamation. This is not the case.

2. THEORY AND PREVIOUS RESEARCH

Amalgamation of subnational governments may have a number of effects on spending and service provision. Here, we present an overview, and we discuss the implications for the design of this study. We also offer a brief review of results of previous empirical studies.

Jurisdiction Size

The most obvious effect of amalgamation is an increase in jurisdiction size. Amalgamations are often inspired by the hope that size increase will improve productive efficiency. One reason is that bigger size allows specialization, that is, an improved division of labor, resulting in more experienced or better educated workers. Furthermore, increasing scale enables fixed costs to be spread over a larger output. Moreover, larger jurisdictions may be able to attract better administrators, and thus improve service levels or take on responsibilities previously avoided. Another positive effect is that scaling up will reduce spillovers, promoting allocative efficiency (Oates, 1972).

However, a larger size may raise agency and information costs. Large organizations require more planning, monitoring, and reporting than small ones. Also, governance may be weakened, as the influence of voters may be diminished as jurisdictions grow larger (Lassen and Serritzlew, 2011). Moreover, political yardstick competition may be less effective as the number of jurisdictions is reduced. (Yardstick competition is the mechanism where voters use local tax rates and service levels, relative to those in other jurisdictions, as indicators of their administrators' performance; Allers, 2012). This might reduce both allocative and productive efficiency.

Size effects are likely to materialize over a number of years. To cover them fully, a long research period is essential.

As a result of these conflicting effects, the per capita cost of public services is often assumed to be U-shaped, although firm empirical evidence is scarce (Breunig and Rocaboy, 2008). Such a U-curve reflects economies of size (downward sloping costs per capita) for units below the size where per capita costs are at a minimum. Larger organizations would then face diseconomies of size. With u-shaped costs, the effect of amalgamation on production efficiency would be positive for small jurisdictions (size after amalgamation $<$ optimal size) and negative for larger jurisdictions. Theoretically, economies and diseconomies of size might even cancel out in an aggregate analysis, leading to an insignificant effect on average. Existing empirical studies do not consider this possibility. Moreover, they tend to ignore that it is increase in size, not amalgamation per se, that drives economies of size.

Note that economies of size apply to production units, not necessarily organizational units. For example, many local governments are responsible for refuse collection, but contract this out to firms or intermunicipal organizations (e.g., Bel et al., 2010). In such a case, amalgamating municipalities will not increase scale of production. Economies of size are most likely in administration, because the number of administrators and council members does not rise proportionally with population size. Blom-Hansen, Houlberg, and Serritzlew (2012) and Moisio and Uusitalo (2013) found evidence of lower expenditures on administration in amalgamated municipalities in Denmark and Finland, respectively.

Scaling up organizations operating under economies of size may result in lower spending, higher service levels (increase in quality or quantity), or both. If public services become cheaper to produce, the optimal service level rises (Buettner and Holm-Hadulla, 2013). Moreover, bureaucrats might be reluctant to reduce spending (Niskanen, 1971). However, a reduction in spending may be the result of cuts in services instead of cost savings. Thus, studying spending alone is insufficient to judge whether amalgamation is successful.

Fox and Gurley (2006) and Holzer (2009) review the literature on subnational government amalgamations. Most of the papers reviewed there are case studies; any empirical research uses descriptive statistics at best. They conclude that the evidence is mixed: it is unclear whether amalgamations improve efficiency. Econometric analyses also have mixed results. Some studies point to higher spending after amalgamation (Lüchinger and Stutzer, 2002, studying Switzerland; Hansen, 2011, Denmark; Moisio and Uusitalo, 2013, Finland), whereas others find that amalgamation reduces spending (Reingewertz, 2012, Israel; Blesse and Baskaran, 2013, Germany; Hanes, 2015, Sweden).

Lower spending levels do not necessarily point at cost reductions, however. Spending may also be lowered by reducing output. Only two studies we know of also check whether lower spending is associated with lower service levels. To this end, Reingewertz (2012) uses net migration, housing construction, birth rate, school test results, and average class size as indicators of service levels; Blesse and Baskaran (2013) use birth rates, immigration, and the logarithmized sum of per capita municipal traffic and recreational area. Such exercises are useful: lower spending because of lower service levels instead of more efficiency is not the desired outcome of amalgamation. However, the output indicators that have been used seem rather arbitrary; selected because of availability, not out of conviction that they cover the full range of the multiservice jurisdictions that municipalities are. As an alternative to this approach, the effects of amalgamation on efficiency in specific fields may be studied. In this vein, Rouse and Putterill (2005) use data envelopment analysis (DEA) to test whether amalgamation in New Zealand increased efficiency in highway maintenance (it did not).

A different vein of literature studies the effect of decentralization and (geographic) government fragmentation on economic indicators like employment and income. The results are as yet inconclusive (see, e.g., Hammond and Tosun and the literature cited therein).

Uniform Service Levels

Jurisdictions have very limited scope to vary service levels within their boundaries. Thus, amalgamation normally requires unifying the different service levels existing in the participating municipalities. In case of preference heterogeneity among the inhabitants of the merging jurisdictions, the result is reduced allocative efficiency.

Preference heterogeneity among amalgamating municipalities might also influence the effect of amalgamation on spending. In democracies, differences in preferences will be reflected by differences in public services. Citizens will be disappointed if services they value are downgraded after amalgamation. The local government may therefore choose to adopt, for each service, the highest standard that existed before amalgamation (Park, 2013). For example, the merger of a municipality which spends a lot on social services with a municipality that has a high-quality road network may result in a municipality which spends a lot on both social services and roads. This would raise per capita spending, possibly more than exploiting economies of size could lower it. Municipalities with more homogeneous preferences would have less need to adjust public service levels after amalgamation. There, economies of size could lead to lower spending. Both effects might cancel

out in an aggregate analysis, leading to an insignificant effect. The current literature does not address this issue.

Temporary Effects

Amalgamation should be expected to have temporary effects as well. First, there will be the costs of restructuring different parts of the municipal organizations. New office buildings might be needed, IT systems have to be integrated, regulations must be harmonized, and so on. Amalgamation and the uncertainties surrounding it may also have disruptive effects on managerial behavior and organizational outcomes. Restructuring costs will normally start well before the official amalgamation date, and continue for several years afterward. It seems likely that these costs rise with the number of amalgamating jurisdictions. Andrews and Boyne (2012) found that spending of local governments in England went up while performance and value for money went down before they were merged in 2009.

Restructuring costs are likely to depend on the size of the amalgamating jurisdictions. Roughly speaking, amalgamations come in two types. The first type, which we will denote simply by "amalgamations," involves municipalities which do not differ too much in size (a "merger of equals"). The second type, denoted as "annexations," is characterized by the absorption of a small municipality into a big neighbor. It is not at all clear that both types have the same effects on the local budget. For one thing, amalgamations require setting up new organizational structures, whereas annexations do not. Empirical studies should take this into account.

Spending might be higher in jurisdictions knowing they will soon be merged, as a result of a common pool effect. Municipalities could engage in opportunistic behavior and decide to increase spending and/or accumulate debt in the years preceding amalgamation in order to shift part of the burden onto residents of their future amalgamation partners. Empirical evidence for this is reported by Tyrefors Hinnerich (2009), Jordahl and Liang (2009), Blom-Hansen (2010), Hansen (2014), and Saarimaa and Tukiainen (2015). But, of course, a common pool effect is only one possible explanation for rising expenditures or debt preceding amalgamation. Although restructuring costs are not considered by these authors, some link the budgetary effects to the size of the common pool (Tyrefors Hinnerich, 2009; Hansen, 2014; Saarimaa and Tukiainen, 2015), which supports the opportunistic behavior hypothesis.

Positive temporary effects may exist as well. Existing organizations usually have well-established ways of doing things, which might have become outdated. Amalgamation forces organizations to reconsider procedures and operations, possibly resulting in the adoption of more efficiency practices (Hansen et al., 2014).

3. MUNICIPALITIES AND AMALGAMATIONS IN THE NETHERLANDS

The Netherlands is divided into 12 provinces and 418 municipalities (in 2011). All provinces have more or less the same set of tasks and responsibilities, as do all municipalities. Municipalities provide a broad array of public services. Some of these are mandated by the central government, but municipalities are free to take up new tasks as they please. There is no legal restriction on borrowing (Allers, 2015). About two thirds of municipalities' revenues consist of grants from the central government. The most important one is an unconditional equalizing grant, allocated through a formula with over 50 local characteristics reflecting costs of providing municipal services. Most other grants are conditional grants meant to finance mandated tasks, allocated through formulas based on local spending needs. Taxes and user fees account for 15 percent of municipal revenues

TABLE 1: Mean Values of Variables for Different Groups of Municipalities (2002–2013)

	All Municipalities	Not amalgamated	Amalgamated	Amalgamated or Almost Amalgamated		
	Mean	Mean	Mean	Mean	Min	Max
Total expenditures per capita[a]	1,967 (10)	2,024 (13)	1,798 (11)	1,787 (10)	741	3,448
Expenditures on administration per capita[a]	120 (1.0)	127 (1.3)	102 (1.0)	106 (0.9)	25	306
Property tax revenues per capita[a]	184 (1.0)	186 (1.2)	175 (1.7)	177 (1.4)	47	540
Average house price[b]	256,867 (864)	259,402 (1,033)	249,709 (1,535)	257,173 (1,338)	118,368	510,552
General grant per capita[c]	826 (2.7)	842 (3.5)	783 (3.1)	777 (2.8)	372	1,370
Population[a]	36,829 (722)	37,149 (957)	35,923 (560)	33,138 (602)	4,005	218,456
Density[c]	0.94 (0.01)	1.02 (0.01)	0.73 (0.01)	0.76 (0.01)	0.19	2.80
Ideology of coalition (left)[d]	0.43 (0.003)	0.44 (0.003)	0.39 (0.005)	0.38 (0.004)	0	0.91
Concentration of power in municipal council[d]	0.21 (0.0007)	0.21 (0.0008)	0.22 (0.0014)	0.21 (0.001)	0.11	0.42
Share of coalition in municipal council[d]	0.63 (0.001)	0.62 (0.002)	0.64 (0.003)	0.63 (0.002)	0.27	0.97
Number of observations[*]	3,681–5,417	2,744–4,004	937–1,413	1,265–1,889		
Number of municipalities	387	286	101	135		

Notes: Standard errors within parentheses. Amounts are expressed in euros of 2013. [*]Some variables are not available for the entire period.

Sources: [a]Statistics Netherlands (CBS). [b]Estimated (hedonic regression) using data from Dutch Association of Realtors (NVM). [c]Ministry of the Interior and Kingdom Relations. [d]Statistics Netherlands (CBS) and Associations of Netherlands Municipalities (VNG).

on average. Municipalities can choose tax rates freely.[2] The property tax is by far the most important local tax. Other local taxes are insubstantial or only raise significant revenues in a limited number of municipalities. Property tax revenues vary considerably among municipalities and in time (Table 1).

Although matching grants exist, they play a minor role. As a result, grant revenue is generally independent of local taxing or spending decisions. Therefore, efficiency gains do not harm grant revenue and may be used to reduce spending and to cut taxes. This is politically attractive. Allers and Elhorst (2005) show that Dutch municipal tax rates are influenced by political yardstick competition, which implies that voters use local tax rates, relative to those in nearby jurisdictions, as indicators of their administrators' performance.

[2]In 2006 and 2007, property tax rates were capped at the municipality level. Both before 2006 and after 2007, each municipality had complete freedom to raise or reduce the property tax.

The number of municipalities has been steadily declining for a long time. Dutch municipalities had 40,000 inhabitants on average in 2011, which makes them large compared with those in other countries. In 1997–2011, our research period, the number of municipalities was reduced by 154. Often, two municipalities were merged, but the number of municipalities involved in an amalgamation ranges from two to six. Most municipalities selected for amalgamation had between 5,000 and 20,000 inhabitants (234 out of 329). After amalgamation, population size often lies in the range 20,000–50,000 (86 out of 122).

Most amalgamations concern municipalities of similar size. The number of annexations is too small for meaningful statistical analysis. Therefore, we drop municipalities involved in annexations from our dataset. As a cutoff point, we choose a population share of 85 percent for the biggest partner, thus eliminating 17 municipalities from our dataset. Lowering this cutoff point to 70 percent does not change our findings.

Dutch law allows amalgamations to be initiated by municipal councils, provincial governments or the Minister of Home Affairs (Boedeltje and Denters, 2010). The provincial government plays a key role. It prepares a draft amalgamation proposal, which is sent to the councils of the affected municipalities. Residents can also read the proposal. The councils can recommend changes to the province's proposal, but their consent is not needed. The province may revise its proposal as it sees fit and submit it to the Minister of Home Affairs. Parliament makes the final decision. The whole process takes several years. The stated reason for amalgamation is typically that municipalities are too small to effectively carry out all tasks expected from them. Efficiency gains are seldom mentioned explicitly but taken for granted. For example, in 2012, the central government announced a cut of 1 billion euros (6 percent) on the general grant because it thought municipalities could save costs by amalgamating further. This amount was not based on empirical research (which was nonexistent at the time).

Public opinion is often hostile to amalgamation, but that does not necessarily stop it. Hostility is usually based on the fear of losing influence on local matters, sometimes supplemented by ancient rivalries among nearby towns. Often, it is hard to say to what extent amalgamation is voluntary or mandatory. Some provinces have been more active in this respect than others. As a result, amalgamations are not spread out evenly across the country (Figure 1).

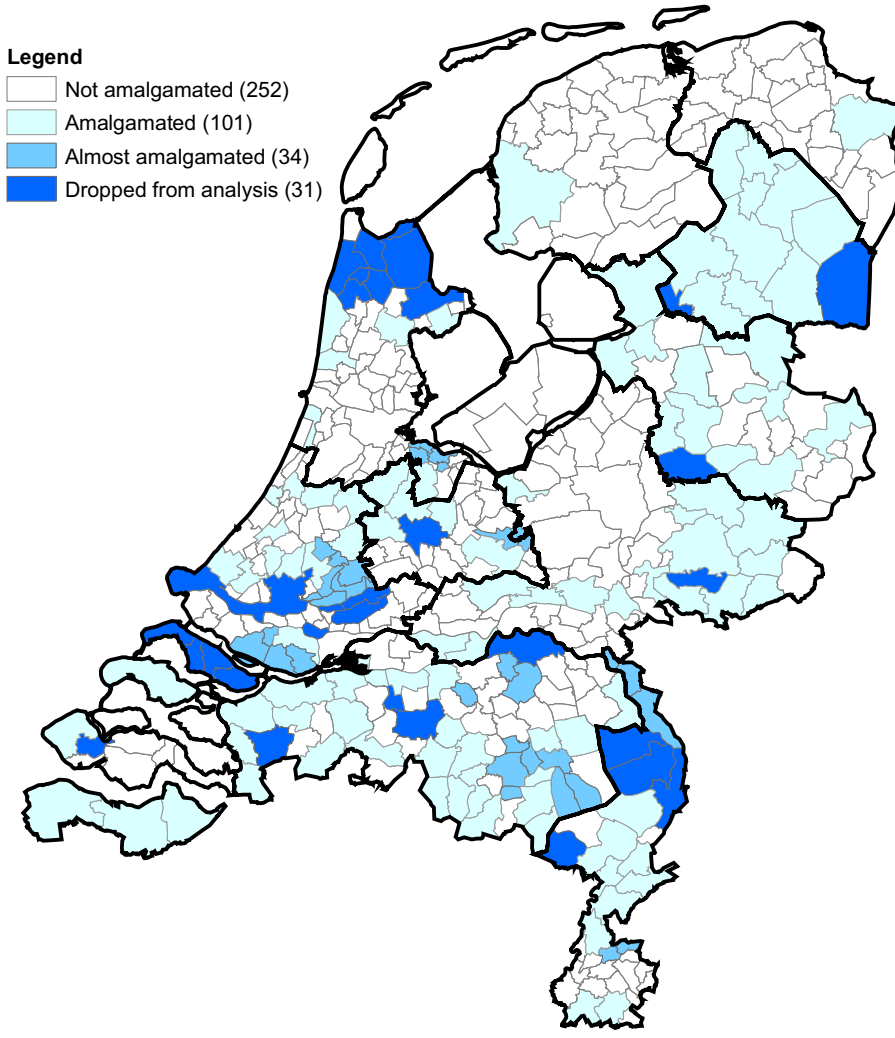
Obviously, local issues are important factors influencing the probability of amalgamation. To learn more about the general determinants of amalgamation, we ran a logistic regression on data for 2000.[3] The dependent variable was a dummy that took the value one if the municipality was to be amalgamated in 2001–2011. Not surprisingly, smaller municipalities turn out to be more likely to amalgamate. Density, measured as the average number of addresses per square kilometer, also affects the likelihood of amalgamation. Finally, several province dummies are significant, as expected.

4. RESEARCH SETUP

Identification Strategy

We use budgetary data on 418 municipalities for a period up to 12 years to estimate a panel data model including a number of amalgamation dummies. We use difference-in-difference estimation, comparing changes in spending of amalgamated municipalities

[3]For results see Table S1 in the appendix.



Note: Thin lines depict municipal boundaries; thick lines depict provincial boundaries.

FIGURE 1: Municipalities Formed Through Amalgamation, 1997–2011.

(the treatment group) with those of a control group of municipalities that were not amalgamated. Difference-in-difference estimation has been applied in this field by Lüchinger and Stutzer (2002), Tyrefors Hinnerich (2009), Jordahl and Liang (2010), Reingewertz (2012), and Blesse and Baskaran (2013). Like these authors, we exploit the fact that some municipalities were amalgamated and others were not. In addition, the staggered nature of the Dutch amalgamations allows us to also utilize fact that amalgamations took place in different years.

Difference-in-difference estimation requires that the error term is uncorrelated with the treatment status. Obviously, selection for amalgamation is not random. To control for the forces that drive selection, an instrumental variables approach may sometimes be used. This would require an instrument that influences selection for amalgamation, but not budgetary outcomes. It is unlikely that such an instrument exists. We take an

alternative approach: including all relevant variables affecting selection in the budgetary regressions as controls. Although one can never be sure that all relevant variables have been included, many of these are likely to be relatively time invariant, for example, location within a certain province. Including municipal and year fixed effects takes care of these. We control for time-variant variables affecting selection by including municipality-specific time trends and control variables.

Despite these measures, selection bias might still be present. If some municipalities are badly managed, with deteriorating public services or rising tax rates, citizens might revolt and press for amalgamation. If, after amalgamation, such municipalities perform as well as not-amalgamated municipalities (which were performing satisfactorily), this improvement might not be found in our results. To see whether this bias might occur, we will check whether pre-amalgamation budgetary trends differ from those in other jurisdictions.

We use three different control groups. The first control group consists of all municipalities that were not amalgamated, or that were amalgamated but in a different year. This control group is far from ideal, as amalgamated municipalities have different characteristics from non-amalgamated municipalities. For our second control group ("amalgamated"), we use municipalities that were amalgamated, but in a different year. This control group resembles the treatment group well; using it compares amalgamating municipalities with municipalities that are not yet amalgamated but will be in a later year within our research period. Using this control group is possible because of the staggered nature of the Dutch amalgamations. As a last control group, following Reingewertz (2012), we add to the second control group 34 municipalities that were set to amalgamate, but have, for political reasons, been left intact. This control group is denoted as "amalgamated or almost amalgamated."

Static Model

We start our analysis with a standard fixed effects model:

$$y_{it} = X_{it}\,\beta + a_t I_n + n_i + \gamma_i t + \epsilon_{it}, \tag{1}$$

where y_{it} is the dependent variable, X_{it} is the vector of (strictly exogenous) explanatory variables, α_t is a time scalar and I_n is a column vector of ones, η_i is an unobserved individual effect, t is a linear time trend that is allowed a municipality-specific effect and ϵ_{it} is an error term. The subscript i denotes municipalities ($i = 1, \ldots, n$), the subscript t denotes years.

The first dependent variable we use is total per capita spending. However, this includes spending on tasks mandated (and financed) by the central government. Therefore, as a second dependent variable, we use per capita property tax revenue. Municipalities are free to set tax rates and use the money as they see fit. Cost savings may be used to lower tax rates. Finally, we study the spending category where we would most expect economies of size: administration. Spending on administration of Dutch municipalities includes remunerations for mayor, aldermen, and members of the municipal council, and spending on staff and administrative support of these administrators and politicians. Amalgamations reduce the number of aldermen, council members, and mayors.

The dependent variables and the control variables are expressed in logs.[4] That is because we expect amalgamation to have a proportional effect on spending, if at all, not a constant effect.

[4]One exception is made for ideology of the coalition, because this variable can take a value of zero.

Dynamic Model

Previous econometric studies of amalgamations rely on static models. In the related literature on political business cycles, however, dynamic models are common (e.g., Brender and Drazen, 2005; Alt and Lassen, 2006). This is motivated by the nature of the dependent variables. While spending is partly discretionary, it changes only gradually. First, because national regulations and popular expectations often oblige municipalities to deliver certain services, as a result of which part of total spending is precommitted (Allers and Elhorst, 2011). Second, spending decisions involve rather complex trade-offs between political priorities. The previous year's budget often serves as a point of reference, and only limited changes are made every year (Bennett, 1984). Moreover, the apparatus of government is largely fixed in the short term. Hence, budgetary decision-making is likely to be incremental (Wildavsky, 1964). Therefore, we do not limit our analysis to static models but use dynamic models as well, including the 1 year lag of the dependent variable.

In our dataset, the time dimension ($T = 11$)[5] is rather small. Using dummy variables (LSDV) to estimate individual effects in a dynamic model then results in biased estimates. Various estimation methods have been proposed to cope with this problem, using instrumental estimators (e.g., generalize method of moments, GMM) or a direct bias correction. The most commonly used estimator in situations like these has become system GMM (Blundell and Bond, 1998), which relies heavily on a large N in the data panels (preferably approaching infinity). However, Judson and Owen (1999) and Behr (2003) conclude that the estimators using direct bias correction are superior for panels with limited T and small or moderate N ($N = 100$). Bias corrected LSDV estimators have since been used by several authors (e.g., Potrafke, 2012; Aidt and Mooney, 2014). Because the number of municipalities in our preferred data panel ($N = 135$) is close to 100, we also use the corrected LSDV method (Kiviet, 1995, 1999),[6] based on a standard dynamic panel data model:

$$y_{it} = \gamma y_{i,t-1} + X_{it}\beta + a_t I_n + \eta_i + \epsilon_{it}. \tag{2}$$

To study the effects of amalgamations, we first extend models (1) and (2) to include amalgamation dummies. Using amalgamation dummies is standard in the literature. Because we expect short term effects to differ from long-term effects, and pre-amalgamation effects from post-amalgamation effects, we use different amalgamation dummies.

IV. model: effect of jurisdiction size. Possible size effects are related to increase of jurisdiction size, not to amalgamation as such. Therefore, in addition to dummy variables, we also use an instrumental variable approach to test whether increase in size through amalgamation affects spending or taxation. In this model, we introduce the variable average population per jurisdiction, which before amalgamation is calculated as the combined population of the municipalities that are later amalgamated to become a single

[5]We have expenditure data for 2002–2013. Because we include a lagged dependent variable, we lose one year in our regressions.

[6]We use Bruno's (2005) implementation to deal with the fact that our panel is unbalanced. The system GMM estimator of Blundell and Bond (1998) is used as the initial estimator. Using the Arellano-Bond (1991) instead yields nearly identical results. Standard errors are approximated by a bootstrap algorithm with 50 repetitions. Because no information on the goodness of fit of the CLSDV model is available, we have rerun all regressions as a regular LSDV test with fixed effects (including a lagged dependent variable), and provide the R^2 of these estimations. Although these values give no accurate measure of the goodness of fit of the CLSDV model, they do give a good indication of the relative goodness of fit of the various CLSDV regressions. However, they are not comparable with the R^2 values given for the static regressions.

municipality divided by the number of municipalities that will be amalgamated.[7] After amalgamation, it is equal to the population. This average population per jurisdiction is instrumented on a dummy indicating whether a municipality has been amalgamated, and used as an explanatory variable. At the moment of amalgamation, average population increases (e.g., it doubles when two municipalities amalgamate). This variable reflects that it is increase in size through amalgamation, not amalgamation as such, that is expected to yield economies of size.

Spatial interaction model. Finally, as a robustness test, we use a dynamic model which is extended to include spatial interaction effects.[8] Allers and Elhorst (2011) found evidence of expenditure mimicking among Dutch local governments. Failure to include this could lead to omitted variable bias.

Extended analysis. We extend the basic analysis described above in two ways. First, based on theory, we would expect to see different amalgamation effects on small and large municipalities, on municipalities with homogeneous and heterogeneous preferences, and on amalgamations of few and many jurisdictions. Therefore, we estimate the influence of population size, preference heterogeneity, and number of amalgamating jurisdictions on the amalgamation effect. To this end, we introduce interaction terms.

Second, we include service levels into the analysis. Efficiency gains can be used to improve public services instead of reducing spending. Moreover, reduced spending might be the result of cuts in services instead of increased efficiency. Therefore, we investigate whether amalgamation raises the overall public service level. If amalgamated municipalities improve service levels, this should have made them more attractive to live in, ceteris paribus. Housing supply in the Netherlands is inelastic (Vermeulen and Rouwendal, 2007). If a municipality becomes more attractive, local demand for housing will rise, resulting in rising house prices (Oates, 1969; Brueckner, 1979). Recent empirical studies indicate that intergovernmental grants are fully capitalized into house prices in England and in the Netherlands (Hilber, Lyytikäinen, and Vermeulen, 2011; Allers and Vermeulen, 2016). We would expect the same to happen with funds that become available when economies of size are exploited. Thus, changes in quality-adjusted average house prices per municipality and per year seem a better indicator for changes in service levels that variables like birth rate that have been used in some previous studies. Hedonic price analysis has been used by many authors to measure the value of local public services. For examples, see Zheng, Sun, and Wang (2014) and the references provided therein.

We first ran a hedonic regression based on a panel data set which, for 1.7 million transactions in 1995–2013, contains sale prices and dates along with a rich set of house characteristics (number of rooms, floors, kitchens, bathrooms; year of construction, proximity of busy roads, garden orientation, etc.).[9] We then used the regression results to estimate the average house price per municipality and per year, keeping every other variable constant. The result is a price reflecting the value of a location in a particular municipality in a particular year. We use this average house price as the dependent variable in a regression with amalgamation dummies, fixed effects, year effects, and individual municipality trends on the right-hand side. For completeness, we also estimate a dynamic model and an IV-model, like we do for spending and taxation.

[7]Using a weighted average does not change our results.

[8]Different spatial interaction models exist. A spatial lag model is chosen here because we know from Allers and Elhorst (2011) that we should expect direct spatial interactions between Dutch municipalities. Our spatial econometric model is specified in the appendix.

[9]Data have been kindly made available by the Dutch Association of Realtors (Nederlandse Vereniging van Makelaars o.g. en vastgoeddeskundigen NVM). For regression results, see Table S7 in the appendix.

5. DATA

Budgetary data for 2002–2013 is provided by Statistics Netherlands.[10] Because data are missing for some municipalities in some years, we have an unbalanced panel. Amounts are expressed in euros of 2013 using the consumer price index. We rebuilt the dataset in such a way that all amalgamations are retroactively applied to the data. Thus, we organize our data as if all amalgamations had been implemented by 2002. For all 408 municipalities that existed in 2013, we have information on amalgamations in 1997–2013. We drop five municipalities that were amalgamated twice in this period from our dataset, along with the 14 municipalities that amalgamated in 2012 and 2013. This leaves us spending data for 387 municipalities, of which 101 were created through amalgamation, 34 were selected for amalgamation but left intact ("almost amalgamated"), and 252 were not amalgamated or almost amalgamated. Figure 1 shows the geographical distribution of these groups.

The matrix X_{it} consists of several control variables. As described above, central government grants constitute a large part of total municipal income. We include per capita amounts of the general grant.[11] As this is an equalization grant, allocated through a formula containing more than 50 demographic, physical, and other local characteristics outside the control of the local government, this variable indirectly controls for a great number of variables that might influence both spending and selection for amalgamation.

The second control variable is the number of inhabitants. As we have seen, this is one of the determinants of selection for amalgamation. A different reason for inclusion is that spending may not grow proportionately to population size. Autonomous population growth results in larger municipalities which may lead to economies of size. Because density also turned out to influence the probability of amalgamation (see above), we include this variable as well. Province dummies also have significant effects on the probability of being selected for amalgamation, but these are superfluous as we include municipal fixed effects.

As a fourth control variable, we use the political ideology of the municipal government. For each municipality, we divide the council seats held by the coalition parties into left-wing, right-wing, and other parties. We measure ideology as the share of left-wing parties on a scale from 0 to 1.[12] In accordance with partisan theory (for Dutch evidence,

[10]We exclude expenditures on land purchases and land development from total expenditures. In some cases, these form a considerable part of total expenditures, but they are highly volatile due to their incidental nature, and they are not relevant for our study.

[11]Data on earmarked intergovernmental grants are only available from 2010 onward. However, the correlation between the general grant and the total of other intergovernmental grants is very high (Allers and van Gelder, 2013). Thus, the general grant seems to be an adequate proxy for the total size of central government grants. The allocation formula of the general grant awards a temporarily higher grant for amalgamated municipalities (in the first four years only). This is meant to help them finance the transition costs which follow amalgamation. Inclusion of control variables that are affected by the treatment should normally be avoided. That is because indirect effects of the treatment working through such controls may load on these controls, downwardly biasing the estimates of the treatment effect. In this case, amalgamation temporarily raises the grant, as a result of which spending is likely to go up. By including the general grant we control for this indirect effect. We chose to include the grant variable because our analysis extends well beyond the four-year period for which this might be problematic. Grants are the most important source of municipal revenue. Changes in grants not due to amalgamations should therefore be controlled for. As a robustness test, we will check whether excluding this variable changes our results.

[12]This is done by counting the number of seats for left wing parties, adding one half of the seats of parties of "neutral" ideology (e.g., local parties without a clear ideological disposition) and dividing the sum by the total number of coalition seats. The national parties PvdA, Groen Links, SP, D66, and CU are counted as left wing parties, whereas VVD, CDA, and SGP are counted as right wing parties. Local parties that have a clear right or left wing signature are treated accordingly.

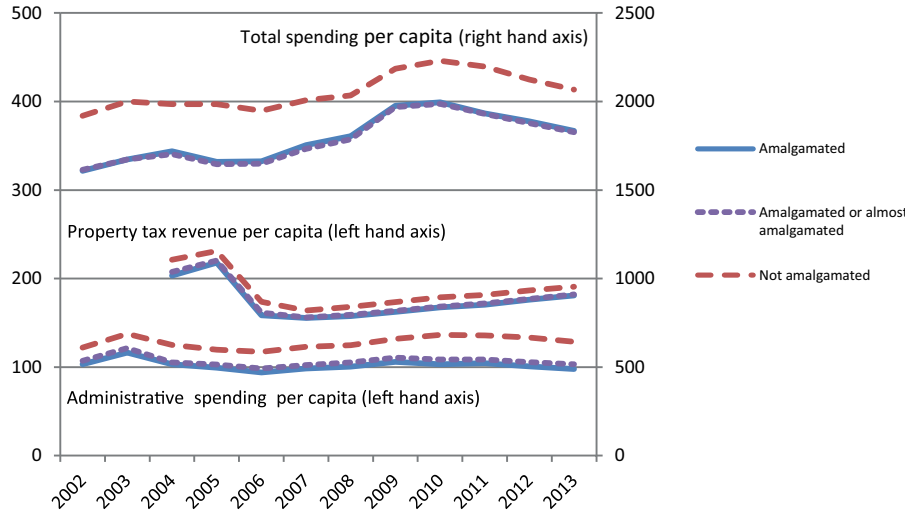


FIGURE 2: Total Spending, Administrative Spending and Tax Revenue for Different Groups in euros of 2013.

see Allers, De Haan, and Sterks, 2001), we expect spending and taxation to increase when left wing parties are in charge and vice versa. Two more political variables are included to control for differences in the political power to influence spending: the political concentration of the municipal council (Herfindahl index) and the share of council seats taken by the parties that form the ruling coalition. Because of the time lag between elections and the moment the elected politicians make budgetary decisions, reverse causality between political variables and fiscal variables is unlikely.

Amalgamations are sometimes accompanied by local elections, depending on whether they take place in or near national election years.[13] To control for possible political budget cycle effects, we include three election dummies: for the election year itself as well as for the year before elections and the year after.

Table 1 compares dependent variables and control variables for different groups of municipalities, and specifies data sources. The spatial weight matrix W_i is built on municipal border information from Statistics Netherlands. Municipalities are marked as neighbors if they share at least one border point.

6. RESULTS

Graphical Analysis

Figure 2 presents our dependent variables graphically for the different control groups. Differences between amalgamated municipalities on the one hand and amalgamated or almost amalgamated municipalities on the other hand are so small that they are hardly visible. Non-amalgamated municipalities show the same pattern, but at a higher level. The sharp decline in tax revenue in 2006 is due to the abolition of property taxes for tenants.

[13]Normally, local elections take place every four years in all municipalities.

TABLE 2: Basic Results

Control Group	Amalgamated or Almost Amalgamated				
Model	Static	Static	Static	Dynamic	Dynamic
Regression number	1	2	3	4	5
A_{pre}	−0.00	−0.03	−0.04*	−0.03*	−0.03*
	(−0.16)	(−1.65)	(−1.86)	(−1.83)	(−1.84)
$A_{0\text{-}3}$	0.00	0.01	−0.03	−0.01	0.00
	(0.17)	(0.27)	(−0.99)	(−0.66)	(0.11)
$A_{4\text{-}10}$	0.08***	0.04	−0.02	0.00	0.00
	(2.87)	(1.16)	(−0.58)	(0.11)	(0.12)
A_{11+}	0.11***	0.04	−0.01	−0.00	0.00
	(3.25)	(1.10)	(−0.29)	(−0.16)	(0.03)
Lagged dependent				0.58***	0.70***
				(18.40)	(17.19)
General grant	0.48***	0.19	−0.09	0.32***	0.03
	(10.53)	(1.53)	(−1.04)	(12.11)	(0.28)
Population	−1.03***	−1.11***	−1.25***	−0.25	−0.42***
	(−4.70)	(−4.76)	(−4.00)	(−1.61)	(−2.73)
Density	0.93***	0.74***	0.30	0.08	0.36**
	(6.52)	(3.31)	(1.28)	(0.68)	(2.46)
Ideology (left)	0.04	0.01	0.02	0.06***	0.01
	(1.52)	(0.40)	(0.86)	(3.16)	(0.52)
Concentration	0.04	0.03	−0.03	0.03	0.00
in council	(1.27)	(1.06)	(−1.00)	(1.16)	(0.14)
Coalition power	−0.02	−0.02	0.01	0.01	−0.00
in council	(−0.58)	(−0.66)	(0.52)	(0.49)	(−0.27)
Pre-election year	0.01***	0.01	0.02	0.02***	−0.00
	(3.22)	(0.81)	(1.24)	(2.61)	(−0.06)
Election year	−0.04***	0.06**	0.06**	−0.02***	0.03
	(−4.69)	(2.59)	(2.61)	(-2.96)	(0.90)
Post-election year	−0.04***	0.02	0.02*	−0.02***	0.01
	(−5.33)	(1.64)	(1.96)	(−3.76)	(0.31)
Year effects	No	Yes	Yes	No	Yes
Municipal fixed effects	Yes	Yes	Yes	Yes	Yes
Municipal time trends	No	No	Yes	No	No
Observations	1,541	1,541	1,541	1,339	1,339
Municipalities	135	135	135	135	135
R^2 (within)	0.45	0.52	0.74		
Pseudo-R^2				0.62	0.67

Notes: Dependent variable: total per capita spending. *T*-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. *Denotes significance at the 10 percent confidence level. **Denotes significance at the 5 percent confidence level. ***Denotes significance at the 1 percent confidence level.

Econometric Analysis

Table 2 reports regression results of total expenditures, using our preferred control group of municipalities that were amalgamated in a different year, or that had been selected for amalgamation but were left intact.[14] Different control groups will be introduced later.

[14]The dependent variables and the control variables are expressed in logs. As a result, the coefficients of continuous variables can be interpreted as elasticities. Before interpreting the coefficient of a dummy variable, one must take the exponent. For example, if the coefficient of a dummy is 0.20, then, when the dummy takes the value 1, the dependent variable is 22 percent larger than otherwise ($e\hat{}0.2 = 1.22$).

All regressions include fixed effects at the municipal level, to control for unobserved time-invariant local characteristics, and four amalgamation dummies: A_{pre}, $A_{0–3}$, $A_{4–10}$, and A_{11+}. These take the value of 1 in the corresponding periods running from three years before amalgamation (A_{pre}) to 11 or more years after (A_{11+}). Amalgamations take effect on the first of January of a certain year and that year is marked as the amalgamation year where the dummy $A_{0–3}$ takes the value of 1 for the first time.

The first three columns in Table 2 present regressions of the basic static panel model of total spending. In the first regression, we include only a constant and control variables. This renders insignificant amalgamation effects before and shortly after amalgamation, but the medium and long term effects are highly significant. This significance disappears after adding year dummies (Regression 2) that control for nationwide temporal effects like law changes or national budget cuts. Adding municipality-specific linear time trends (Regression 3) does not have much impact. Earlier studies using static models found either lower spending (Reingewertz, 2012; Blesse and Baskaran, 2013) or higher spending (Lüchinger and Stutzer 2002; Hansen, 2011; Moisio and Uusitalo, 2013) after amalgamation.

Regressions (4) and (5) in Table 2 present the results of the dynamic regression model. Per capita municipal spending is positively affected by density and negatively by population size, as expected, and the lagged dependent is highly significant. However, whether year dummies are included or not, almost all amalgamation coefficients are close to zero and far from significant. Only the pre-amalgamation effect borders on being significant, but its negative sign contradicts the expectations based on the theory.

Robustness Tests

Table 2 suggests that amalgamation does not affect total local government spending, with the possible exception of a pre-amalgamation effect. We now put this result to a number of tests.

First, we test for budgetary differences between municipalities that are later amalgamated and other municipalities. As explained, such differences might point to selection bias, as badly-run municipalities might be more likely to be selected for amalgamation. We have run regressions with dummies measuring the amalgamation effect four to 10 years before ($A_{\text{pre}(4–10)}$), one to three years before, and zero to three after amalgamation (Table 3). Control variables are included but coefficients no longer reported. There is no significant pre-amalgamation effect on total spending, on spending on administration, or on tax revenue. The pre-amalgamation effect suggested by regressions (4) and (5) of Table 2 is not robust. This also implies that common pool effects, as reported by some previous studies, are not found.

Next, we repeat the analyses in Table 2 in four different ways: using different control groups; including annexations (amalgamations with a dominant partner, Section 2); using dummies $A_{4–8}$ and A_{9+} instead of $A_{4–10}$ and A_{11+}, respectively, and excluding the general grant as a control variable (because this grant is higher during the 4-year period following amalgamation). None of this changes our results significantly.[15]

Next, we check whether inclusion of spatial interaction effects affects the outcomes of the dynamic model (see Appendix). Although the coefficient for the spatial lag is significantly positive, the introduction of this effect into the model does not affect our results with regard to the amalgamation effects.

We conclude that our basic results are robust.

[15]For results, see Tables S2 and S3 in the appendix.

TABLE 3: Long-Term Pre-Amalgamation Effects

Dependent Variable	Total Expenditures	Spending on Administration	Property Tax Revenue
Model	Dynamic	Dynamic	Dynamic
Regression number	6	7	8
$A_{\text{pre(4–10)}}$	−0.00	0.07	−0.01
	(−0.15)	(1.15)	(−0.14)
A_{pre}	−0.03	0.06	−0.02
	(−1.29)	(0.91)	(−0.28)
$A_{0–3}$	−0.00	0.01	−0.01
	(−0.06)	(0.15)	(−0.53)
Lagged dependent	0.70***	0.70***	0.79***
	(16.90)	(18.97)	(13.83)
Control variables	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes
Municipality time trends	No	No	No
Observations	1,339	1,353	1,062
Municipalities	135	135	135
Pseudo-R^2	0.67	0.38	0.79

Notes: Control group: amalgamated or almost amalgamated. *T*-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. *Denotes significance $P < 0.1$. **Denotes significance $P < 0.05$. ***Denotes significance $P < 0.01$.

TABLE 4: Instrumental Variable Approach

	IV Estimate	First-Stage Regression
Regression number	9	10
Average population per jurisdiction	0.01	
	(0.53)	
Amalgamated		0.96***
		(14.94)
Control variables	Yes	Yes
Year effects	Yes	Yes
Municipal fixed effects	Yes	Yes
Municipal time trends	Yes	Yes
Observations	1,541	1,541
Municipalities	135	135
R^2		0.966
Kleibergen–Paap *F*	223	

Notes: Dependent variable: total per capita spending. Control group: amalgamated or almost amalgamated. *T*-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. *Denotes significance $P < 0.1$. **Denotes significance $P < 0.05$. ***Denotes significance $P < 0.01$.

Effect of jurisdiction size

We now investigate the effect of the increase in jurisdiction size, caused by amalgamation, on municipal spending. Table 4 presents results of our IV approach. Here, instead of $A_{\text{pre}}, A_{0–3}, A_{4–10}$, and A_{11+}, we use average population per jurisdiction, defined in section 4, as the independent variable of interest. This variable reflects that it is the increase in jurisdiction size through amalgamation, not amalgamation as such, that is expected to allow exploiting economies of size. We instrument this variable on a simple dummy (Amalgamated), which takes the value of one in the years after a municipality has been

amalgamated. As we see in first-stage regression results, the coefficient for the dummy variable amalgamated is highly significant. The Kleibergen–Paap F-statistic indicates that our instrument is strong. A possible amalgamation effect should now be observable in the coefficient of average population per jurisdiction. However, this is close to zero and far from significant (regression 9). Results for different control groups are similar (not reported).

Effect on spending on administration

The spending category where we would most expect economies of size is administration. Amalgamations reduce the number of aldermen, council members, and mayors. We do indeed find a negative amalgamation effect on short, medium, and long run per capita spending on administration in both the static and the dynamic model with amalgamation dummies. However, in the dynamic model, the coefficients are only significant at the 10 percent level (Table 6). Still, in the IV model, the increase in population size as a result of amalgamation has a strongly significant and negative effect on spending on administration. This points to economies of size in this specific field.

Any savings on administration may have been used on different spending categories, perhaps improving public service levels. However, as the share of administration in total spending is small (Figure 2), it cannot be ruled out that savings on administration have been used to reduce total spending, but that the effect is too small to be picked up by our regressions.

Effect on tax revenue

As explained above, any spending savings from amalgamation may be used to lower tax rates, which should be politically attractive. Thus, a different approach to studying amalgamation effects is to check whether it affects local property tax revenue. Table 5 shows the results of regressions with total property tax revenue per capita as dependent variable. We find no significant amalgamation effect.

7. EXTENDED ANALYSIS

Regardless of the chosen control group or regression model, no robust effect of amalgamation on total spending or on tax revenue is found. This holds for all time periods around amalgamation, be it shortly before, shortly after, or even in the medium or long term after amalgamation. However, compared with those in other countries, Dutch municipalities are large. Perhaps economies of size only exist in small municipalities.[16] Moreover, as we have seen, the amalgamation effect might differ for municipalities with different characteristics, and this effect might even work in opposite directions for different amalgamations. As our analysis so far concerns the aggregate effect, that is, for all amalgamations, the result might reflect both positive and negative effects that cancel out. Therefore, we now test whether the amalgamation effect for small municipalities, where economies of size are more likely, differs from that for large municipalities. We also study whether the amalgamation effect depends on preference heterogeneity, or on the number of amalgamating municipalities.

As a second extension, we consider the possibility that economies of size do not result in lower tax rates but in higher service levels. Such an amalgamation effect will not affect aggregate spending, but should be observable in the appreciation for local public services.

[16]Hanes (2015) found that a negative amalgamation effect on spending exists only for Swedish municipalities below a certain critical size.

TABLE 5: Effect on Administrative Spending

Model	Static	Dynamic	IV	First-Stage IV
Regression number	11	12	13	14
A_{pre}	−0.02	−0.02		
	(−0.42)	(−0.52)		
$A_{0–3}$	−0.23**	−0.10*		
	(−2.55)	(−1.69)		
$A_{4–10}$	−0.26***	−0.12*		
	(−2.62)	(−1.69)		
A_{11+}	−0.28***	−0.16*		
	(−2.72)	(−1.93)		
Lagged dependent		0.70***		
		(19.27)		
Average population per jurisdiction			−0.21***	
			(−2.99)	
Amalgamated				0.96***
				(15.07)
Control variables	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Municipal fixed effects	Yes	Yes	Yes	Yes
Municipal time trends	Yes	No	Yes	Yes
Observations	1,549	1,353	1,549	1,549
Municipalities	135	135	135	135
Pseudo-R^2 (within)		0.38		
R^2	0.46			0.97
Kleibergen-Paap F			227	

Notes: Dependent variable: per capita spending on administration. Control group: Amalgamated or almost amalgamated. T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. *Denotes significance $P < 0.1$. **Denotes significance $P < 0.05$. ***Denotes significance $P < 0.01$.

Does Amalgamation Affect Total Spending of Certain Types of Municipalities?

To estimate the influence of population size on the amalgamation effect, we introduce four interaction dummies corresponding with our four amalgamation dummies in the model underlying Table 2. None of the amalgamation dummies and none of the interaction variables have significant coefficients.[17] The relevant effect, however, is the combined effect of both amalgamation and population, and cannot be read from the table directly. Size effects are expected to be most relevant in the long run, so we focus on the A_{11+} dummy. Figure 3 presents the combined effect of this dummy and its interaction with population in the dynamic model.[18] The vertical bars represent the number of municipalities observed in that population range, where we use intervals of 1,000. The amalgamation effect turns out not to vary with population size, and the slope of the marginal effect line is nearly horizontal. Thus, we find no indication of (dis)economies of size for small (large) municipalities. Also, we see that the amalgamation effect is insignificant for the entire population range. Results for other amalgamation dummies and control groups are similar, as well as those for the static model with municipality trends.[19]

[17]See appendix, Table S5.

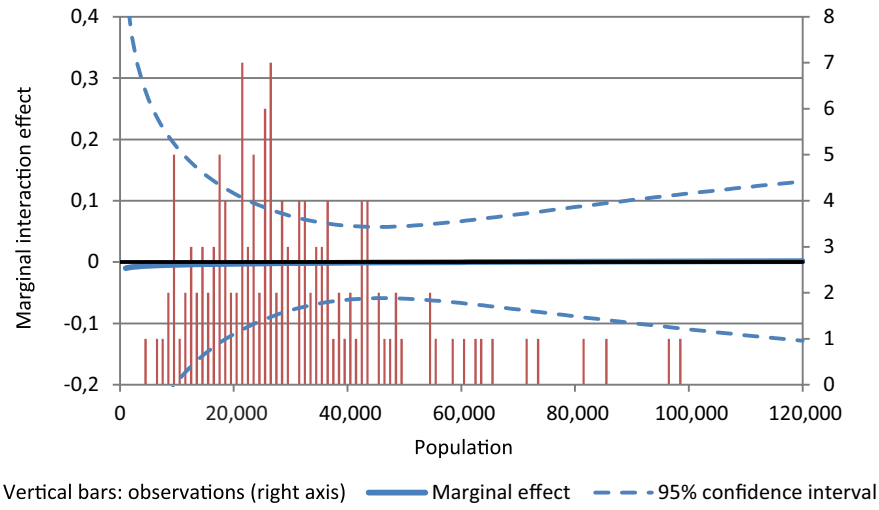
[18]The marginal effect of amalgamation on per capita spending is $\beta_1 + \beta_2 Population$, where $\beta_1$is the coefficient of A_{11+} and β_2 the coefficient of the interaction term $Population^*A_{11+}$. The standard error is given by $\sqrt{\text{var}(\beta_1) + Population^2\text{var}(\beta_2) + 2Population\,\text{cov}(\beta_1\beta_2)}$. See, e.g., Brambor et al. (2006).

[19]For results for other amalgamation dummies, see Figure S1 in the appendix.

TABLE 6: Effect on Property Tax Revenue

Model	Static	Dynamic	IV	First-Stage IV
Regression number	15	16	17	18
A_{pre}	0.01	−0.01		
	(0.16)	(−0.24)		
$A_{0–3}$	0.04	−0.00		
	(0.63)	(−0.05)		
$A_{4–10}$	0.07	0.00		
	(1.07)	(0.06)		
A_{11+}	0.07	−0.00		
	(1.12)	(−0.02)		
Lagged dependent		0.79***		
		(14.01)		
Average population per jurisdiction			0.01	
			(0.30)	
Amalgamated				0.95***
				(16.44)
Control variables	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Municipal fixed effects	Yes	Yes	Yes	Yes
Municipal time trends	Yes	No	Yes	Yes
Observations	1,265	1,062	1,265	1,265
Municipalities	135	135	135	135
Pseudo-R^2 (within)		0.79		
R^2 (within)	0.86			0.971
Kleibergen-Paap F			270	

Notes: Dependent variable: total per capita property tax revenue. Control group: amalgamated or almost amalgamated. T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. Period: 2004–2013. *Denotes significance $P < 0.1$. **Denotes significance $P < 0.05$. ***Denotes significance $P < 0.01$.



Note: This figure is based on column 2 of Table S5 in the appendix.

FIGURE 3: Marginal effect of amalgamation on total municipal spending after eleven or more years.

To test whether preference heterogeneity affects amalgamation effects, we again use interaction variables. As an indicator for preference heterogeneity, we use differences in political ideology of the parties governing the amalgamating jurisdictions. Ideology is measured as the share of left-wing parties on a scale from 0 to 1, as described above. Ideological difference is then calculated as the difference between the highest and the lowest value of ideology among jurisdictions in the year before they amalgamate. Graphs depicting the marginal effects for different amalgamation periods show no significant amalgamation effect for any range of ideological differences.[20]

A last possible factor influencing the amalgamation effect is the number of amalgamating municipalities. Most amalgamations concern two or three jurisdictions. The number of observations for amalgamations of four or more municipalities is very low. Consequently, we test whether the effect of amalgamating two jurisdictions differs from the effect of amalgamating three jurisdictions. We find that this is not the case.[21]

Hence, we find no evidence suggesting that our failure to find a significant amalgamation effect on total spending is the result of averaging out counteracting effects for small and large, or homogeneous and heterogeneous, jurisdictions. The number of amalgamating jurisdictions does not affect the amalgamation effect either.

Changes in service levels

Finally, it is conceivable that economies of size do occur, but that they are not used to reduce spending but to increase public service levels. We investigate this by analyzing the effect of amalgamation on house prices. Rising house prices after amalgamation would support the improved public services hypothesis. As explained, we first estimated average house prices which are corrected for differences in house characteristics. We next use this as the dependent variable in regressions with amalgamation dummies, fixed effects, year effects, and individual municipality trends on the right hand side. Again, variables are expressed in logs. We also estimate an IV-model with average population per jurisdiction as the variable of interest.

Table 7 shows that amalgamations do not raise house prices significantly. Thus, we find no evidence supporting the improved public services hypothesis.

8. CONCLUSIONS

This paper studies the effects of amalgamation on spending, taxation, and on a proxy for service levels of Dutch municipalities. We use different control groups and econometric models and include spatial spending interaction to check the robustness of our results. We consistently find that there is no significant effect on total per capita municipal spending before or after amalgamation. Property tax revenue is not affected by amalgamation either. Spending on administration is reduced after amalgamation, but this constitutes only about 6 percent of total spending. It is conceivable that savings on administration have been used to reduce total spending, but that the effect is too small to be picked up by our regressions.

However, this result in itself does not mean that amalgamation does not affect total government spending. First, amalgamation may have different effects on municipalities with different characteristics. Such effects might work in opposite directions for different amalgamations, resulting in the absence of an aggregate effect. Second, it is possible that

[20] See Figure S2 in the appendix.

[21] For results see Table S6 in the appendix.

TABLE 7: Effect on Average House Price

Model	Static	Dynamic	IV	First-Stage IV
Regression number	19	20	21	22
A_{pre}	−0.01*	−0.00		
	(−1.68)	(−0.29)		
$A_{0–3}$	−0.02*	0.01		
	(−1.82)	(0.99)		
$A_{4–10}$	−0.02*	0.02		
	(−1.67)	(1.19)		
A_{11+}	−0.01	0.02		
	(−0.88)	(1.13)		
Lagged dependent		1.45***		
		(83.12)		
Average population per jurisdiction			−0.00	
			(−0.88)	
Amalgamated				0.95***
				(16.39)
Control variables	No	No	No	No
Year effects	Yes	Yes	Yes	Yes
Municipal fixed effects	Yes	Yes	Yes	Yes
Municipal time trends	Yes	No	Yes	Yes
Observations	1,464	1,340	1,464	1,464
Municipalities	122	122	122	122
Pseudo-R^2 (within)		0.92		
R^2 (within)	0.94			0.96
Kleibergen–Paap F			269	

Notes: Dependent variable: estimated average house prices which are corrected for differences in house characteristics. Control group: amalgamated or almost amalgamated. T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. *Denotes significance $P < 0.1$. **Denotes significance $P < 0.05$. ***Denotes significance $P < 0.01$.

economies of size do exist, but that these do not result in lower spending but in higher service levels after amalgamation.

We examine the influence of three municipal characteristics on the amalgamation effect: population size, preference heterogeneity, and number of amalgamating jurisdictions. We would expect economies of size to be most likely in small municipalities. However, we find that, even in small jurisdictions, amalgamation does not reduce spending. Preference heterogeneity might drive up spending if local governments adapt the level of each public service to the level of the municipality that had the highest standard in that field before amalgamation. However, we find no significant influence of political heterogeneity on the amalgamation effect. Finally, we test whether amalgamating two jurisdictions affects spending differently than amalgamating three jurisdictions. This is not the case.

The second hypothesis involves the possibility that amalgamations do in fact result in efficiency gains, for example by lowering the cost of administration, but that these gains are used to raise public service levels, not to reduce expenditures and lower taxes. Increasing service levels at constant per capita tax revenue would make a municipality more attractive to live in, which we would expect to capitalize into house prices. Previous research shows that Dutch house prices react strongly to changes in intergovernmental grants (Allers and Vermeulen, 2016). However, we find that house prices are not affected by amalgamations.

Our study has three main conclusions. First, we find no evidence of an effect of amalgamation on aggregate municipal spending or tax revenue. Neither an increase nor a decrease of spending or tax revenue can be observed either before or after amalgamation. Second, even under favorable circumstances (small municipalities; municipalities with homogeneous preferences), we find no evidence that amalgamation affects spending. Third, we find no evidence supporting the hypothesis that amalgamations help municipalities reduce costs, but that these gains are used to raise service levels instead of reducing spending.

These results do not imply that amalgamation of local government is always inadvisable. They do imply, however, that economies of size should not be taken for granted, that budgetary savings may be elusive and that public services are not necessarily improved through amalgamation. National governments should in general be indifferent with respect to the size of subnational governments unless there is clear evidence that amalgamations are in some way beneficial.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web site.

TABLE S1: Logistic Regression: Determinants of Amalgamation

TABLE S2: Regressions of Total Per Capita Spending: Alternative Control Groups

TABLE S3: Various Robustness Tests

TABLE S4: Regressions of Total Per Capita Spending with Spatial Lag; Dynamic Panel Data Model

TABLE S5: Regression of Total Per Capita Spending; Static and Dynamic Panel with Interaction Terms

TABLE S6: Amalgamation Effect for Amalgamations with Two and Three Municipalities

TABLE S7: Hedonic Regression for House Prices

FIGURE S1: Marginal Effect of Amalgamation on Total Municipal Spending, Conditional on Population.

FIGURE S2: Marginal Effect of Amalgamation on Total Municipal Spending, Conditional on Preference Heterogeneity.