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Abstract

We use difference-in-difference estimation to study how municipal amalgamation affects local government spending and public service levels in the Netherlands. Employing different models, different control groups and a number of robustness tests, we find no significant effect on aggregate spending. We explore whether this finding is a result of amalgamation effects working in opposite directions for different types of municipalities, cancelling each other out. However, the amalgamation effect for small municipalities does not differ significantly from that for large ones, and the effect for municipalities with homogeneous preferences does not differ from that for jurisdictions with heterogeneous preferences. We also investigate whether amalgamation leads to better public services instead of lower spending. As it turns out, amalgamation reduces spending on administration, but there is no corresponding spending increase on public services. Finally, amalgamation does not raise house prices, which we would expect were it to improve public services.

Keywords: municipal amalgamation, jurisdiction size, local spending, public services

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. The more heterogeneity, the bigger the gain from decentralization. However, internalizing spillovers and reaping economies of scale 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 (Burki et al. 1999; Hoorens 2008; Warner 2006): it is low in the Czech Republic (1,640 inhabitants) and France (1,720) and high in Venezuela (78,000) and the UK (140,000). Average population size is 7,400 in the USA and 5,400 in the EU-countries.

Local government size is far from constant, however. E.g., Belgium reduced 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 municipalities in 2003. More recently, during the Danish administrative reform of 2007, 270 municipalities were amalgamated into 98 new municipalities. Local government amalgamation is currently being considered in both Norway and Finland.

Surprisingly, the effects of such measures are not well known. In many cases, amalgamation is primarily aimed at gaining economies of scale. 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 as well. The Dutch did not follow this "big bang" approach. Instead, 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.

Our analysis is based on three different control groups and several econometric models. Whereas previous studies in this field rely on static models, we also use dynamic panel data models, since expenditure levels are strongly influenced by budgets set in the previous year. In a closely related field, the study of political business cycles, the use of dynamic models is standard. 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. However, this does not rule out the possibility that amalgamation does in fact affect local government 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 scale), but increase spending of large municipalities (diseconomies of scale). To test this, we introduce interaction variables to estimate the influence of population size on the amalgamation effect. Secondly, we consider preference heterogeneity among amalgamating jurisdictions. Large 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, while municipalities with more homogeneous political preferences would have less difficulty in this regard. To study this, we run regressions including interaction variables to estimate the influence of political heterogeneity on the amalgamation effect. Finally, we test whether the amalgamation effect depends on the number of amalgamating municipalities.

It is conceivable that amalgamations do result in economies of scale, but that spending levels do not go down because the money that has been saved is now spent for other purposes. Instead of lowering taxes, local governments may increase service levels. To shed more light on this, we first study the amalgamation effect on spending on administration. As amalgamation reduces the number of administrators and council members, economies of scale are most likely in this spending category. Next, we test whether any reductions in spending on administration are matched by corresponding increases in spending on culture & recreation. This spending category is directly linked to public services; moreover, it is mostly driven by political ambitions, not national guidelines. An increase of public services levels is therefore likely to be observable in the share of expenditures on this category.

Finally, we investigate whether amalgamation affects the overall level of public services by studying its effect on house prices. Through capitalization, improved public services accompanied by constant spending levels should be observable through an increase in 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 are affected by amalgamation.

We begin with a theoretical discussion of the various effects of amalgamation and an overview of the results of previous studies (Section 2). Then we briefly describe municipal finance and amalgamations in the Netherlands (Section 3). Section 4 describes the model and the econometric methods that we deploy. The fifth section gives an overview of the data and its sources. Section 6 presents the results of our study of the amalgamation effect on per capita municipal spending. Section 7 presents the results of our extended research into amalgamation effects for different groups of municipalities, different spending categories and the effect on house prices. Section 8 concludes.

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 a study of these effects. We also offer a brief review of results of previous empirical studies in this field.

Larger scale

The most obvious effect of amalgamation is an increase in administrative scale. This may lead to improved service quality because specialization and standardization may result in more experienced or better educated workers. A small municipality may not be able to employ specialists because there is not enough work to keep them busy. 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, which will promote allocative efficiency (Oates, 1972). On the other hand, 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 (Allers, 2012). This might reduce both allocative and productive efficiency.

Amalgamation is often inspired by the hope that increased scale will improve productive efficiency. That is because scaling up may promote specialization, i.e, an improved division of labor. Moreover, it enables fixed costs to be spread over a larger output. On the other hand, a larger scale may raise agency and information costs. Large organizations require more planning, monitoring and reporting than small ones. Scale 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 seems to be lacking. Such a u-curve reflects economies of scale (downward sloping expenditures per capita) for units below a certain critical scale, at which per capita expenditures are at a minimum. Organizations with a larger

scale would then face diseconomies of scale. With u-shaped costs, the effect of amalgamation on production efficiency would be negative for small jurisdictions (scale after amalgamation < optimal scale) and positive for larger jurisdictions. Theoretically, economies and diseconomies of scale might even cancel out in an aggregate analysis, leading to an insignificant effect on average. Existing empirical studies do not seem to consider this possibility. Moreover, they seem to ignore that it is increase in scale, not amalgamation per se, that drives economies of scale.

Note that economies of scale apply to production units, not necessarily organizational units. E.g., 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, and economies of scale are unlikely to occur. Economies of scale are most likely in administration, because the number of administrators and council members does not rise proportionally with population size. Blom-Hansen et al. (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 scale 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 normally rises (substitution effect; Buettner and Holm-Hadulla 2013). Moreover, bureaucrats might be reluctant to reduce spending, e.g., as a result of budget maximizing behavior (Niskanen, 1971). On the other hand, a reduction in spending may be the result of deteriorating public services. Thus, studying spending levels alone is insufficient to judge whether amalgamation is successful.

Fox and Gurley (2006) and Holzer (2009) review the literature on sub-national 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).

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 constructions, 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 multi-service 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 didn't).

Uniform service levels

Jurisdictions have very limited scope to vary service levels within their boundaries. Thus, amalgamation normally requires unifying different service levels. In case of preference heterogeneity among the inhabitants of the merging jurisdictions, the result is reduced allocative efficiency. That is because the ability to tailor local services to local demand, which is the basic argument for decentralization (Oates, 1972), is reduced.

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 be tempted to adopt, for each service, the highest standard that existed before amalgamation (Park 2013). E.g., 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 economies of scale could lower it. Correspondingly, for amalgamating municipalities with more homogeneous preferences, there might be less need to adjust public service levels after amalgamation, and economies of scale could lead to lower spending. Both effects might even cancel out in an aggregate analysis, leading to an insignificant effect on average. The current literature does not seem to 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 afterwards. 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 involves municipalities which do not differ too much in size (a “merger of equals”). The second type of amalgamation is characterized by the absorption of a small municipality into a big neighbor. In the Netherlands, the first type, which we will denote simply by “amalgamations”, occurs far more often than the second, denoted as “annexations”. 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. Then, municipalities 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

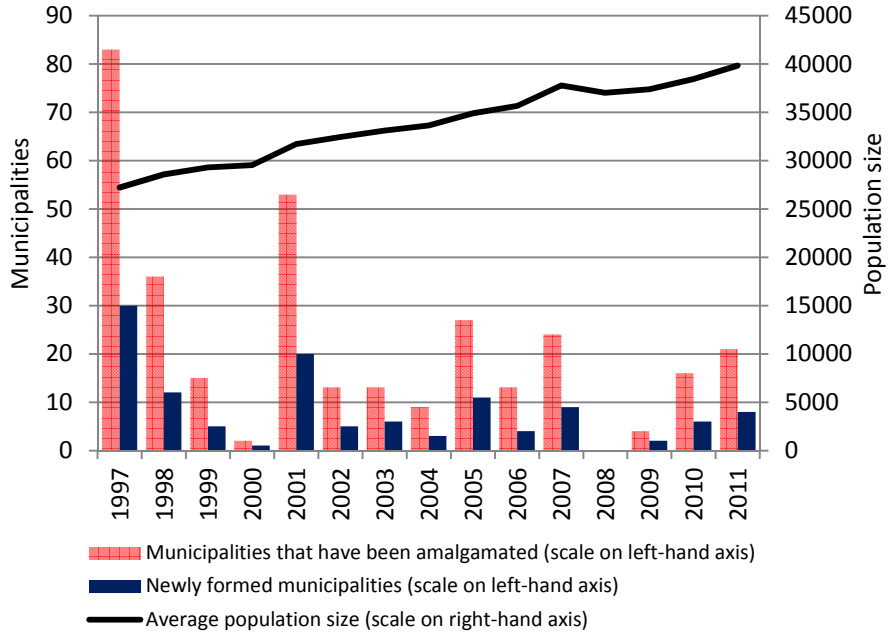
evidence for such an effect is reported by Tyrefors Hinnerich (2009), Jordahl and Liang (2009), Blom-Hansen (2010), Hansen (2014) and Saarimaa and Tukiainen (2013). But, as we have seen, a common pool effect is only one possible explanation for rising expenditures or debt preceding amalgamation. Although restructuring costs are not considered by these authors, some find that the budgetary effects are linked to the size of the common pool (Tyrefors Hinnerich, 2009; Hansen, 2014; Saarimaa and Tukiainen, 2013), 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

In the Netherlands, there are three territorial layers of government: in addition to the national government, the country is divided into 12 provinces and into 418 municipalities (in 2011). All three tiers cover the entire country. All provinces have more or less the same set of tasks and responsibilities, as do all municipalities. About two thirds of Dutch municipalities' revenues consists of (mostly non-matching) grants from the central government. Taxes and levies account for approximately 15 percent of municipal revenues. Municipalities use accrual accounting, and local budgets must be balanced.

Figure 1. Number of municipalities subject to amalgamation and average municipal population size



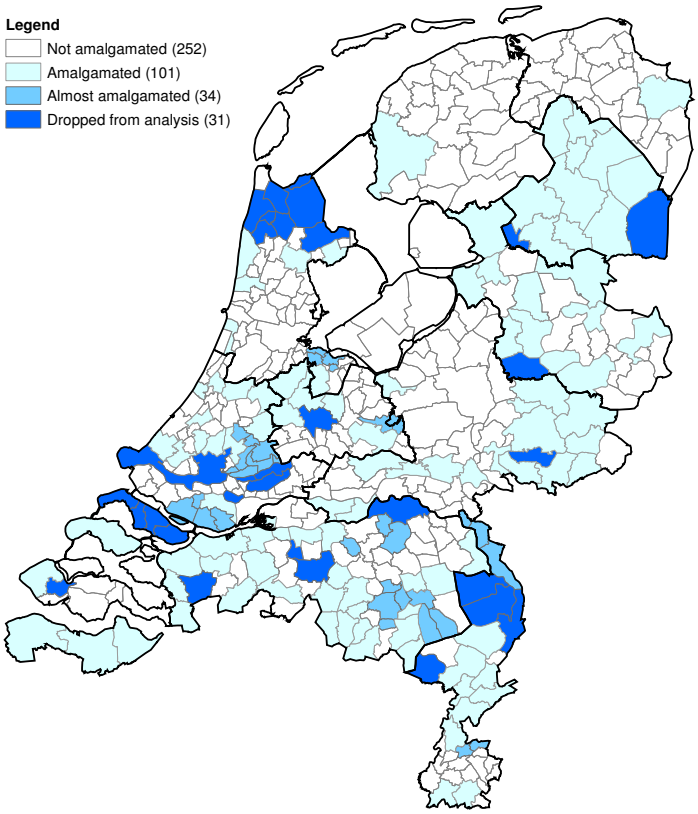
The number of municipalities has been steadily declining for a long time. As a result, Dutch municipalities had 40,000 inhabitants on average in 2011(Figure 1), which makes them large

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 limit our analysis to amalgamations without a dominant partner and 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 80 percent does not change our findings.

The final decision to amalgamate municipalities is made by the national parliament, usually in the year preceding amalgamation. Several years of debate and preparations precede any amalgamation. Amalgamation may occur at the request of the municipalities concerned, but can also be against their will. Often, it is hard to say to what extent amalgamation is voluntary or mandatory. Provinces play an important role here, initializing and coordinating amalgamations. Some provinces have been more active in this respect than others. This is one of the reasons why amalgamated municipalities are not spread out evenly across the country (see Figure 2).

Figure 2. Municipalities formed through amalgamation, 1997-2011
Thin lines depict municipal boundaries; fat lines depict provincial boundaries



Obviously, local issues are important factors influencing the probability of amalgamation. In order to learn more about the general determinants of amalgamation, we ran a logistic regression on data for 2000. 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. A second determinant, also highly significant, is density, measured as the average number of addresses per square kilometer. Higher density implies a bigger likelihood of amalgamation. Finally, several province dummies are significant, as expected.

4. Research setup

Identification strategy

In order to study the effects of amalgamation, we use difference-in-difference estimation, comparing changes in spending of amalgamated municipalities (the treatment group) with those of a control group of municipalities that were not amalgamated. Difference-in-difference estimation has been applied to study the effects of amalgamations before 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. The staggered nature of the Dutch amalgamations allows us to also utilize fact that amalgamations took place in different years.

An important assumption in difference-in-difference estimation is 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, like, e.g., 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 a number of control variables.

A second important assumption is that the treatment group and the control group consist of municipalities with similar budgetary trends. Both groups should consist of comparable municipalities. 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 not entirely satisfactory, as amalgamated municipalities have different characteristics from non-amalgamated municipalities. For our second control group, we use municipalities that were amalgamated, but in a different year. This control group resembles the treatment group well. 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”.

Basic analysis

Since we have budgetary data on 418 municipalities for a period up to 12 years, we have an opportunity to study amalgamation effects using a panel data model into which we can introduce a number of amalgamation dummies. We first explain our choice of the type of panel data model.

We start our analysis with a fixed effects model:

$$y_{it} = X_{it}\beta + \alpha_t I_n + \eta_i + \gamma_i t + \epsilon_{it} \quad (1)$$

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 unobserved white noise disturbance. The subscript i denotes municipalities ($i = 1 \ldots n$), the subscript t denotes years.

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 variable, being local expenditures. While these are partly discretionary and as such can be changed from year to year, spending in many categories 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 pre-committed (Allers and Elhorst, 2011). Secondly, 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 supplement our static analysis with a dynamic model, which takes into account the one year lag of the dependent variable.

In our dataset, the number of jurisdictions (387) is relatively large whereas the time dimension (T=11)[1] is rather small. Using dummy variables (LSDV) to estimate individual effects in a dynamic model then results in biased estimates. Judson and Owen (1999) compare various estimation methods that have been developed for cases with limited T. They conclude that the Corrected Least Squares Dummy Variable (CLSDV) method (Kiviet 1995; 1999) is the best choice. We use this method, in Bruno's (2005) implementation to deal with the fact that our panel is unbalanced.[2] The method is based on a standard dynamic panel data model:

$$y_{it} = \gamma y_{i,t-1} + X_{it}\beta + \alpha_t I_n + \eta_i + \epsilon_{it} \quad (2)$$

The initial, biased estimations of γ, β α are obtained employing the Arellano and Bond-estimator (1991). The CLSDV method then corrects any bias in the observed values of γ and β. Standard errors are approximated by a bootstrap algorithm with fifty repetitions. Since no

[1] We have expenditure data for 2002-2013. Because we include a lagged dependent variable, we lose one year in our regressions.
[2] We ran our regressions in Stata using the xtlsdvc command.

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.

The dependent variables and the control variables are expressed in logs.[3] That is because we expect amalgamation to have a proportional effect on spending, if at all, not a constant effect.

In order to study the effects of amalgamations, we first extend models (1) and (2) to include a number of amalgamation dummies. This is the standard approach 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 four different amalgamation dummies, A_{pre}, $A_{0\text{-}3}$, $A_{4\text{-}10}$, and A_{11+}, which take the value of 1 in the corresponding periods running from three years before amalgamation to eleven or more years after. Amalgamations take effect on the 1st of January of a certain year and that year is marked as the amalgamation year where the dummy $A_{0\text{-}3}$ takes the value of 1 for the first time.

Robustness tests

Possible economies of scale effect are related to increase of scale, not to amalgamation as such. Therefore, as a robustness test, we use an instrumental variable approach to test whether increase in size through amalgamation affects spending. In this model, we introduce the variable *average population per jurisdiction*, which before amalgamation is calculated as the population of the amalgamated municipality divided by the number of amalgamating jurisdictions. 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 scale.

As a second robustness test, we use a dynamic model which is extended to include spatial interaction effects.[4] Allers and Elhorst (2011) found evidence of expenditure mimicking among Dutch local governments. Failure to include this could lead to omitted variable bias. Elhorst (2010) compares a number of different dynamic panel models with spatial interaction effects, and specifically evaluates their performance for panels with a small time dimension (T=5). He finds that the bias-corrected LSDV (BCLSDV) method from Yu, De Jong and Lee (2008) roughly decimates the bias that is found when using a standard LSDV method. This bias is even lower if the time dimension is larger than 5, as in our case. Therefore we will use this model, for which the econometric specification is:

$$y_{it} = \gamma y_{i,t-1} + X_{it}\beta + \lambda W_i y_{it} + \rho W_i y_{it-1} + \alpha_t I_n + \eta_i + \epsilon_{it} \qquad (3)$$

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

W_i is an n x n spatial weights matrix which is non-stochastic and generates the spatial dependence among cross sectional units y_{it}. As each row sums to one, $W_i y_{it}$ is the average of y_{it} in neighboring municipalities. Spatial interaction is included both for the dependent variable in the present year *t* and in the previous year *t-1*. No indicator for goodness of fit is available for this estimator. As with the dynamic non-spatial model, we extend model (3) to include a number of amalgamations dummies, which are defined above.

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 both population size, preference heterogeneity and number of amalgamating jurisdictions on the amalgamation effect. To this end, we introduce interaction dummies.

Secondly, 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 declining service levels instead of increased efficiency. Economies of scale are most likely in administration. We first test whether per capita spending in administration as a share of total spending goes down after amalgamation, and whether there is a corresponding spending increase in policy fields more directly associated with public service provision.

In addition, we investigate whether amalgamation might raise the overall level of public services. 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). A recent study indicates that intergovernmental grants in the Netherlands are fully capitalized into house prices (Allers and Vermeulen, 2013). We would expect the same to happen with funds that become available as a result of economies of scale. 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.

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.).[5] We have 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 next take 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.

[5] Data have been kindly made available by the Dutch Association of Realtors (Nederlandse Vereniging van Makelaars o.g. en vastgoeddeskundigen NVM).

5. Data

We have spending data for 2002-2013. 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. 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 fourteen 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 2 shows the geographical distribution of these groups.

The main dependent budgetary variable is total per capita expenditures. In section 7, we also consider spending in separate policy fields. 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. Spending data is provided by Statistics Netherlands. Unfortunately, data is missing for some municipalities in some years. As a result, we have an unbalanced panel. Amounts are expressed in euros of 2013 using the consumer price index.

The matrix X_{it} consists of seven control variables. As described above, central government grants constitute a large part of total municipal income. We include per capita amounts of the general, non-earmarked equalization grant. 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.[6] 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. For this reason alone we need to include it. A different reason for inclusion is that spending may not grow proportionately to population size. Just like amalgamation, autonomous population growth results in larger municipalities which may lead to economies of scale. 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.[7]

[6] The allocation formula of the general grant awards a temporarily higher grant for amalgamated municipalities (in the first four years). 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 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. Nevertheless, we include the grant variable, because grants are the most important source of municipal revenue. Changes in grants not due to amalgamations should therefore be controlled for.

[7] In the period under study, provincial boundaries have not changed.

The fourth control variable is the sum of the number of unemployment benefits and the number of social welfare benefits per capita. This variable is a good indicator of the social structure of the municipality. Moreover, social welfare benefits are paid out of the municipal budget and as a result can influence expenditures.

As a fifth 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. 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.[8] In accordance with partisan theory (for Dutch evidence, see Allers et al. 2001), we expect government expenditures 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. Amalgamations are sometimes accompanied by local elections, depending on whether they take place in or near national election years.[9] In order 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 control groups. The source of the first four control variables is Statistics Netherlands. Data on the political variables is available from COELO. The spatial weight matrix W_i is built on municipal border information from Statistics Netherlands. It is based on queen contiguity, meaning that municipalities are marked as neighbors if they share at least one border point.

[8] The national parties PvdA (social democrats), Groen Links (the green left), SP (socialist party), D66 (left wing liberals) and CU (social christians) are counted as left wing parties, whereas VVD (conservative liberals), CDA (christian democrats) and SGP (orthodox christians) are counted as right wing parties. Local parties that have a clear right or left wing signature are treated accordingly.

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

Table 1: Mean values of control variables and dependent variables for different groups of municipalities (2002-2013)

	All municipalities	Not amalgamated	Amalgamated	Amalgamated or almost amalgamated
Total expenditures per capita	1968 (10)	2024 (13)	1802 (12)	1790 (10)
Share of expenditures on culture & recreation	0.129 (0.0005)	0.126 (0.0005)	0.138 (0.0008)	0.134 (0.0008)
Share of expenditures on administration	0.064 (0.0005)	0.066 (0.0006)	0.059 (0.0007)	0.062 (0.0006)
General grant per capita	833 (3.1)	848 (3.9)	786 (3.6)	782 (3.2)
Population	37,219 (818)	37,626 (1072)	36,006 (645)	33,188 (692)
Density	0.95 (0.01)	1.03 (0.01)	0.73 (0.01)	0.77 (0.01)
Unemployment benefit recipients per capita	0.029 (0.002)	0.031 (0.003)	0.023 (0.0006)	0.023 (0.0006)
Ideology (left)	0.43 (0.003)	0.44 (0.004)	0.40 (0.005)	0.39 (0.005)
Concentration of power in municipal council	0.21 (0.0008)	0.21 (0.0009)	0.21 (0.002)	0.21 (0.001)
Share of coalition in municipal council	0.62 (0.001)	0.62 (0.002)	0.64 (0.003)	0.63 (0.003)
Number of observations	4,433	3,319	1,114	1,507

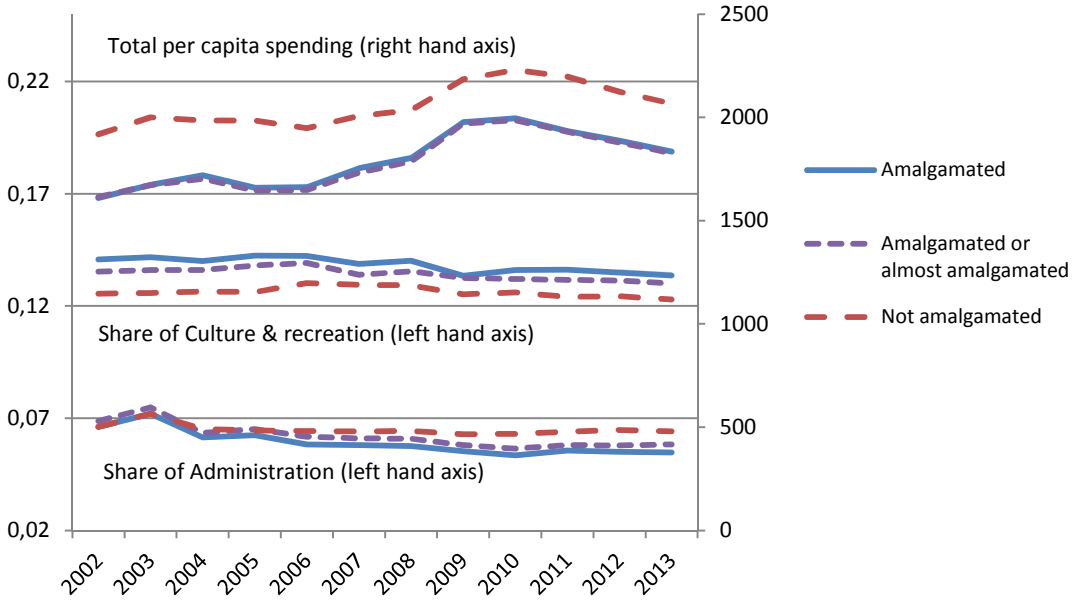
Standard errors within parentheses. Amounts are expressed in euros of 2013.

6. Results

Graphical analysis

Figure 3 presents our data graphically. The upper part of Figure 3 shows per capita municipal spending 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 they are hardly visible. Non-amalgamated municipalities show the same pattern, but at a higher level. The middle part and the lower part of Figure 3, respectively, show the shares of culture & recreation and of administration in total spending. For the first, no clear trend is discernible. The share of administration is more or less constant for not amalgamated municipalities, but falls roughly one percent point for (almost) amalgamated municipalities.

Figure 3. Total per capita spending (euros of 2013) and shares of spending on administration and on culture & recreation for different groups of municipalities



Econometric analysis

Table 2 reports regression results of total expenditures, using as a control group municipalities that were amalgamated in a different year, or that had been selected for amalgamation but were left intact. Different control groups will be introduced in Table 3.

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 on a dummy is 0.20, then, when the dummy takes the value 1, the dependent variable is 22 percent larger than otherwise ($e^{0.2} = 1.22$).

All regressions include fixed effects at the municipal level, to control for unobserved time-invariant local characteristics. The first three columns in Table 2 present regressions of the basic static panel model of total spending. There is no lagged dependent variable yet, which makes these results more or less comparable with those of previous studies. In the first regression we include only amalgamation dummies, 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 (Column 2) that control for nationwide temporal effects, like law changes or national budget cuts that affect the local playing field. Adding municipality-specific linear time trends (Column 3) does not have much impact, although one (negative) pre-amalgamation effect now borders on significance. Theoretically, we would expect a pre-amalgamation effect to be positive. For the periods after amalgamation, amalgamation effects are insignificant. Earlier studies found lower spending (Reingewertz, 2012; Blesse and

Baskaran, 2013) or higher spending (Lüchinger and Stutzer 2002; Hansen, 2011; Moisio and Uusitalo, 2013) after amalgamation.

Columns (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, all amalgamation coefficients are close to zero and far from significant.

Table 2: Regressions of total per capita spending, static and dynamic panel models

Control group	Amalgamated or almost amalgamated				
Model	Static	Static	Static	Dynamic	Dynamic
Regression number	1	2	3	4	5
Lagged dependent				0.43***	0.47***
				(13.66)	(12.97)
General grant	0.46***	0.24*	-0.03	0.32***	0.14
	(8.93)	(1.75)	(-0.29)	(8.33)	(1.32)
Population	-1.05***	-1.09***	-1.24***	-0.47**	-0.57***
	(-4.79)	(-4.71)	(-3.98)	(-2.27)	(-2.74)
Density	0.97***	0.73***	0.24	0.42**	0.49**
	(6.46)	(3.32)	(1.02)	(2.48)	(2.45)
Unemployment	-0.01	-0.01	-0.00	-0.03***	-0.00
Benefits	(-1.50)	(-1.07)	(-0.75)	(-2.68)	(-0.43)
Ideology (left)	0.03	0.00	0.01	0.04	0.00
	(1.22)	(0.14)	(0.53)	(1.62)	(0.17)
Concentration	0.03	0.02	-0.04	0.02	0.00
in council	(0.94)	(0.81)	(-1.26)	(0.55)	(0.09)
Coalition power	-0.03	-0.03	0.00	-0.01	-0.02
in council	(-0.88)	(-0.85)	(0.08)	(-0.57)	(-0.79)
Pre-election year	0.03***	0.01	0.02	0.03***	-0.01
	(4.88)	(0.64)	(1.06)	(3.19)	(-0.22)
Election year	-0.04***	0.05**	0.05**	-0.02**	0.02
	(-3.25)	(2.45)	(2.49)	(-2.35)	(0.60)
Post-election year	-0.03***	0.02	0.02*	-0.02**	0.01
	(-3.69)	(1.57)	(1.85)	(-2.06)	(0.43)
A_{pre}	-0.00	-0.03	-0.04*	-0.02	-0.03
	(-0.17)	(-1.57)	(-1.83)	(-0.98)	(-1.18)
A_{0-3}	0.01	0.01	-0.03	-0.00	0.00
	(0.32)	(0.27)	(-0.99)	(-0.04)	(0.03)
A_{4-10}	0.08***	0.04	-0.01	0.02	0.01
	(2.95)	(1.27)	(-0.38)	(0.58)	(0.27)
A_{11+}	0.12***	0.05	0.00	0.03	0.02
	(3.56)	(1.32)	(0.11)	(0.71)	(0.35)
Year effects	No	Yes	Yes	No	Yes
Municipal fixed effects	Yes	Yes	Yes	Yes	Yes
Municipal time trends	No	No	Yes	No	No
Observations	1,542	1,542	1,542	1,341	1,341
Municipalities	135	135	135	135	135
R^2 (within)	0.40	0.46	0.64		
Pseudo-R^2				0.48	0.51

T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. * denotes significance at the 10% confidence level, ** significance at the 5% confidence level, and *** significance at the 1% confidence level.

Table 3: Regressions of total per capita spending: alternative control groups

Model	Static	Static	Static	Dynamic	Dynamic	Dynamic
Control group	Amalgamated or almost amalgamated	Amalgamated	All	Amalgamated or almost amalgamated	Amalgamated	All
Regression number	6	7	8	9	10	11
Lagged dependent				0.47***	0.42***	0.65***
				(12.97)	(7.56)	(31.89)
General grant	-0.03	0.04	0.05	0.14	0.19	0.13***
	(-0.29)	(0.32)	(1.04)	(1.32)	(1.41)	(2.96)
Population	-1.24***	-1.50***	-0.43**	-0.57***	-0.67***	-0.36***
	(-3.98)	(-3.86)	(-2.24)	(-2.74)	(-2.69)	(-4.48)
Density	0.24	0.20	-0.08	0.49**	0.51**	0.16**
	(1.02)	(0.72)	(-0.65)	(2.45)	(2.00)	(2.14)
Unemployment	-0.00	0.00	-0.00	-0.00	0.01	-0.00
Benefits	(-0.75)	(0.42)	(-1.01)	(-0.43)	(0.47)	(-0.43)
Ideology (left)	0.01	0.01	-0.02	0.00	0.00	-0.01
	(0.53)	(0.39)	(-1.28)	(0.17)	(0.03)	(-0.61)
Concentration	-0.04	-0.02	-0.03*	0.00	0.00	-0.02
in council	(-1.26)	(-0.43)	(-1.88)	(0.09)	(0.14)	(-1.46)
Coalition power	0.00	-0.02	0.01	-0.02	-0.03	0.00
in council	(0.08)	(-0.60)	(0.55)	(-0.79)	(-0.87)	(0.05)
Pre-election year	0.02	0.02	0.02	-0.01	-0.01	-0.00
	(1.06)	(0.92)	(1.15)	(-0.22)	(-0.22)	(-0.12)
Election year	0.05**	0.05**	0.05**	0.02	0.02	0.02
	(2.49)	(2.10)	(2.57)	(0.60)	(0.63)	(0.84)
Post-election year	0.02*	0.02	0.02*	0.01	0.01	0.00
	(1.85)	(1.35)	(1.86)	(0.43)	(0.26)	(0.13)
A_{pre}	-0.04*	-0.05**	-0.03	-0.03	-0.03	-0.02
	(-1.83)	(-2.19)	(-1.50)	(-1.18)	(-1.11)	(-1.24)
A_{0-3}	-0.03	-0.05	-0.02	0.00	0.01	0.01
	(-0.99)	(-1.39)	(-0.73)	(0.03)	(0.36)	(0.37)
A_{4-10}	-0.01	-0.02	0.00	0.01	0.03	0.02
	(-0.38)	(-0.62)	(0.08)	(0.27)	(0.92)	(0.70)
A_{11+}	0.00	0.00	0.03	0.02	0.05	0.03
	(0.11)	(0.01)	(0.65)	(0.35)	(1.18)	(0.93)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipal fixed eff.	Yes	Yes	Yes	Yes	Yes	Yes
Municipal time trends	Yes	Yes	Yes	No	No	No
Observations	1,542	1,145	4,491	1,341	987	3,983
Municipalities	135	101	387	135	101	387
R^2	0.64	0.61	0.67			
Pseudo-R^2 (within)				0.51	0.48	0.56

T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. * denotes significance at the 10% confidence level, ** significance at the 5% confidence level, and *** significance at the 1% confidence level.

Robustness tests

Table 2 suggests that there are no significant amalgamation effects on total local government spending. It is important to check the robustness of these findings. First, we repeated the analyses in Table 2 in three different wasy: including annexations (amalgamations with a dominant partner, Section 2); using dummies $A_{4\text{-}8}$ and A_{9+} instead of $A_{4\text{-}10}$ and A_{11+}, respectively, and using the ideology of the entire local council, instead of only those parties that form the ruling coalition. None of this changes our results significantly.

Next, in Table 3, we present regression results for different control groups. Columns (6) and (9) in Table 3 match Columns (3) and (5) in Table 2. In Columns (7) and (10) we remove the almost amalgamated municipalities from the control group, leaving only the municipalities that have indeed been amalgamated. In Columns (8) and (12) we include all municipalities, except for those municipalities that have been dropped from the dataset altogether (see above). The negative pre-amalgamation effect in the static model is significant when using the second control group (Amalgamated). This contradicts theoretical expectations of possible common pool effects and reorganization costs. However, whichever control groups is used, the dynamic model does not yield any significant amalgamation effects.

As a further robustness test, we use two alternative models. Table 4 presents results of an instrumental variable approach. Here, instead of A_{pre}, $A_{0\text{-}3}$, $A_{4\text{-}10}$, and A_{11+}, we use average population per jurisdiction, defined in Section 4, as dependent variable of interest. This variable reflects that it is the increase in size through amalgamation, not amalgamation as such, that is expected to yield economies of scale. 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 these estimates are strongly identified. A possible amalgamation effect should now be observable in the coefficient of average population per jurisdiction. However, this is not the case (Column 12).

Next, we check whether inclusion of spatial interaction effects affects the outcomes of the dynamic model, using the estimator of Yu, De Jong and Lee (2008). We include control variables, year dummies and municipal fixed effects. We run the spatial dynamic model for the entire sample. Thus, the control group consists of municipalities that were not amalgamated, or that were amalgamated in a different year. Reducing the sample to limit the control group would result in too many geographical gaps to make spatial analysis useful. Many municipalities would have no or few neighbors included in the analysis. Table 5 presents the results. Column (18) matches Column (11) in Table 3. Column (19) shows the results of the same model, but for a balanced panel. These results can be compared with those of the model including a spatial lag in Column (20), which can only be estimated for balanced panels. The coefficient for the spatial lag is significantly positive. Per capita spending increases with 1 percent when the average level of per capita spending in neighboring municipalities increases with 10 percent. However, the introduction of this effect into the model does not affect our results with regard to the amalgamation effects. These remain insignificant. We take this as evidence that the absence of any effect of amalgamation we find

in the dynamic models in Tables 2 and 3 does not result from omitting spatial interaction from the model.

Table 4: Regressions of total per capita spending: instrumental variable approach

Control group	Amalgamated or almost amalgamated	
	IV estimate	1st stage regression
Regression number	12	13
General grant	-0.06	0.09
	(-0.59)	(1.02)
Density	0.09	0.32
	(0.43)	(1.55)
Unemployment benefits	-0.00	0.01
	(-0.83)	(0.85)
Ideology (left)	0.01	-0.04
	(0.59)	(-1.56)
Concentration in council	-0.04	-0.02
	(-1.28)	(-0.77)
Coalition power in council	0.00	-0.02
	(0.06)	(-1.63)
Pre-election year	0.01	0.02
	(0.94)	(1.02)
Election year	0.05***	0.01
	(2.64)	(0.23)
Post-election year	0.03**	0.00
	(2.51)	(0.09)
Average population per jurisdiction	0.01	
	(0.40)	
Amalgamated		0.96***
		(14.98)
Year effects	Yes	Yes
Municipal fixed effects	Yes	Yes
Municipal time trends	Yes	Yes
Observations	1,542	1,542
Municipalities	135	135
R^2	0.02	0.966
Kleibergen-Paap F	224.5	

T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. * denotes significance at the 10% confidence level, ** significance at the 5% confidence level, and *** significance at the 1% confidence level.

Table 5: Regressions of total per capita spending with spatial lag; dynamic panel data model

Control group	All	All	All
Balanced panel	No	Yes	Yes
Regression number	18	19	20
Lagged dependent	0.65***	0.64***	0.62***
	(31.89)	(24.08)	(35.02)
Spatial lag			0.10***
			(3.67)
Spatial lag on lagged dependent			0.05
			(1.48)
General grant	0.13***	0.17***	0.13***
	(2.96)	(3.64)	(2.76)
Population	-0.36***	-0.41***	-0.41***
	(-4.48)	(-4.17)	(4.92)
Density	0.16**	0.18**	0.21***
	(2.14)	(2.24)	(2.67)
Unemployment	-0.00	-0.00	-0.00
Benefits	(-0.43)	(-0.33)	(0.30)
Ideology (left)	-0.01	0.00	-0.01
	(-0.61)	(0.30)	(0.81)
Concentration	-0.02	-0.03*	-0.04***
in council	(-1.46)	(-1.94)	(2.73)
Coalition power	0.00	0.00	-0.00
in council	(0.05)	(0.25)	(0.09)
Pre-election year	-0.00	-0.01	-0.01
	(-0.12)	(-0.22)	(0.26)
Election year	0.02	0.02	0.02
	(0.84)	(0.27)	(0.32)
Post-election year	0.00	0.01	0.01
	(0.13)	(0.46)	(0.31)
A_{pre}	-0.02	-0.01	-0.01
	(-1.24)	(-0.22)	(0.22)
A_{0-3}	0.01	-0.03	-0.02
	(0.37)	(-0.61)	(0.48)
A_{4-10}	0.02	-0.02	0.00
	(0.70)	(-0.31)	(0.05)
A_{11+}	0.03	-0.01	-0.00
	(0.93)	(-0.26)	(0.02)
Year effects	Yes	Yes	Yes
Municipal fixed effects	Yes	Yes	Yes
Observations	3,983	2,717	2,717
Municipalities	387	247	247
Pseudo-R^2 (within)	0.56	0.52	

T-values between parentheses. Variables are expressed in logs. * denotes significance at the 10 percent confidence level, ** significance at the 5 percent confidence level, and *** significance at the 1 percent confidence level.

7. Extended analysis

Regardless of the chosen control group or regression model, no robust effect of amalgamation on total spending is found. This holds for all time periods around amalgamation, be it shortly before, shortly after or even in medium or long term after amalgamation. Amalgamations do not appear to affect municipal spending.

However, compared with those in other countries, Dutch municipalities are large. Perhaps economies of scale only exist in small municipalities. 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. Since our analysis so far concerns the aggregate effect, i.e., 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 scale 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 scale do not result in lower spending but in higher service levels. In that case, the amalgamation effect will not be observable in the total level of municipal spending, but should be observable in the composition thereof, or in the appreciation of local public services. We study both possibilities.

Does amalgamation affect total spending of certain types of municipalities?

In order to estimate the influence of population size on the amalgamation effect, we introduce four interaction dummies corresponding with our four amalgamation dummies. The results for the dynamic model and the static model with municipality trends are presented in Columns (21) and (22) of Table 6. None of the amalgamation dummies and none of the interaction variables have significant coefficients. The relevant effect, however, is the combined effect of both amalgamation and population, and cannot be read from the table directly. We present the combined effect in a figure. Scale effects are expected to be most relevant in the long run, so we focus on the A_{11+} dummy. Figure 4 presents the combined effect of this dummy and its interaction with population in the dynamic model.[10] 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 scale for small (large) municipalities. Also, we see that the amalgamation effect is insignificant for the entire population range. This finding holds for other amalgamation dummies and control groups, as well as for the static model with municipality trends.

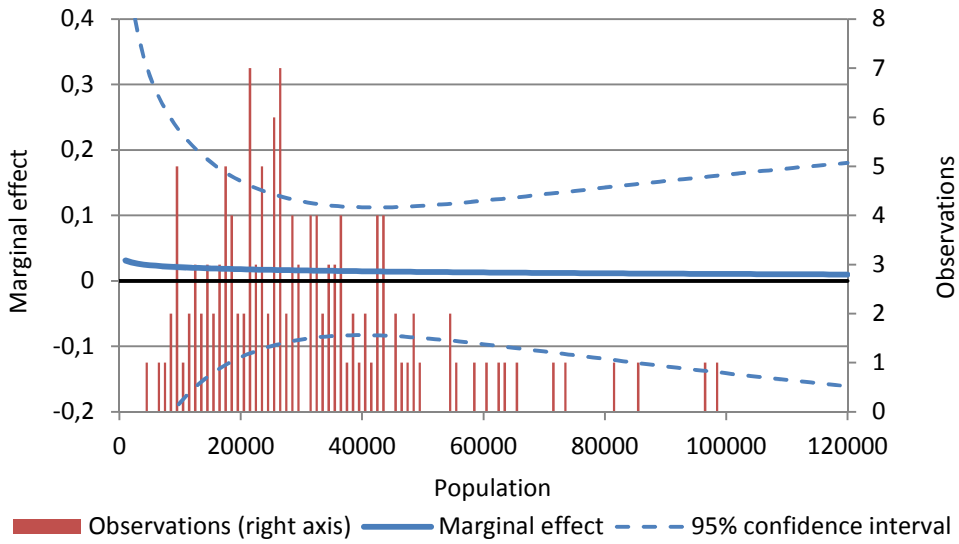
[10] The marginal effect of amalgamation on per capita spending is calculated as $\beta_1 + \beta_2 \text{Population}$, where $\beta_1$is the coefficient of A_{11+} and β_2 the coefficient of the interaction term Population*A_{11+}. The standard error is given by $\sqrt{\text{var}(\beta_1) + \text{Population}^2\text{var}(\beta_2)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

Table 6: Regression of total per capita spending; dynamic panel with interaction terms (control group: amalgamated or almost amalgamated)

Interaction variable	Population		Difference in ideology of coalition		Difference in ideology of council	
Model	Static	Dynamic	Static	Dynamic	Static	Dynamic
Regression number	21	22	23	24	25	26
Lagged dependent		0.47***		0.47***		0.47***
		(12.81)		(13.39)		(12.79)
A_{pre}	-0.58	-0.11	-0.03	-0.04	-0.03	-0.05*
	(-1.31)	(-0.20)	(-1.31)	(-1.25)	(-1.37)	(-1.80)
A_{0-3}	-0.56	-0.17	0.01	-0.00	-0.07	-0.04
	(-0.86)	(-0.27)	(0.23)	(-0.00)	(-1.59)	(-0.68)
A_{4-10}	-0.66	0.02	0.03	0.01	-0.05	-0.03
	(-0.91)	(0.03)	(0.59)	(0.14)	(-1.07)	(-0.38)
A_{11+}	-0.76	0.06	0.04	0.02	-0.05	-0.02
	(-1.03)	(0.09)	(0.78)	(0.27)	(-0.95)	(-0.34)
Interaction with A_{pre}	0.05	0.01	-0.08	0.04	-0.09	0.28*
	(1.26)	(0.14)	(-1.31)	(0.53)	(-0.66)	(1.71)
Interaction with A_{0-3}	0.05	0.02	-0.19	0.00	0.31	0.33
	(0.82)	(0.27)	(-1.57)	(0.01)	(1.01)	(1.02)
Interaction with A_{4-10}	0.06	-0.00	-0.22	-0.01	0.32	0.30
	(0.90)	(-0.02)	(-1.37)	(-0.03)	(0.89)	(0.73)
Interaction with A_{11+}	0.07	-0.00	-0.20	-0.03	0.45	0.33
	(1.05)	(-0.07)	(-1.16)	(-0.14)	(1.09)	(0.79)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipal fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipal time trends	Yes	No	Yes	No	Yes	No
Observations	1,542	1,341	1,542	1,341	1,542	1,341
Municipalities	135	135	135	135	135	135
R^2 (within)	0.64		0.64		0.65	
Pseudo-R^2 (within)		0.52		0.46		0.46

T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs, except for the political difference variables. * denotes significance at the 10% confidence level, ** significance at the 5% confidence level, and *** significance at the 1% confidence level.

Figure 4. Marginal effect of amalgamation on total municipal spending, conditional on population, after eleven or more years (based on Column 22 of Table 6)

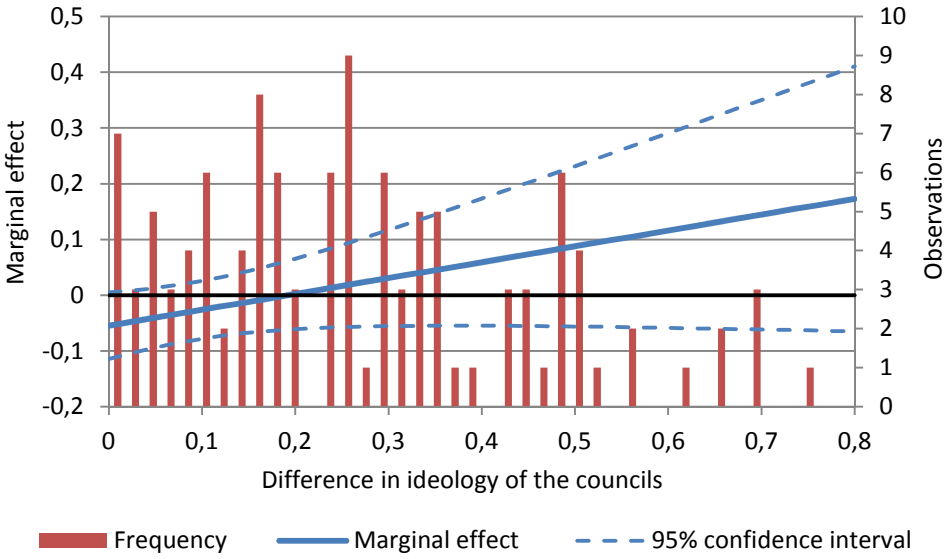


To test whether preference heterogeneity affects amalgamation effects, we again use interaction variables. As an indicator for preference heterogeneity we use differences in political ideology of the parties governing the amalgamating jurisdictions. Ideology is measured as the share of left-wing parties 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. The results are given in Columns (23) and (24) of Table 6. None of the coefficients for the amalgamation dummies are significant, nor are those for the interaction variables. Graphs depicting the marginal effects for different amalgamation periods (not displayed) show no significant amalgamation effect for any range of ideological differences. When we use the ideology of the entire council instead of just that of the ruling coalition (Columns (25) and (26) of Table 6), in the dynamic model, the coefficients for A_{pre} and the corresponding interaction variable are weakly significant. Figure 5 shows the marginal effect for these variables in the dynamic model. Although we do observe an upward slope of the marginal effect, the 95% confidence interval shows that this is not significant.

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. Regressions testing whether the effect of amalgamating two jurisdictions differs from the effect of amalgamating three jurisdictions, show that this is not the case.

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.

Figure 5. Marginal effect of amalgamation on total municipal spending before amalgamation, conditional on preference heterogeneity (based on Column 26 of Table 6)



Changes in service levels

Finally, it is conceivable that economies of scale do occur, but that they are not used to reduce spending but to increase public service levels. We investigate this by analyzing the composition of municipal spending, and the effect of amalgamation on house prices.

The spending category where we would most expect economies of scale is 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. We do indeed find a significantly negative amalgamation effect on long run spending on administration in both the static and the dynamic model (Table 7). This points to economies of scale in this specific field. Any savings on administration might have been used on different spending categories, perhaps raising public service levels. However, as the share of administration in total spending is small (see Figure 3), it cannot be ruled out a priori 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.

If efficiency gains have been used to improve public services, one would expect higher spending levels in policy fields where spending is largely discretionary and aimed at providing services to the public. In the Netherlands, spending on many municipal tasks is driven by national guidelines or economic developments (e.g., welfare). In contrast, spending on culture & recreation is characterized by a large degree of freedom for local politicians. Moreover, this category consists of outlays for services that benefit citizens directly. In Columns (29) and (30) of Table 7 we present regressions with the share of spending on culture & recreation as dependent variable. In the dynamic model, we find no significant

effect of amalgamations on this share. In the static setting with municipality trends, we do find a positive effect immediately after amalgamation that borders on significance. There is no long term effect, though. We also investigated the effect of amalgamation on the shares of all eight other main spending categories. The dynamic model finds no significant increase anywhere, the static model only for Traffic & public transport.

Table 7: Regressions of share of spending categories in total spending (control group: amalgamated or almost amalgamated)

Dependent variable	Share of administration		Share of culture & recreation	
Model	Static	Dynamic	Static	Dynamic
Regression number	27	28	29	30
Lagged dependent		0.68***		0.61***
		(16.50)		(16.77)
A_{pre}	0.01	-0.01	0.02	0.02
	(0.21)	(-0.20)	(0.82)	(0.49)
A_{0-3}	-0.22**	-0.12	0.07*	0.03
	(-2.08)	(-1.62)	(1.67)	(0.78)
A_{4-10}	-0.24**	-0.14*	0.06	0.02
	(-2.17)	(-1.75)	(1.11)	(0.49)
A_{11+}	-0.27**	-0.18**	0.05	0.02
	(-2.30)	(-2.18)	(0.96)	(0.47)
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	No
Observations	1,515	1,311	1,514	1,309
Municipalities	135	135	135	135
Pseudo-R^2 (within)		0.41		0.27
R^2	0.50		0.40	

T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. * denotes significance at the 10% confidence level, ** significance at the 5% confidence level, and *** significance at the 1% confidence level.

By focusing on individual spending categories, we cannot observe a possible broader increase in the level of public services. Therefore, we also test whether house prices are affected by amalgamations. Rising house prices after amalgamation would support the improved public services hypothesis. As explained above, we first estimated average house prices which are corrected for differences in house characteristics. We next use this as the dependent variable in a regression with amalgamation dummies, fixed effects, year effects and individual municipality trends on the right hand side. Again, variables are expressed in logs.

Table 8 shows that amalgamations do not raise house prices significantly. If anything, there is some weakly significant evidence of temporary negative amalgamation effects. Thus, we find no evidence supporting the improved public services hypothesis.

Table 8: Regressions of average house price

Control group	Amalgamated or almost amalgamated
Regression number	31
PreH2	-0.01*
	(-1.68)
H0123	-0.02*
	(-1.82)
H4_10	-0.02*
	(-1.67)
H11plus	-0.01
	(-0.88)
Constant	12.46***
	(1,953)
Control variables	No
Year effects	Yes
Municipal fixed effects	Yes
Municipal time trends	Yes
Observations	1,464
Municipalities	122
R^2 (within)	0.94

T-values between parentheses, based on robust standard errors clustered by municipality. Variables are expressed in logs. * denotes significance at the 10% confidence level, ** significance at the 5% confidence level, and *** significance at the 1% confidence level.

8. Conclusions

This paper studies the effects of amalgamation on spending and on 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. Our study consistently finds that there is no significant effect on total per capita municipal spending before or after amalgamation.

However, this result in itself does not mean that amalgamation does not affect local government spending. We test two hypotheses that might explain the absence of an effect on total per capita 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. Secondly, it is possible that economies of scale do exist, but that these do not result in lower spending but in higher service levels.

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 scale to be most likely in small municipalities. However, we find that the influence of population size on the amalgamation effect is not significant. Thus, 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. To test this, we interact amalgamation dummies with a measure of political heterogeneity.

However, we find no evidence of a 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, but that these are used to raise public service levels, not to reduce expenditures. We test this by first examining different spending categories and then analyzing the effect of amalgamation on house prices.

The spending category most likely to exhibit economies of scale is administration. Amalgamation reduces the per capita number of administrators and politicians, and, presumably, of their staff. We do indeed find that, in the long term, spending on administration is significantly reduced by amalgamation. These savings may have been used to improve public services. In that case we would expect a corresponding rise in the share of spending on culture & recreation, which is largely discretionary instead of driven by national regulations, and associated with public services that benefit citizens directly. However, we do not find such a rise of spending, nor on culture & recreation, nor on any other spending category.

To further study the hypothesis that amalgamation increases service levels, we test whether amalgamation raises house prices. Increasing service levels at constant per capita spending would make a municipality more attractive to live in, which we would expect to capitalize into house prices. However, the effect of amalgamation on house prices is only weakly significant. Moreover, it is negative instead of positive.

Our study has three main conclusions. First, we find no robust evidence of an effect of amalgamation on aggregate municipal spending. Neither an increase nor a decrease of spending can be observed either before or after amalgamation. Secondly, we find no evidence that economies of scale do in fact occur, but only for amalgamations of small jurisdictions, or jurisdictions with homogeneous preferences. Thirdly, we find no evidence supporting the hypothesis that amalgamations generate economies of scale, but that these are used to raise service levels, not to reduce spending.

These results do not imply that amalgamation of local government is always inadvisable. They do imply, however, that economies of scale should not be taken for granted, that budgetary savings may be elusive and that public services are not necessarily improved through amalgamation.

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