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Who 'marries' whom? The influence of societal connectedness, economic and political homogeneity, and population size on jurisdictional consolidations

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Abstract. For decades, political scientists have been asking how political jurisdictions are formed and reshaped. Nevertheless, studies of local government jurisdictional formation are few and often plagued with endogeneity since the formation of jurisdictions cannot be separated from sorting effects. In this article, the unique case of the Danish structural reform is utilised to overcome endogeneity due to migration-related sorting by studying patterns of municipal amalgamations. In the recent Danish reform, 239 of 271 municipal entities were forced to amalgamate simultaneously, while who actually amalgamated with whom was left entirely to negotiations between the respective municipalities. Applying logistical regression to a dataset where the unit of analysis is dyads of municipalities allows the construction of a relational model for estimating the effect of different political and societal variables on the likelihood of amalgamation. Societal connectedness, population size and geography are important predictors of amalgamation patterns, while political and economic homogeneity between municipalities does not appear to matter much.

How are political jurisdictions formed and reshaped? Political scientists have been interested in the causes and consequences of jurisdictional formation for decades (e.g., Dahl & Tufte 1973; Lassen & Serritzlew forthcoming). The vast redistricting literature has gauged the reshaping of electoral boundaries (e.g., Cain 1985; Gelman & King 1994; Ansolabehere et al. 2002). Other scholars have examined the number and sizes of nations (Alesina & Spolaore 1997; Bolton & Roland 1997). Others yet have studied local government jurisdictional consolidation (Alesina et al. 2004).

This article focuses on municipal amalgamations in order to provide insight regarding the shaping of local government jurisdictions. Studying amalgamations allows us to overcome a typical problem in the study of how local jurisdictions form, where the formation itself cannot be studied. Instead, an often-used approach is to examine the determinants of the number of jurisdictions within some aggregate entity (e.g., counties), from which the motivation of the jurisdictional consolidation is inferred (Alesina et al. 2004). However, if we simply observe that entities are politically homogeneous, this may either indicate that they were created in this manner (jurisdictional

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formation) or that they became homogeneous due to migration/sorting or other adjustments between their creation and the point of observation (e.g., Tiebout 1956; Banzhaf & Walsh 2008). By studying municipal amalgamations directly, we entirely avoid the *ex post* sorting effects. This allows us to estimate a model in which all of the covariates are exogenously determined and only the formation patterns respond endogenously (Alesina et al. 2004).

Though the history of municipalities in many established democracies is one of amalgamation (e.g., Vojnovic 2000; Mabuchi 2001; Dollery et al. 2007), the actual patterns of municipal mergers have not been studied extensively. Numerous studies have investigated the consequences of local government amalgamations (Desrochers 1965; Derksen 1988; Kushner & Siegel 2003, 2005a, 2005b; Dollery et al. 2007; Lassen & Serritzlew forthcoming), but to the authors' knowledge no studies have thus far quantitatively examined which municipalities amalgamate with which.

A major municipal reform was undertaken in Denmark in 2007, reducing the number of municipalities from 271 to 98. The article sets out to explain the eventual amalgamation patterns. Why did the municipalities choose their respective 'partner municipalities' instead of other potential candidates? In other words, what were the motivations behind the patterns of jurisdictional formation?

The Danish case is particularly interesting to study since the municipalities were under coercive pressure from the government to amalgamate. The eventual amalgamations were enacted in a single item of legislature at the national level at *one* point in time (Ministry of the Interior and Health 2004a). Hence, the Danish case presents a situation in which all of the municipalities considered changing their physical boundaries simultaneously. From a substantive point of view, this means that almost everything was up for grabs. Almost all of the municipalities were seeking potential partner municipalities, making the number of potential partners very large. At the same time, it was left to the municipal councils to decide whom they would amalgamate with, as long as the resulting entity satisfied the population size requirement of 20,000 and given the natural geographic constraints (to which we will return later). From a technical point of view, the large number of simultaneous amalgamations provides a sufficient number of 'successes' (amalgamations) on the dependent variable for a statistical analysis of a simple cross-section, as opposed to a situation in which amalgamations would occur more gradually (in which case, sorting [e.g., migration] effects would muddy the picture).

In the next section, the context for, and the process involved, in the Danish municipal reform are presented. We then consider the overall research design, develop the hypotheses and measures, and discuss the dyadic patterns of amalgamation. The ambition is to uncover *with whom* a municipality chooses to amalgamate, not *if* the municipality chooses to amalgamate – that is, the focus is not when jurisdictions re-form, but the patterns in which they do so. This allows us to shed light on the motivations behind the jurisdictional formations. Next, the estimation method for the multivariate analysis is discussed before the analysis is carried out. The results indicate that societal connectedness and municipal population size mattered for the amalgamation pattern, while political and economic homogeneity did not seem to influence how the municipalities chose their partners. Finally, the findings are discussed.

The Danish municipal reform

The pre-reform Danish government system (2006) consisted of three elected layers: the state, 13 counties and 271 municipalities. Most welfare services (child care, elementary schools, care for seniors, libraries, etc.) were provided or administered at the municipal level. A total of 27 per cent of the total GDP – or roughly half of all public spending – was administered in the municipalities prior to the reform, as compared to 7 per cent in Germany or 11 per cent in the United Kingdom (Mouritzen 2003). The counties were responsible for the hospitals, a range of special institutions, secondary education programmes and environmental planning. Finally, the central government took care of a range of state-level services, including foreign aid, the military, courts, police and higher education.

The main part of the process defining the new municipal borders unfolded over the years 2002–2005. The debate over a municipal reform started in the Danish media in the summer of 2002. Shortly thereafter, the Prime Minister formed a so-called 'Structural Commission'. Negotiations between the government and its coalition partners over the Commission's recommendations took place in the spring and summer of 2004. The resulting laws were passed in the spring of 2005, and the reform ultimately came into effect in January 2007 (Blom-Hansen et al. 2006b: 13; Christiansen & Klitgaard 2008).

One of the main foci in the Structural Commission's report and the subsequent political debate was the size of the pre-reform municipal entities (Ministry of the Interior and Health 2004b). The main argument was that amalgamations should be carried out in order to achieve a sufficient level of professionalism and economies of scale in the municipalities. It was *de facto* left entirely up to the municipalities to find their new partners, as long as the resulting entities had roughly 30,000 inhabitants and an absolute minimum of 20,000 (Ministry of the Interior and Health 2004a; Blom-Hansen et al. 2006b). There was no formal ceiling on municipal size, although among the municipalities themselves there was awareness that excessively large municipalities could create diseconomies of scale.

The amalgamations were negotiated in 2004 under the coercive pressure of the government's preferred municipal size. The negotiations were exclusively among the municipalities. The Minister of the Interior formally had to approve the amalgamations, but it was clear from the outset that he would only exercise his formal veto power if the new entities failed to meet the 20,000 inhabitant requirement (or in the case of gridlocks in the inter-municipal negotiations, in which a government appointed conciliator played a facilitating role). Geography imposed a natural constraint, since it would be highly problematic to organise services in an entity that was geographically separated by other municipalities.

The reform resulted in the transfer of competencies (e.g., environmental monitoring) from the counties to the municipalities and the state. Even more importantly for our purposes, 239 of the 271 municipalities merged to form 66 municipalities, reducing the total number of political-administrative entities to 98. The average number of inhabitants increased from roughly 20,000 to 56,000, and the mean municipal size expanded from 159 square kilometres to 440 square kilometres. The few municipalities that did not amalgamate were mainly large, urban entities (for a short analysis of the amalgamate-or-not question, refer to Table A1 of the Appendix). Figure 1 shows before-and-after maps of the Danish municipalities.

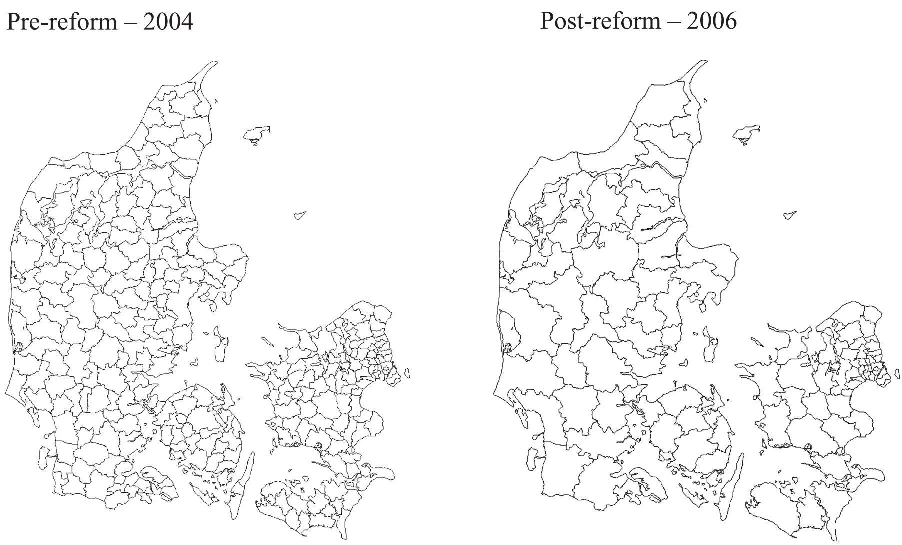

Figure 1. Visualisation of the Danish municipal amalgamations.

Research design

The basic setup is to examine which municipalities amalgamated with which during the reform. This allows us to provide insights into jurisdictional formation without being plagued by endogeneity. Analytically, the question concerns whether an event (amalgamation) occurs within a pair of political entities. This means that the data structure is dyadic – that is, the unit of analysis is pairs of municipalities. Such a data structure is well known in the social science literature – for instance, in the study of international conflicts (e.g., King & Zeng 2001: 706–708). One advantage of a dyadic design is that it allows for modelling mutual selection. No municipality can simply pick the partner it wants; an amalgamation is dependent on the consent of both partners who are simultaneously comparing their potential partners. In the (non-directed) dyadic approach, one can simultaneously model the choices of each of the units (municipalities) and their potential partners (as is commonly done in the quantitative literature on interpersonal relationships – e.g., Fisman et al. 2006; Marmaros & Sacerdote 2006).

Since there are 268 municipalities in the analysis,[1] each entity will appear in 267 (non-directed) dyads, for a total of (268*267)/2 = 35,778 cases. If municipality X_1 merges with municipality X_2 and X_3 to form a new municipality (X_1, X_2, X_3), X_1 will appear in two 'successful' ($X_1 + X_2$ and $X_1 + X_3$) and 265 'failing' dyads.

An often-discussed problem is whether to include *all* possible dyads or only the politically relevant ones (King & Zeng 2001: 706–708). In the present case, it is highly improbable that municipalities situated far from each other would amalgamate; it is simply not practical for municipalities to amalgamate if they are not bound together geographically. At first glance, it might therefore seem tempting to limit the study to neighbouring dyads. However, applying the neighbouring-dyads-only strategy would limit the generality of the estimates. It is indeed possible to amalgamate with a non-neighbouring municipality, as more than two entities can easily constitute a geographically connected area. In fact, 117 of the total 370 dyadic amalgamations occurred among non-neighbours. Including all cases (dyads) and controlling all geographic variation (e.g., whether or not the municipalities are neighbours) in order to avoid omitted variable bias (i.e., not including the relevant geographic variables and thus having an underspecified model) therefore seems to offer a better solution than restricting the sample and running the risk of losing generality – that is, not being able to generalise to the amalgamations of non-neighbouring municipalities (King et al. 1994).[2] We will elaborate on exactly how these important geographic controls are constructed in the discussion of measures.

A related question is whether to examine all of the possible combinations of municipalities or just all of the possible combinations of the 239 that did in fact amalgamate. Including municipalities that never seriously considered amalgamating (e.g., very large municipalities) would shift the analysis from exclusively examining the 'fit' of potential partners to simultaneously incorporating the question of whether one of the municipalities was genuinely interested in entering into an amalgamation. This is not our research question, as the present analysis exclusively seeks to uncover the factors leading to the choice of partners – not whether or not to marry, but *whom* to marry. Again, this problem is readily solved by including all of the dyads and controlling away irrelevant variation. We include *all* of the possible pairs in the analysis *and* include a variable for the number of amalgamations in which the municipalities composing the dyad engaged. Without excluding any cases, the focus thereby exclusively remains on who amalgamates with whom while allowing for the theoretical possibility that all municipalities *could have* amalgamated.

Hypotheses and measures

Size and homogeneity are the two most often discussed factors in the existing literature. Local government jurisdictional formation is often described as a trade-off between size and homogeneity. On the one hand, larger communities can provide economies of scale. On the other hand, people are often thought to prefer relatively homogenous communities, for instance due to different preferences for public goods (Alesina & Spolaore 1997; Alesina et al. 2004).

Qualitative case studies from the Danish amalgamations suggest that different variables are at play in the processes (Mouritzen 2006), including considerations regarding size and homogeneity. In some cases, community identity and internal cohesion were important in the choice of a partner; in other cases, homogeneity in wealth and service levels played an important role; and in other cases still, political scenarios, such as which party would most likely assume the mayoral office in the new municipality, were included in the considerations. Finally, jurisdictional size and the ambition to become a large actor among the post-reform municipalities seem important. This gives us four potential causal factors to consider: societal connectedness; economic homogeneity; political homogeneity; and population size. In the following, we develop each of these factors to present four hypotheses on their relationship to the choice of municipal partner. Subsequently, we discuss the appropriate geographic and general controls.

Societal connectedness

Local government jurisdictional reconfigurations may be based on pre-existing patterns of societal connectedness since the higher the connectedness, the greater the need for common and coordinated solutions. A similar hypothesis is mentioned in some of the qualitative evidence from the Japanese amalgamations carried out between 1961 and 1992: 'The main purpose of these city-centered amalgamations was to facilitate economic activities by making the administrative boundaries consistent with social and economic activities' (Mabuchi 2001). If, for instance, there is a high level of commuting between the entities, there is a need for common local traffic planning. Similarly, when municipalities are closely related in societal terms, their citizens may use each other's services (roads, libraries, sports facilities, etc. that can be accessed across municipal borders) without any practical opportunity to distribute the costs fairly. Furthermore, if people reside (and so pay taxes) and work in different municipalities, there might be a rational incentive for the municipalities to merge. The commuting-in municipalities have a rational interest in obtaining the tax revenues from those who are using their services anyway. For the commuting-out municipalities, the incentive is to gain influence over the delivery of the services already used by its citizens. In this manner, the better the administrative boundaries can be fitted to the societal patterns, the more efficiently and fairly service delivery and taxation can be organised.

Societal connectedness may also improve public support for the amalgamations by offsetting some of the negative reform consequences. For instance, if you work in a particular neighbouring municipality, it might even be convenient for you if the services for citizens are centralised there. In addition, and perhaps most importantly, when municipalities are closely connected in societal terms, citizens and politicians alike may perceive the municipalities as 'naturally linked' with a common community identity, for which reason a formal connection in terms of an amalgamation can appear to be the natural thing to do (Hansen 2007).

> *H1*: The likelihood of amalgamation increases in a dyad when the societal connectedness between the municipalities is high.

All of the data for the independent variables are from 2004, since this is when the negotiations on the eventual choice of partners took place and the vast majority of agreements were settled. To work with the societal connectedness hypothesis, a variable is created for commuting. Commuting is an interesting variable since it is a very good indicator of which municipalities citizens are oriented towards. For each municipality, the proportion of its

Table 1. Degree of commuting between municipalities: T-test for difference in commuting for non-amalgamating and amalgamating dyads

	Full sample (N = 35,778)		Only neighbouring dyads (N = 605)	
	Non-amalgamating dyads	Amalgamating dyads	Non-amalgamating dyads	Amalgamating dyads
Commuting	0.00	0.05***	0.04	0.07***

Notes: *** $p < 0.001$; ** $0.001 < p < 0.01$; * $0.01 < p < 0.05$.

working population commuting to each potential partner municipality is computed. Then for each of the dyads, the average of the two relevant proportions is taken. Hence, a value of 0.05 indicates that on average 5 per cent of the working population in the two municipalities commute to the other entity in the dyad. A measure that uses a ranking instead of the percentage measure was tried; however, the main conclusions of this study remain unchanged.

Table 1 provides initial evidence in favour of *H1*. The effect of commuting is, of course, strongly inflated when geography is not controlled since proximate municipalities tend to be more closely connected societally. Nevertheless, even when only neighbouring pairs are considered, the score is 0.04 in non-amalgamating dyads, but 0.07 in amalgamating dyads. See Table 1 comparing columns 3 and 4. This suggests that societal connectedness matters irrespective of geography *per se*.

Political homogeneity

Dyadic political homogeneity is a second potential causal factor. As indicated, the idea of homogeneity is central within the logic of optimal jurisdictions, within which larger jurisdictions may, on the one hand, reduce unit costs but, on the other hand, lead to a welfare loss due to greater heterogeneity (Fisher & Wassmer 1998; Alesina et al. 2004; Tanguay & Wihry 2008). From this perspective, one would expect new municipalities to be politically homogenous. In a municipal amalgamation, priorities must be collapsed into a single set of tax rates, service levels and so forth. The more similar the municipalities are in terms of their priorities, the easier it will be to reach common ground and fulfil the preferences of the citizens, and the lower the welfare loss from inability to differentiate priorities. The idea is particularly interesting in the present analysis since by studying the amalgamations themselves, we avoid the potential endogenous effect of sorting. We are thus able to distinguish the motivation behind the jurisdictional formation from subsequent migration (which may itself create more or lesser homogeneous units).

Political homogeneity may also matter for a more strategic reason. If municipalities were highly homogeneous politically, an amalgamation would most likely cause no change in which party would be in charge of the new, merged municipality. On the other hand, if municipalities were politically different, a merger would cause a political power shift in one of the municipalities. Thus, municipalities and their politicians could possibly be motivated to search for potential partners who would be less likely to contribute to a political regime change.

> *H2*: The likelihood of amalgamation for a dyad increases the more homogeneous the municipalities are in terms of their political priorities.

The absolute difference in the percentage of national-level, left-party voters offers a proxy for popular ideology (Erikson & Wright 2000). The idea here is that the national-level vote provides a common baseline for evaluating public preferences, whereas local party systems can vary. The difference in the party of the mayor is a dummy variable, indicating whether the mayors of the two municipalities are from the same or different sides of the ideological spectrum (Blom-Hansen et al. 2006a), thus capturing the elite ideology. We also include tax levels and service levels in order to capture more specific political priorities; the lower the difference, the higher the expected likelihood of amalgamation since the municipalities are more homogeneous.[3]

Economic homogeneity

Another kind of homogeneity may also be important for local jurisdictional reconfiguration – namely economic homogeneity in terms of fiscal capacity. Fiscal capacity may matter because all municipalities are expected to want a partner with as sound an economic position as possible. The better off the partner is, the better will be the *ex post* financial situation/capacity of the new municipality.[4] However, since every municipality can be expected to think this way, the likely outcome would be for similar municipalities to amalgamate since no municipality would accept a partner in a substantially worse position than themselves (a somewhat related argument can be found in Feiock 2007). Thus, one would expect economic homogeneity – not as the result of a taste for homogeneity, but due to the need for mutual consent.

> *H3*: The likelihood of amalgamation for a dyad increases the more homogeneous the municipalities are in terms of their capacity.

Differences in terms of the tax base, long-term debt, expenditures and social index (a government-issued socio-economic summary index)[5] are used as proxies for capacity. It should be noted that, in practice, economic and political homogeneity are difficult to distinguish since, for instance, the spending level has both financial and political priority elements. No sharp distinction is therefore made between *H2* and *H3*.

Table 2 reveals that, in general, amalgamating municipalities are politically and economically much more homogenous than non-amalgamating entities. However, when only considering neighbouring dyads, the difference in homogeneity is limited at best. The large drop in the difference between amalgamating and non-amalgamating entities from the full to the restricted sample tells us that much of the apparent effect is simply due to the fact that political and economic characteristics are geographically clustered. Only the indicator for popular ideology (the difference in voter behaviour in the previous national election) remains statistically significant when neighbours alone are considered. Even for this variable, however, the difference between amalgamating and non-amalgamating municipalities is limited when geography is taken into accounted. (As Table 4 below shows, all of the homogeneity variables have little or no effect in the full model.)

Population size

One of the important purposes of local government jurisdictional reconfigurations throughout the world has been the achievement of economies of scale (e.g., Derksen 1988; Desrochers 1965; Alesina et al. 2004; Dollery et al. 2008). The idea is simply that the per-unit cost of service delivery can be reduced with larger units – for instance because administration costs are thought to be relatively fixed. In the Danish case, economies of scale were indeed an important argument for the reform. The central government insisted that the post-reform municipalities should have at least 20,000 – and preferably 30,000 – inhabitants. On the other hand, it was recognised that forming excessively large municipalities would lead to diseconomies of scale (Ministry of Interior and Health 2004b). Hence, when the aggregate number of inhabitants in two municipalities becomes too large, one would expect the probability of a merger to decrease. Another argument in the municipal amalgamation process is that larger municipalities have more resources to develop and a higher status in the competition with other municipalities. This argument is not perceived to be affected by diseconomies of scale. Simply put: larger is stronger.

Taking the two arguments together, one would expect population size to be negatively related to whether municipalities amalgamate in the first place (due to perceived economies of scale). Moreover, when examining amalgamation

Table 2. Degree of homogeneity: T-test for difference in homogeneity for non-amalgamating and amalgamating dyads

	Full sample (N = 35,778)		Only neighbouring dyads (N = 605)	
	Non-amalgamating dyads	Amalgamating dyads	Non-amalgamating dyads	Amalgamating dyads
Political homogeneity				
Diff. in national election left party vote prop.	0.07***	0.05	0.06**	0.05
Diff. in mayor (1 = mayor different party blocs)	0.43	0.42	0.36	0.40
Diff. in taxation level	1.16***	0.85	0.85	0.84
Diff. in service level	0.07***	0.05	0.05	0.05
Economic homogeneity				
Diff. in taxation (10,000 DKK)	2.14***	0.99	1.17	0.98
Diff. in expenditures (10,000 DKK)	0.58***	0.43	0.50	0.46
Diff. in long-term debt (10,000 DKK)	0.53*	0.47	0.46	0.47
Diff. in social index	0.27***	0.23	0.25	0.24

Notes: *** $p < 0.001$; ** $0.001 < p < 0.01$; * $0.01 < p < 0.05$.

patterns in dyads, one would expect the dyadic population size to be negatively related to mergers (due to perceived diseconomies of scale). While not the focus here, Table A1 in the Appendix confirms the former point, since the probability of merger is greater among the smaller municipalities than the larger ones. The latter point leads to the fourth hypothesis.

> *H4*: The likelihood of amalgamation decreases for a dyad of municipalities when the aggregate population size increases.

One might ask why the belief in a curvilinear relationship between population size and economies of scale leads to a negative – *not* a curvilinear – prediction for the dyads of municipalities. Should we not see dyads with a low population size displaying a low probability of amalgamating, simply because the resulting municipality will be too small? While intriguing at first glance, such a claim entirely misses the level of analysis. The unit of analysis is pairs of municipalities – not all of the possible combinations of new municipalities. Hence, the fact that a dyad amalgamates does not preclude that the resulting municipality can consist of additional entities. In fact, on average, a new municipality involved more than 3.5 old municipalities – that is, more than one dyad is typically involved in an amalgamation, so low dyad size does not necessarily mean that an 'optimal municipal size' cannot be achieved.

The municipal population size hypothesis is applied by considering the summarised population size for the municipalities in a dyad. The simple t-test in Table 3 provides some introductory evidence in favour of the hypothesis. Dyads that did not amalgamate are substantially larger than the amalgamating ones, regardless of whether geography is taken into account. In fact, the average total dyad population size for amalgamating neighbouring dyads is 29,700, whereas it is more than 50 per cent higher (46,800) among those that did not join together.

Table 3. Population size: T-test for difference in total dyadic population size for non-amalgamating and amalgamating dyads

	Full sample (N = 35,778)		Only neighbouring dyads (N = 605)	
	Non-amalgamating dyads	Amalgamating dyads	Non-amalgamating dyads	Amalgamating dyads
Total population size	3.56**	2.68	4.68***	2.97

Notes: *** p < 0.001; ** 0.001 < p < 0.01; * 0.01 < p < 0.05.

Geography per se

Recall that all dyads are included in the analysis in order to maximise the generality of the results, even though it is highly improbable that very distant entities will amalgamate. Thus, an extremely important control is the relative location of the municipalities in question. Therefore, we control for whether the municipalities are bound together geographically. From a modelling point of view, considering this factor is vital. If not done appropriately, the homogeneity indicators may simply pick up variance from the omitted geographic variable since neighbouring municipalities are typically more similar than a randomly drawn pair of municipalities. Likewise, societal connectedness and geography are closely correlated since there are simply fewer costs for citizens to commute in geographically connected areas. Hence, because all possible dyads are included in the analysis (rather than only neighbouring dyads), it is extremely important to control for geography *per se* in order to avoid substantial omitted variable bias.

The geographic controls are operationalised in two ways. First, a dummy variable is created for neighbourship. Dyads consisting of two neighbours are coded '1' and the remaining dyads are coded '0'. A neighbour is defined as two municipalities bound together by land or a bridge (of less than five kilometres), such that only 'naturally linked' municipalities are counted. However, a neighbour variable is not sufficient to account for all geographic dependence. In amalgamations consisting of more than two municipalities, it is indeed possible to create entities consisting of non-neighbouring municipalities without having geographic gaps between them. Hence, a variable is included for whether the dyads include neighbours' neighbours. Our control variables are superior to considering the distance between the municipalities since this variable would depend heavily on the area of any in-between entities. Considered together, the two variables provide a very strong control for geographic dependence. In fact, only nine amalgamating dyads consisted neither of neighbours nor of neighbours' neighbours, for which reason the two variables eliminate almost all of the irrelevant geographic variation. In order to further validate that the results are not driven by omitted geographic variation, a regression involving only neighbouring dyads was performed as a test of robustness (Model 2 in Table 4 below).

Other control variables

In addition to the geographic controls, a range of variables are included as extra controls. First, a variable is created for the difference in municipal population size. A likely pattern for the amalgamations would be for large municipalities to absorb their surrounding smaller (often rural) neighbours. This could potentially suppress the effect of the total population size variable. Similarly, a possible effect of societal connectedness could merely be a reflection of large-small municipalities amalgamating. The difference in population density is also included in order to capture the same mechanism.

Finally, controls are included for the total number of amalgamations engaged in by the entities in the dyads in order to separate the results from the question of *why* municipalities choose to amalgamate in the first place (and how many partners they choose). For instance, smaller municipalities might have a higher propensity to amalgamate with multiple partners in order to achieve a new municipality of reasonable size. If not controlled, this could bias the estimate of *H4*. In a related manner, two variables are included for the number of opportunities possessed by the municipalities. If a municipality has only two neighbours to choose between, the probability of amalgamating should be higher than if it had ten potential partners. These control variables are operationalised as the total number of neighbours and neighbours' neighbours, respectively.

Analysis: What explains the eventual pattern of amalgamation?

With 268 municipalities included in the analysis, there are a total of 35,778 dyads or cases in the analysis. Of these, 370, or 1.0 per cent, in fact amalgamated. The dyadic data structure relates directly to how the hypotheses are formulated. If, for instance, the homogeneity hypothesis holds, one would expect a higher probability for the amalgamation of homogeneous dyads than other dyads.

The amalgamation question is dichotomous; dyads can either amalgamate or not. Hence, the choice of statistical model is a logistic regression. A well-known complication is that the logit is biased when the event under investigation is rare. To overcome this problem, all models were first estimated using binomial logit and then re-estimated using King's corrected logit estimates from the ReLogit package, implemented in Stata 10 (King & Zeng 2001). Since the main results for logit and relogit are substantively very similar, the standard logit coefficients are, for the sake of simplicity, reported in Table 4.[6] Table 4 displays the results from the logistic regressions based on the operationalisation of *H1–H4*. A regression is included for a sample restricted to geographic neighbours in order to test the robustness of the results where the possibility for omitted variable bias due to geography is entirely eliminated.

Both models provide strong evidence supporting *H1* and *H4*. Most interestingly, commuting (*H1*) has a very strong impact on the likelihood of

Table 4. Logistic regression predicting the eventual amalgamation pattern

	Model 1		Model 2	
	Full sample		Only neighbouring dyads	
	Logistic coefficient	Marginal effects	Logistic coefficient	Marginal effects
Commuting (*H1*)	50.9*** (5.29)	0.0065	36.8*** (4.42)	8.59
Diff. in national election left party vote prop. (*H2*)	–2.87 (2.13)	–0.0004	–2.73 (3.53)	–0.64
Diff. in mayor (1 = mayor different party blocs) (*H2*)	0.20 (0.15)	0.0000	–0.06 (0.24)	–0.01
Diff. in taxation level (*H2*)	–0.07 (0.13)	–0.0000	–0.06 (0.19)	–0.01
Diff. in service level (*H2*)	–0.95 (1.77)	–0.0001	1.04 (3.02)	0.24
Diff. in taxation foundation (10,000 DKK) (*H3*)	0.05 (0.08)	0.0000	0.11 (0.12)	0.03
Diff. in expenditures (10,000 DKK) (*H3*)	–0.20 (0.27)	0.0000	–0.32 (0.45)	–0.07
Diff. in long-term debt (10,000 DKK) (*H3*)	–0.12 (0.24)	0.0000	0.08 (0.34)	0.02
Diff. in social index (*H3*)	0.12 (0.63)	–0.0000	–0.48 (0.93)	–0.11
Total population size (10,000) (*H4*)	–0.56*** (0.11)	–0.0001	–0.34** (0.13)	–0.08
Diff. in population size (10,000) (control)	–0.02 (0.13)	0.0000	–0.02 (0.15)	–0.01
Diff. in pop. density (inhabitants/1,000 km^2) (control)	–5.98 (7.54)	–0.0007	11.62 (6.71)	2.71
Neighbour dummy (control)	6.27*** (0.47)	0.0575	–	–
Neighbour's neighbour (control)	5.71*** (0.38)	0.0316	–	–
Number of neighbours (control)	–0.29*** (0.05)	–0.0001	–0.24*** (0.05)	–0.06
Number of neighbour's neighbours (control)	0.04* (0.02)	0.0000	–	–
Number of amalgamations (control)	0.40*** (0.06)	0.0001	0.75*** (0.09)	0.17
Constant	–6.47*** (0.73)	–	–1.51* (0.62)	–
N	35,778		6,050	
Log likelihood	–606.1		–248.9	
LR Chi^2	875.2		200.5	
Pseudo R^2 (McFadden)	0.71		0.39	

Notes: Dependent variable = 1 if a dyad amalgamated, 0 = if the dyad did not amalgamate. The coefficients are the unstandardised logistic coefficients to the left; to the right are marginal effects when variables are set to their means. Robust standard errors in the parentheses clustered by the first municipality in the dyad. *** $p < 0.001$; ** $0.001 < p < 0.01$; * $0.01 < p < 0.05$.

amalgamating, despite thoroughly controlling for geography *per se* and though our setup eliminates the possibility of simply measuring *ex post* societal integration. Hence, the pre-existing societal connectedness is a strong independent predictor of the dyadic propensity to merge. The result even holds when only neighbours are investigated. This underlines that the result is not caused by omitted variable bias due to insufficient geographic controls.[7] The effect is substantively large. In the neighbour-only regression, the predicted probability of amalgamating, when all other variables are set at their means, increases from 0.15 to 0.24 when the commuting variable rises from its 25th percentile (2.2 per cent mutual commuting) to its median (3.8 per cent). When the commuting variable is at its 75th percentile (7.1 per cent mutual commuting), it implies a probability of amalgamation of more than 0.51 and almost 0.89 at the 90th percentile (12.5 per cent).

As for population size (*H4*), the lower the total population size in a dyad, the higher the probability of amalgamating. This indicates that the municipalities may have taken into account that excessively large jurisdictions would create diseconomies of scale. For instance, reducing the dyadic size by 1,000 inhabitants when all variables are set to their means would increase the likelihood of amalgamating by about eight-tenths of a percentage point (of course, such an empirical relationship is only suggestive of the motivations of the legislators). In an additional regression (not shown), the total population size variable was broken into a series of dummy variables to uncover whether any threshold values exist. However, the relationship between total population size and amalgamating was indeed linear. If one had examined which municipalities amalgamated in the first place (Table A1 in the Appendix), one would also have found evidence of economies of scale. Hence, both economies and diseconomies of scale may have mattered in the Danish amalgamations.

Political and economic homogeneity mainly seem to matter when included separately, as in Table 2. As shown in Table 4, the apparent relationships are caused by geography and societal connectedness. This is so because close municipalities resemble each other more than two entities picked randomly from the entire country. The results are intriguing because studies on optimal jurisdictions have found strong homogeneity effects (Alesina & Spolaore 1997; Alesina et al. 2004). As a robustness test, a variable ranking mayors on the political spectrum instead of aggregating them into two political groups, and a measure of local instead of national elections vote share were considered. However, none of these potential alternatives altered the conclusions. Even though they are theoretically compelling, there is no empirical evidence favouring the homogeneity indicators in the Danish case.

The influence of geography *per se* is self-explanatory and therefore mainly of interest as a control variable. It is much easier for geographically connected municipalities to merge than other municipalities since it would be more difficult to organise common services in geographically separated areas. Likewise, the remaining control variables behave as expected; the probability of dyadic amalgamation is positively related to the number of amalgamations the municipalities engage in while negatively related to the number of number of neighbours (i.e., the number of alternative options). This allows the main coefficients exclusively to be indicators of who amalgamates with whom.

Conclusion

Amalgamation has been a major trend among municipalities in established democracies in the twentieth and twenty-first centuries. Municipalities are merged in order to provide larger and more viable units for meeting modern demands relating to service provision. While much is known about the overall motivations and justifications for municipal amalgamations and some knowledge exists about their actual effects in terms of economies of scale and citizen satisfaction, the amalgamation patterns have only been examined to a very limited extent. The Danish amalgamations offer an important example of local government jurisdictional formation that can be analysed without problems of endogeneity due to *ex post* societal integration and sorting.

The patterns of amalgamation among the municipalities in question confirmed two of the four hypotheses. Most interestingly, there is evidence supporting the societal connectedness hypothesis, meaning that the propensity to amalgamate increases in the case of strong prior societal ties between the municipalities. This confirms some of the anecdotal evidence from Japanese amalgamations (Mabuchi 2001). There are basically two complementary interpretations of this (i.e., two potential causal mechanisms) – one functionalistic and the other sociological. From the functionalistic perspective, amalgamations on the basis of pre-existing societal connections can be seen as a practical adjustment of administrative borders to needs created by societal structure (commuting, trade, etc.). From the sociological perspective, the amalgamations followed the societal pattern because societally connected areas tend to have a sense of 'natural community' and stronger community identity which was activated in the merging process.

(Dis)economies of scale also seem to matter. The smaller the total number of inhabitants of the dyad, the higher the probability to merge. It should be noted that the analysis only tracks perceived *diseconomies* of scale. This is because an amalgamating dyad does not necessarily mean that the new municipality *only* consists of that dyad. In fact, the post-reform municipalities consisted on average of about six dyads. This means that the dyad size only sets *a lower limit* for the possible municipal size. Thus, when a negative effect is found, it is likely to be because the perceived diseconomies of scale kick in.

While the confirmation of the importance of the geographic controls is trivial, it is intriguing that bivariate evidence of political and economic homogeneity is mainly due to the fact that neighbouring municipalities are both homogeneous and tend to amalgamate. Thus, dyadic homogeneity did not seem to have robust independent impact. This is interesting from the perspective of the literature on optimal jurisdictions, where one would expect greater welfare losses when heterogeneous entities are created (Alesina & Spolaore 1997; Alesina et al. 2004). In a broader perspective, this indicates that structural factors (e.g., societal connectedness) appear to be most important when reshaping local government political jurisdictions.

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Appendix

Table A1. Logistic regression predicting which municipalities amalgamated (N = 1) in 2004

	Model A1	Model A2
Log (population size)	–1.86* (0.89)	–
Population size 20,000+ dummy	–	–4.64** (1.69)
Population density (inhabitants/1,000 km^2)	–8.96* (3.65)	–13.2** (3.88)
Island dummy	–	–
Taxation (10,000 DKK)	–0.19 (0.29)	0.17 (0.31)
Expenditure (10,000 DKK)	0.77 (1.17)	0.57 (1.09)
Social index (0–1)	2.22 (2.74)	5.16 (2.82)
Mayor (socialist = 1, other = 0)	–1.43 (0.93)	–0.93 (1.00)
Commuting	0.00 (0.05)	0.03 (0.04)
Percentage of inhabitants with university education	0.19 (0.11)	0.13 (0.11)
Constant	17.6 (11.1)	–3.78 (6.43)
N	265	265
Log likelihood	–26.15	–22.47
LR Chi^2	117.8	125.1
Pseudo R^2 (McFadden)	0.692	0.736

Notes: The coefficients are unstandardised logistic coefficients. Standard errors in parentheses. *** $p < 0.001$; ** $0.001 < p < 0.01$; * $0.01 < p < 0.05$. In both regressions, the island dummy dropped out along with three cases it predicted perfectly. Bornholm was excluded due to a prior amalgamation, and Copenhagen and Frederiksberg were dropped due to their special status as municipalities and counties. A shift in the population size dummy in column 2 from 0 to 1 corresponds to a change in predicted probability from 0.997 to 0.744. All data are census data from the Ministry of Interior and Health and Statistics Denmark.

Table A2. Variables and descriptive statistics for the analysis of the amalgamation of individual municipalities (Table A1)

Variable name	Variable coding	Variable function	Mean	Standard deviation
Amalgamation	1 = the municipality amalgamated 0 = the municipality did not amalgamate	Dependent variable	0.88	0.32
Log (population size)	Natural logarithm of population size	Independent variable	9.43	0.80
Population size 20,000+ dummy	1 = the municipality has 20,000+ inhabitants 0 = the municipality has 0–20,000 inhabitants	Independent variable	0.23	0.42
Population density	Inhabitants/1,000 km^2	Independent variable	0.27	0.81
Island	1 = the municipality is an island 0 = the municipality is not an island	Independent variable	0.01	0.12
Taxation	Taxation foundation per capita before governmental redistribution in 10,000 DKK	Independent variable	12.9	2.42
Expenditures	Gross expend. per capita in 10,000 DKK	Independent variable	4.89	0.54
Social index	Summary index calculated on a wide range of socio-economic criteria	Independent variable	0.82	0.25
Mayor	1 = SD or SPP mayor 0 = other party mayor	Independent variable	0.32	0.47
Commuting	Average of commuting in and commuting out percentages	Independent variable	46.5	13.5
Percentage of inhabitants with university education	Percentage of inhabitants with a university education	Independent variable	16.4	5.86

Notes: SD = Social Democrats, SPP = Socialist People’s Party. All data are census data from the Ministry of Interior Health and Statistics Denmark.

Table A3. Correlation matrix for the variables included in the analysis of the amalgamation of individual municipalities (Table A1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Amalgamation (1)	–										
Log (population size) (2)	–0.45	–									
Population size 20,000+ dummy (3)	–0.50	0.80	–								
Population density (4)	–0.51	0.46	0.51	–							
Island (5)	–0.33	–0.11	–0.06	–0.03	–						
Taxation (6)	–0.39	0.38	0.37	0.38	–0.03	–					
Expenditures (7)	–0.26	0.26	0.36	0.10	0.10	0.00	–				
Social index (8)	–0.28	0.50	0.54	0.20	0.03	0.01	0.79	–			
Mayor (9)	–0.17	0.25	0.31	0.11	–0.08	–0.07	0.30	0.33	–		
Commuting (10)	–0.22	–0.04	0.02	0.34	–0.29	0.50	–0.11	–0.14	0.01	–	
Percentage of inhabitants with university education (11)	–0.31	0.45	0.37	0.39	0.06	0.77	0.03	0.10	–0.03	0.30	–

Note: The coefficients are pairwise correlations.

Table A4. Variables and descriptive statistics for the analysis of the amalgamation of municipal dyads (Table 4)

Variable	Variable coding	Variable function	Mean	Standard deviation
Amalgamation	1 = the dyad amalgamated 0 = the dyad did not amalgamate	Dependent variable	0.01	0.10
Commuting	For each municipality the share of its working inhabitants that commute to the other municipality in the dyad is found. Then the average of the two shares is found. The variable can in theory range between 0 and 1.	*H1*	0.00	0.01
Diff. national election left party vote prop.	The abs. diff. in the prop. votes for left parties at the national election in the dyad	*H2*	0.07	0.06
Diff. in mayor	1 = other-SD/SPP or SD/SPP-other mayor 0 = SD/SPP-SD/SPP or other-other mayor	*H2*	0.43	0.50
Diff. in taxation level	The abs. diff. in taxation level (i.e., tax levels) in the dyad	*H2*	1.16	0.91
Diff. in service level	The abs. diff. in municipal service levels in the dyad	*H2*	0.07	0.06
Diff. in taxation	The abs. diff. in taxation foundation in the dyad before governmental redistricting (in 10,000 DKK)	*H3*	2.13	2.66
Diff. in expenditures	The abs. diff. in gross expenditures in the dyad (in 10,000 DKK)	*H3*	0.58	0.49
Diff. in long-term debt	The abs. diff. in long-term debt in the dyad (in 10,000 DKK)	*H3*	0.53	0.49
Diff. in social index	The abs. diff. in the government-issued social index in the dyad	*H3*	0.27	0.23

Table A4. Continued.

Variable	Variable coding	Variable function	Mean	Standard deviation
Total population size	The total population size of the dyad (in 10,000 s)	*H4*	3.55	3.63
Diff. in population size	The abs. diff. in population size in the dyad (in 10,000 s)	Control	1.70	3.22
Diff. in population density	The abs. diff. in population density in the dyad (in inhabitants/1,000 km^2)	Control	0.03	0.05
Neighbour dummy	1 = the two municipalities are neighbours 0 = the municipalities are not neighbours	Control	0.02	0.13
Neighbour's neighbour dummy	1 = the two municipalities are neighbour's neighbours 0 = the municipalities are not neighbour's neighbours	Control	0.03	0.17
Number of neighbours	The total number of neighbours for the two municipalities in the dyad	Control	9.04	2.45
Number of neighbour's neighbours	The total number of neighbour's neighbours of the two municipalities in the dyad	Control	15.9	4.92
Number of amalgamations	Total number of amalgamations in which the two municipalities engage	Control	3.76	1.56

Note: SD = Social Democrats, SPP = Socialist People's Party.

Table A5. Correlation matrix for the variables included in the analysis of the amalgamation of municipal dyads (Table 5)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Amalgamation (1)	–																	
Commuting (2)	0.52	–																
Diff. national election left party vote (3)	–0.04	–0.02	–															
Diff. in mayor (4)	–0.00	0.01	0.18	–														
Diff. in taxation level (5)	–0.04	–0.04	0.14	–0.01	–													
Diff. in service level (6)	–0.03	–0.03	0.06	0.03	0.19	–												
Diff. in taxation (7)	–0.04	–0.04	0.05	–0.06	0.29	0.06	–											
Diff. in expenditures (8)	–0.03	0.02	0.34	0.12	0.23	0.30	–0.01	–										
Diff. in long-term debt (9)	–0.01	–0.02	0.07	–0.00	0.15	0.18	0.04	0.21	–									
Diff. in social index (10)	–0.02	0.06	0.37	0.14	0.09	0.08	–0.03	0.63	0.15	–								
Total population size (11)	–0.02	0.15	0.12	0.08	–0.03	0.02	0.11	0.17	–0.06	0.29	–							
Diff. in population size (12)	–0.02	0.15	0.13	0.07	–0.03	0.02	0.07	0.18	–0.04	0.30	0.94	–						
Diff. in population density (13)	–0.04	–0.01	0.23	0.10	0.10	0.20	0.42	0.20	0.02	0.19	0.29	0.25	–					
Neighbour dummy (14)	0.53	0.68	–0.04	–0.01	–0.05	–0.04	–0.05	–0.03	–0.02	–0.02	0.02	0.01	–0.04	–				
Neighbour's neighbour dummy (15)	0.16	0.18	–0.05	–0.01	–0.05	–0.04	–0.06	–0.05	–0.01	–0.03	0.01	0.00	–0.04	–0.02	–			
Number of neighbours (16)	0.01	0.05	0.10	–0.03	–0.15	–0.06	–0.08	–0.03	–0.14	0.03	0.22	0.18	–0.02	0.07	0.08	–		
Number of neighbour's neighbours (17)	–0.10	0.02	0.07	–0.05	–0.14	–0.03	–0.04	–0.11	–0.09	–0.04	0.09	0.06	–0.04	0.05	0.11	0.72	–	
Number of amalgamations (18)	0.07	–0.01	–0.02	–0.06	–0.05	–0.15	–0.29	–0.08	–0.04	0.00	–0.19	–0.15	–0.39	0.02	0.01	0.27	0.04	–

Note: The coefficients are pairwise Pearson correlations.

Notes

1. The island municipality of Bornholm is excluded due to a prior amalgamation in 2003, where the five municipalities on the Baltic island merged to form a single municipality. Copenhagen and Frederiksberg are omitted due to their dual status as municipalities and counties (which occasionally results in a lack of comparative data). None of the three municipalities amalgamated, and including them in the analysis produces substantively identical results to those found in Tables 1–4.
2. A drawback of this solution is that the results may be sensitive to misspecification of the geographic controls. One intriguing alternative strategy would be to analyse how municipalities join clusters of partners rather than analysing two-by-two dyads. This strategy would completely eliminate the trade-off between the loss of generality and the risk of misspecification due to geography. Although this is an intriguing option, the current analytical strategy is chosen for two main reasons. First, the cluster strategy is in practice impossible to operationalise empirically because one cannot objectively identify which clusters are given since in most cases all the partners involved announced their amalgamation simultaneously. Second, it will turn out that omitted geographic controls do not seem to be what drive the results of this article since the eventual results are similar to a situation where irrelevant geographic variation is eliminated by case selection.
3. We also experimented with taking the percentage difference between the highest value in the dyad and the lowest value in the dyad. The results for the absolute difference and the percentage difference were substantively identical.
4. The financial well-being of the post-reform municipality should be in the interest of rational local officials (and not only the citizens) for at least two reasons. First, obtaining a bad deal could increase the likelihood of electoral defeat (due to bad perceived performance). Second, even if elected in the new municipality, governing parties with a bad amalgamation deal would have to initiate service cutbacks or tax increases for their old constituency, which likely would cause decline in approval among their core constituency.
5. The social index is a summary measure describing the municipalities' relative expenditure needs due to a range of socio-economic variables: the number of children living with single parents; the number of adults without employment; the number of foreigners from Third World countries; the number of older/outdated housing units; and the number of inhabitants in social ghettos. An index value above 1 indicates an above average level of 'demanding'/expensive clients, whereas a value below 1 indicates relatively few weak clients (Ministry of the Interior and Health 2008).
6. Detailed tables for all robustness tests reported are available from the authors upon request.
7. Note the results are *not* likely to be a reflection of the fact that larger municipalities may attract more labour from other entities. First, population size is thoroughly controlled in the model. Second, the population size variables are (partially) negatively correlated with the dependent variable and positively correlated with commuting so any eventual omitted population-size-related variance is not likely to explain the large positive effects for commuting. Third, as a robustness test, an indicator for labour opportunities and a rank ordering of neighbouring municipalities by population size was experimented with. These could not account for the results on the commuting variable (the additional controls were insignificant and the commuting variable even increased slightly further in magnitude).

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