Compulsory amalgamation Vs compulsory cooperation in local public goods provision

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Abstract

In recent years, municipal amalgamation and municipal cooperation are widespread practices especially in Europe.

While the political economy of municipal mergers in the presence of expenditure spillovers has been deeply described in literature, there is still a lack of theoretical analyses on the comparison between municipal mergers and municipal consortia in the local decision making process on local public goods allocations.

This paper aims to fill this gap analysing the differences between compulsory municipal mergers and compulsory municipal consortia on the local public good provision from a public choice point of view in the presence of inequalities in the districts size.

The results provide some insights useful to the design of reforms aimed to the reorganization of local jurisdictions.

Keywords:
Municipal amalgamation, municipal cooperation, centralization, bargaining

1. Introduction

Small local governments are likely to be inefficient in public services provision and may underprovide local public goods. Small local jurisdictions can neither exploit scale and scope economies, nor internalize externalities. Furthermore, they may have too little fiscal capacity to provide standard services.

A possible solution to this problem is a system of intergovernmental grants in order to compensate them for not achieving scale economies and,
as a consequence, make possible the provision of local services in line with national standards (Boadway and Hobson 1993).

An alternative solution is to increase the local districts’ size. Such result is usually obtained centralizing local public goods’ provision by means of territorial reforms, pushing local councils to amalgamation or association in order to reach the optimal scale of production. The key driver of this policy is the assumption that local public service provision is characterized by economies of scale and scope, meaning that a reduction in per capita expenditure or a lower tax and debt burden can be realized by centralizing local services of small municipalities.

A number of empirical studies, such as Breunig and Rocaboy (2008), Solé-Ollé and Bosh (2005) and Bönisch et al. (2011), confirm the existence of a U-shaped municipal per capita expenditure curve. Others, such as Sampaio de Sousa et al. (2005) and Gimenez and Prior (2007) conclude that municipal efficiency increases almost linearly with population size. In contrast, the study by Loikkanen and Susiluoto (2005) suggests that small municipalities are more efficient. It follows that the empirical evidence on the existence of scale economies in local public goods provide inconsistent results and amalgamation or other form of policies aimed to centralize the provision of local public goods and services do not necessarily lead to improvements in efficiency.

However, scale economies are not the sole determinant of the level of the local public goods provided in each jurisdiction.

As inhabitants of municipalities usually benefit from the services provided in neighbouring municipalities, the inter-jurisdictional spillover may give rise to severe underprovision as local voters do not take into account the effect of the public good provision on the neighbour municipality (Oates 1972 and Dur and Staal 2008). A natural policy response to these problems is to consolidate municipalities making possible that local voters internalize spillovers in their decision on the provision of local public goods.

It follows that municipal amalgamation and municipal cooperation could be useful in the absence of scale economies too. For this reason, in recent times many countries undertook reforms aimed to consolidate local governments in various forms.

Other motivations on the desirability of municipal mergers or municipal consortia are regularly discussed. They range from strategic issues of spatial fiscal competition to political considerations of how a larger electorate undermines political accountability and participation in the political process. For further details see Jordahl and Liang (2010), Lassen and Serritslew (2011) and Janeba and Osterloh (2013), among others.
Despite the presence of scale economies in local public services provision is questionable, municipal amalgamation is a widespread practice all over the world (Fox and Gurley 2006) and especially in Europe.\footnote{See the special issue of \textit{Local Government Studies}, Vol. 36, No. 2, 2010.} For Example, in 2008, Denmark reduced the number of its municipalities from 350 to 100. Finland, since 2006, reduced the number of municipalities from around 450 down to 320. In Greece (2010) the number of municipalities has been reduced from 1033 to 325.

The number of municipalities in West Germany went down from over 24,175 to 8,506 over the time period 1952 to 1990. After reunification, the number of municipalities continued to decrease from then 16,127 to 11,091 over the time period 1991 to 2015. Similar trends can be observed in Switzerland where the number of municipalities was reduced from 3,203 in 1850 to 2,352 in 2014, when a significant number of municipal mergers took place.

In all cases cited above, municipal amalgamation has been compulsory for some categories of municipalities, in general the smaller ones.

An alternative form of centralization is the constitution of “municipal consortia”. Such forms of municipal cooperation can be compulsory or discretionary. In the latter case usually municipal cooperation is incentivated through a system of grants that permit to provide extra public goods to municipal consortia. For example, this is the case of France.

An unusual system has been adopted in Italy. In fact at the beginning, from Dlgs 267/2000 the “Unione di Comuni” is the local inter-municipal body where municipalities \textit{voluntary} decide to provide jointly local public goods to citizens. Such bodies were (and, in part, are) incentivated by means of grants similar to those adopted in France.

In recent times, incentives to voluntary cooperation diminished and Italy seems to abandon the voluntary co-operation approach in favour of mergers or \textit{compulsory} municipal consortia called “Unioni di Comuni”. In particular, from 2012, with law 135, both voluntary and compulsory associations of local governments coexist but small municipalities are obliged to jointly provide local public goods related to the so-called fundamental expenditure functions.

Such reforms, in Italy, France and in the rest of the Europe, usually are based on the assumption that “bigger districts” means necessarily an higher provision of local public goods. However, the choice on the local public goods provision depends also on political and institutional factors related to
the decisional process within local jurisdictions.

When incumbents are pure rent-seekers as described by Kotsogiannis and Schwager (2008) and Allers (2012), the question is why rent-seeking incumbents should cooperate. Recent literature (Di Liddo and Giuranno 2016) on local rent seeking specifically tries to answer the question, showing some results on the differences between compulsory and discretionary consortia in the centralized rent splitting between local administrators. In particular, (Di Liddo and Giuranno 2016) show that pure rent-seekers administrator may chose to cooperate in order to soft yardstick competition and extract higher rents, making municipal consortia ineffective in improving the local public goods provision.

When local administrators are not rent seekers, the utility functions of citizens (median voters) and of administrators coincide, and the representation of citizens’ requests is consistent. It follows that, in case of merged municipalities and majority vote, the outcome will coincide to the preferences of the median voter of the merged municipality. Such preferences are likely to be different to the preferences of the median voters of each district.

On the other hand, in case of municipal consortia, municipalities remains politically autonomous and local majors bargain on the centralized provision of local public goods. Giuranno (2010) provides an example of bargaining on the centralized production of public goods.

It follows that such different forms of decision making may have different effects on the “centralized” provision of the local public goods and, while the political economy of municipal mergers has been deeply described by Dur and Staal (2008), there is a lack of theoretical analyses on the differences between municipal mergers and municipal consortia in the decision making process on the amount of local public goods in local jurisdictions.

This paper aims to close this gap highlighting possible different results between compulsory mergers and compulsory consortia in the local public good provision, assuming constant returns of scale in the presence of spillovers between jurisdictions. The following analysis will try to answer to the following research questions. Which jurisdiction gain from local mergers, local consortia or autonomy? What solution is closer to the social optimal outcome on public good provision? In what circumstances (spillover levels and differences in local tax bases)?

In particular, we will focus the analysis on the case of benevolent local governments since the case of pure rent seeking has been already partially analysed by Di Liddo and Giuranno (2016). The following analysis may help in designing further reforms on the institutional reorganization of local governments and jurisdictions.
More precisely, we will model municipal amalgamation as in the well-known model of Dur and Staal (2008). Their set-up is close to Besley and Coate (2003), who study the centralized provision of local public goods when expenditure needs are not uniform across jurisdictions. The main differences from Besley and Coate (2003) and Dur and Staal (2008) is that the latter endogenize the decision on centralization and that they allow for transfers from a higher-level government. Here, for simplicity, we do not discuss local decision on centralization or cooperation and we focus our analysis on the compulsory forms of centralization, in order to better fit most of the real cases of reforms adopted in the European context.

Instead, we will model compulsory municipal cooperation under the form of municipal consortia between independent municipalities. In such consortia, elected delegates bargain on the public goods levels in order to maximize the utility of their jurisdictions’ median voters.

Note that this set-up may appear similar to that in Feidler and Staal (2012), who model the trade-off between centralized and decentralized decision making over the local public good decisions in a legislature of locally representatives. However, differently to Feidler and Staal (2012), where the two elected representatives simultaneously but separately determine the levels of public goods in each district, here the two elected representatives bargain over the levels of two different public goods that remain produced separately by each district.

The rest of the paper is organized as follows: in Section 2 we illustrate the basic theoretical framework provided by Dur and Staal (2008); in Section 3 we illustrate the results, in terms of provision of local public goods, in the presence of compulsory amalgamation; we move on with doing the same in the presence of compulsory cooperation in Section 4; in Section 5 we study the effect of the two different of centralization on the population welfare. We conclude with Section 6 in which we provide some comments on the comparison between the results obtained in the previous sections. In Appendix we provide a brief focus on the Kalai and Smorodinsky (1975) solution (KSS) to bargaining problems used in this paper.

2. The model

Following Dur and Staal (2008), we consider a country consisting of two jurisdictions. Each region consists of two districts (also called municipalities

\footnote{Feidler and Staal (2012) show that there’s a conflict of interest between citizens (and the relative representatives) in different jurisdictions.}
or jurisdictions) that differ from each other in population size; otherwise they are identical. The population size of district $i$, with $i \in \{B, S\}$, is denoted by $\alpha_i$. We assume that $\alpha_B > \alpha_S$ and that inhabitants are homogenous and immobile in each district. For simplicity, we normalize to unity the population size within each region; that is:

$$\alpha_B + \alpha_S = 1.$$  \hspace{1cm} (1)

Municipalities provide local public goods by majority rule. The amount of public goods provided in district $i$ is denoted by $g_i$. Local provision produces positive spillovers across jurisdictions. The utility function of an inhabitant of jurisdiction $i$ is

$$U_i = \sqrt{g_i} + k\sqrt{g_j} + y - \tau_i$$  \hspace{1cm} (2)

where $g_j$ is the amount of public spending chosen by the other district, $k \in [0, 1]$ measures the degree of spillovers, $y$ denotes the before-tax private income per capita and $\tau_i$ is the individual lump-sum tax in jurisdiction $i$.

Note that we abstract from intra-jurisdictional income heterogeneity and that taxes are non-distortionary. A convenient implication is that we can normalize income to the unit and omit $y$ in some computations. As a consequence, equation (2) can be rewritten as:

$$U_i = 1 + \sqrt{g_i} + k\sqrt{g_j} - \tau_i,$$  \hspace{1cm} (3)

where $\tau_i \in [0, 1]$. The cost of the local public goods is equal to $p$ units of private goods.

Since, local governments use $\tau_i$ in order to finance $g_i$, their budget constraint is:

$$pg_i = \alpha_i\tau_i.$$  \hspace{1cm} (4)

When the two jurisdictions merge to one municipality, the latter will have a unified budget, as follows:

$$p(g_i + g_j) = \tau^M$$  \hspace{1cm} (5)

where, $\tau^M$ is the centralized head tax of the merged municipality. Instead, when districts form one municipal consortium, the budget constraint of the consortium is:

$$p(g_i + g_j) = \tau^C$$  \hspace{1cm} (6)
where, $\tau^C$ is the head tax needed to implement local public goods when policy is chosen by the consortium, with $\tau^C \leq \tau^M$. Therefore, since the budget constraint (6) has the same form of (5), we are focusing on consortia with operative functions, decentralized budgets and shared revenue responsibilities. Furthermore, we assume that the municipal consortia can not discriminate between inhabitants of the two districts. As a consequence, the per capita lump-sum tax $\tau$ is the same between districts.

A possible extension of the model can be obtained by assuming a mere coordination consortia that do not share revenue responsibilities and preserve fiscal autonomy. It follows that, in this case, the budget constraints remain separate as in equation (4) and the consortium can discriminate between citizens of different districts.

2.1. Decentralized provision Vs. Social Optimum

Following Dur and Staal (2008), we first define the social optimum (SO) as the outcome that maximizes the unweighted sum of utilities of all individuals in the region:

$$SO \equiv \arg \max_{g_B, g_S} (\alpha_B (\sqrt{g_B} + k\sqrt{g_S}) + \alpha_S (\sqrt{g_S} + k\sqrt{g_B}) - pg_B - pg_S + 2)$$

(7)

The social surpluses maximizing public good levels ($g^SO_B, g^SO_S$) that result from this optimization problem are:

$$g^SO_B = \frac{1}{4} \frac{(k\alpha_S + \alpha_B)^2}{p^2}$$

(8)

$$g^SO_S = \frac{1}{4} \frac{(k\alpha_B + \alpha_S)^2}{p^2}.$$  

(9)

Now, we consider the case where districts remain autonomous. Recalling that voters are homogenous within districts, it follows that the median voter of jurisdiction $i$ has the same preferences of each single inhabitant in her jurisdiction. Hence, the outcome of the majority voting in district $i$ is found
by maximizing equation (3) with respect to $g_i$ and $\tau_i$ subject to the budget constraint (4). The resulting equilibrium levels of public goods $(g_B^*, g_S^*)$ are:

$$g_B^* = \frac{1}{4} \frac{\alpha_B^2}{p^2};$$  \hspace{1cm} (10)

$$g_S^* = \frac{1}{4} \frac{\alpha_S^2}{p^2}. $$ \hspace{1cm} (11)

Furthermore, the distances between the non cooperative levels of local public goods and the social optimum are:

$$g_{SO}^B - g_B^* = \frac{k\alpha_S (k\alpha_S + 2\alpha_B)}{4p^2}$$  \hspace{1cm} (12)

and

$$g_{SO}^S - g_S^* = \frac{k\alpha_B (k\alpha_B + 2\alpha_S)}{4p^2}$$  \hspace{1cm} (13)

where, $g_{SO}^B - g_B^* > 0$ and $g_{SO}^S - g_S^* > 0$; that is, decentralised outcomes lead to underprovision of local public goods since voters do not take into account the spillover effect on the neighbour district.\footnote{See also Besley and Coate (2003).} Furthermore, such underprovision is more severe for larger spillover effects and for the district with a larger population size.\footnote{Note that, when $\alpha_B \approx 1$ and $\alpha_S \approx 0$, then $g_{SO}^B \approx g_B^*$. Furthermore, when $\alpha_B \approx \frac{1}{2}$ and $\alpha_S \approx \frac{1}{2}$, then $g_{SO}^B \approx g_{SO}^S \approx \left(\frac{1+k}{16p}\right)^2$ and $g_B^* \approx g_S^* \approx \left(\frac{1}{16p}\right)^2$.}

3. Compulsory amalgamation Vs social optimum

Now we consider the case where the central government imposes municipal consolidation within each region. When districts consolidate into one municipality, the inhabitants of the most populated centre are in a majority and, therefore, $g_B$ and $g_S$ are set according to their wishes. In fact, recalling that voters are homogenous within districts, it follows that the median voter of the resulting new municipality corresponds to the median voter of municipality $B$.

Maximizing equation (3) with respect to $g_B$ and $g_S$, subject to the budget constraint (5), results in:

$$g_M^B = \frac{1}{4p^2};$$  \hspace{1cm} (14)
\[ g_s^M = \frac{k^2}{4p^2}. \]  

Note that, in this case, \( g_s^M \) is increasing in the spillover \( k \); that is \( g_s^M \) increases when the welfare of jurisdiction \( B \) increases. As a result, municipal amalgamation fails to fully internalise spillovers.

Comparing equations (14) and (15) with (8) and (9), we can compute the distances between the levels of local public goods under amalgamation and the social optimum:

\[ g_{SO}^B - g_B^M = \frac{(k\alpha_S + \alpha_B)^2 - 1}{4p^2}; \]  
\[ g_{SO}^S - g_S^M = \frac{(k\alpha_B + \alpha_S)^2 - k^2}{4p^2}. \]

Note that \( g_{SO}^B - g_B^M \leq 0 \) and \( g_{SO}^S - g_S^M \geq 0 \).

Equations (16) and (17) tell us that consolidation leads to overprovision of public goods in the big district, whereas underprovision of public goods in the small district persists. The intuition is that consolidation broadens the tax base and, consequently, the per capita tax per unit of public good is lower. This induces the median voter of the merged city, who coincides to the median voter of the bigger district, to increase the amount of public good provided in \( B \) and decrease the amount of public good provided in \( S \) without taking into account the damage to the inhabitants of the smaller district.

Comparing equation (15) with (11), it follows that consolidation increases public goods supply in the smaller district if spillover is larger enough; e.i., if \( k > \frac{\alpha_S}{\alpha_B + \alpha_S} \).

Now we can compare the distances from the social optimal allocation in case of amalgamation to those in case of single municipalities.

In order to do that, we first study the following inequality:

\[ |g_{SO}^B - g_B^*| > |g_{SO}^B - g_B^M|. \]  

Substituting equation (12) and (16) into (18) and solving we obtain:

\[ |g_{SO}^B - g_B^*| > |g_{SO}^B - g_B^M| \Leftrightarrow k > \frac{1}{2} \frac{2\alpha_B - \sqrt{2\alpha_B^2 + 2}}{1 - \alpha_B}. \]

Figure 1 reports the solution described in equation (19). As we can see from Figure 1, even if the decentralized and the centralized outcome
are both suboptimal, the decentralized outcome is more distant from the optimal level of local public good $g_B$ in the presence of high spillover.

Figure 1 provides a clear intuition. When $\alpha_B$ increases, then in the social optimum computation (7) the utility of voters in district $B$ is weighted more and $g_B^{SO}$ tends to $g_B^*$. As a consequence, for high $\alpha_B$ and $k$ the decision on $g_B$ and $g_S$ taken by the inhabitants of the bigger district (the decisive voters in the merged municipality) is closer to the optimal outcome.

On the contrary, for relatively small $\alpha_B$ and $k$ the “dictatorial” power of the inhabitants of the biggest district leads to higher distance from the optimal level of the public good $g_B$ if compared to the decentralized outcome.

Now we study the following inequality:

$$|g_S^{SO} - g_S^*| > |g_S^{SO} - g_S^M|.$$  \hspace{1cm} (20)

Substituting equation (13) and (17) into (20) and solving we obtain:

$$|g_S^{SO} - g_S^*| > |g_S^{SO} - g_S^M| \iff \alpha_S < k.$$  \hspace{1cm} (21)

Figure 2 reports the solution described in equation (21). The intuition is the same. When $\alpha_S$ decreases, even small values of $k$ makes the decentralized solution more distant from the social optimal level of $g_S$ if compared to the centralized one. In fact, in the social optimum the utility of voters in district $S$, who represents a small minority of total population, is weighted less. It follows that, for small values of $\alpha_S$, the decentralized solution is more distant from the social optimal provision of $g_S$ than the centralized one even if the spillover is small.

That is, when $\alpha_S$ is relatively small, if district $S$ remains autonomous it doesn’t take into account the positive effect of the local public good $g_S$ on the welfare of the population of district $S$, which represent in this case the great majority of the total population.

It follows that the welfare loss is greater than that caused by inhabitants of district $B$ to those of district $S$, imposing their preferred amount of public good $g_B$ in the presence of amalgamation.
4. Municipal cooperation VS social optimum

Here, we consider the case where the central government imposes the creation of municipal consortia within each region. When districts form
a municipal consortium, there is a negotiation on the levels of \( g_B \) and \( g_S \) between the delegates (median voters) of the two districts \( B \) and \( S \), set according to their wishes, given the budget constraint (6).

In this section, we will derive the Kalai and Smorodinsky (1975) solution (KSS) of the bargaining game between the local delegates.\(^6\)

If the central government imposes functional consortia and an homogeneous tax between districts \( B \) and \( S \), then the KSS is the combination of \( g_B \) and \( g_S \) that gives the maximum available utilities to median voters \( B \) and \( S \), satisfying condition

\[
\frac{U^a_B - U^d_B}{\hat{U}_B - \hat{U}^d_B} = \frac{U^a_S - U^d_S}{\hat{U}_S - \hat{U}^d_S},
\]

(22)
given the budget constraint (6).

In equation (22), \( U^a_i \) is the agreement utility, \( U^d_i \) is the disagreement utility and \((\hat{U}_B, \hat{U}_S)\) is the so-called “utopia point” or “claim point”. Informally, the Utopia Point is the ideal point that gives, for each agent, the maximum utility level that can be reached in an individually rational agreement. That is, the outcome awarding each player the maximum amount of utility possible. In most of the cases of interest, the Utopia point lies outside the set of feasible solutions.

The geometrical interpretation of the KSS is the follows. Drawing a line \( l \) connecting the disagreement point to the Utopia point, the point of intersection between \( l \) and the Pareto utility frontier is the KSS. That is, The KSS is the point arrived at when each player makes “appropriate” relative concessions from the Utopia point. The solution point identified by the KSS doesn’t necessarily coincide to that identified by the NBS.

Since in case of compulsory cooperation there are no disagreement points, following Di Liddo and Giuranno (2016) we set the disagreement point equal to \((0, 0)\). It follows that the (22) is reduced to

\[
\frac{U^a_B}{U^a_S} = \frac{\hat{U}_B}{\hat{U}_S},
\]

(23)

That is, the result of negotiation must be the point which maintains the ratios of maximal gains on the Pareto frontier. We will now procede to compute the KSS in case of homogeneous tax.

Substituting the budget constraint (6) into equation (3) we obtain

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\(^6\)In the Appendix we provide some insights on the geometrical meaning of the KSS.
\[ U_i = 1 + \sqrt{g_i} + k\sqrt{g_j} - pg_i - pg_j. \] (24)

for \( i \in (B, S) \) and \( i \neq j \).

Maximizing equation (24) with respect to \( g_B \) and \( g_S \) for player \( S \) and \( B \) respectively, we obtain that

\[ \hat{U}_B = \hat{U}_S = 1 + \frac{1+k^2}{4p} \] (25)

for both delegates.

It follows that the KSS must satisfy

\[ \frac{U_B^a}{U_S^a} = 1. \] (26)

Straightforwardly, in this case, the equilibrium is found when both delegates choose the \( g_B = g_S = g_{FC} \) on the Pareto frontier.

That is, \( g \) is chosen such that:

\[ g_{FC} = \arg \max_g (1 + \sqrt{g} + k\sqrt{g} - 2 pg). \] (27)

It follows that

\[ g_B = g_S = g_{FC} = \left( \frac{1+k}{4p} \right)^2. \] (28)

Comparing equation (28) with (8) and (9), we can compute the distances between the levels of local public goods under municipal consortium and the social optimum:

\[ g_{SO}^B - g_{FC}^B = \frac{(2k\alpha_S + 2\alpha_B)^2 - (1+k)^2}{16p^2}; \] (29)

\[ g_{SO}^S - g_{FC}^S = \frac{(2k\alpha_B + 2\alpha_S)^2 - (1+k)^2}{16p^2}. \] (30)

Note that since \( \alpha_B > 1/2 \) for construction, then it is \( g_{SO}^S - g_{FC}^S \geq 0 \) and \( g_{SO}^S - g_{FC}^S \leq 0 \). Equations (29) and (30) tell us that cooperation in the presence of consolidated budget and uniform taxation leads to underprovision of the local public good in district \( B \) and overprovision in district \( S \).

The intuition is that cooperation broadens the tax base as in the amalgamation case but, on the other hand, in the presence of delegation the small district preferences are more represented than in the previous case, since
here both delegates has the same bargaining power, independently to their districts’ sizes.

We can now compare equation (12) with equation (29) and equation (13) with equation (30).

First we study the following inequality:

$$|g_{SO}^B - g_B^*| > |g_{SO}^B - g_{FC}^B|.$$  \hfill (31)

Substituting equation (12) and (16) into (31) and solving we obtain:

$$|g_{SO}^B - g_B^*| > |g_{SO}^B - g_{FC}^B| \iff \alpha_B < \frac{1 + k}{2}.$$  \hfill (32)

Figure 3 reports the solution described in equation (32). As we can see from Figure 3, in the presence of functional municipal consortia, even if the decentralized and the centralized outcome are both suboptimal, the decentralized outcome is more distant from the optimal level of the local public good $g_B$ when the population share of the bigger district is smaller than a threshold value. Such threshold value increases when the spillover $k$ increases.

The intuition is that when the population share $\alpha_B$ is close to $\frac{1}{2}$, then the ratio between districts’ population is close to one and the bargaining, that for construction assign the same decisional power to both delegates, better reflect the ratio between districts sizes. As a consequence, in this case $g_{SO}^B \approx \left(\frac{1+k}{2kp}\right)^2 \approx g_{FC}^B$, that is, the centralized provision is very close to the social optimum.

Now we study the following inequality:

$$|g_{SO}^S - g_S^*| > |g_{SO}^S - g_{FC}^S|. \hfill (33)$$

Substituting equation (13) and (17) into (20) and solving we obtain:

$$|g_{SO}^S - g_S^*| > |g_{SO}^S - g_{FC}^S| \iff \alpha_S > \frac{\sqrt{2k^4 + 3k^2 - 2k + 1} + 4k(k-1)}{4k^2 - 8k + 2}. \hfill (34)$$

Figure 4 reports the solution described in equation (34). As we can see, the presence of functional municipal consortia leads to levels of the local public good $g_S$ closer to the social optimum when the population share $\alpha_S$ is greater than a threshold value that decreases when the spillover increases.

The intuition is that when the population shares of the smaller district is close to $\frac{1}{2}$, the jurisdictions are similar and the decision making
Figure 3: Values of $\alpha_B$ and $k$ that makes the functional union better than the decentralized solution in terms of distance from the optimal levels of local public good $g_B$.

Figure 4: Values of $\alpha_S$ and $k$ that makes the functional union better than the decentralized solution in terms of distance from the optimal levels of local public good $g_S$.

trough bargaining (in which both delegates have the same bargaining power) represents an equilibrate way to internalize spillover. In fact, in this case $g_S^{SO} \approx \left(\frac{1+k}{10p}\right)^2 \approx g_S^{FC}$, that is the centralized provision is very close to the
social optimum.

When the $\alpha_S$ is small, than the delegation gives to the smaller jurisdiction a relatively high power in deciding the amount of local public goods in jurisdiction $B$ and the decentralized solution less distant from the social optimal one.

5. Welfare analysis

The analysis presented above is related to the distances from the centralized provision of the local public goods and the optimal provision. We have examined cases in which municipal amalgamation and municipal cooperation lead to different situations, with some cases in which amalgamation leads to levels of $g_S$ and $g_B$ closer to the social optimum and cases in which cooperation leads to outcomes closer to the optimal provision. However the above analysis is limited to the distances between the levels of provision of $g_S$ and $g_B$. We can not derive any implication on the total social welfare from the analysis presented above. We only know that both amalgamation and cooperation lead to suboptimal provisions of $g_S$ and $g_B$. We can not derive any implication on the total social welfare from the analysis presented above. We only know that both amalgamation and cooperation lead to suboptimal provisions of $g_S$ and $g_B$ and that their Euclidean distances from the optimal provision is function of the different parameters of the problem considered, specifically, the difference between the population size in the two district and the magnitude of the spillover effect.

However, we are interested on the comparison of compulsory amalgamation, compulsory cooperation and the decentralized solution in terms of their implications on the level of welfare in both municipalities, considered as a unique society.

We know that the social optimal provision, that is, the level of $g_S$ and $g_B$ that maximizes the welfare function (7), will not be provided in any case. So in this section we are interested to compute and compare welfare levels under amalgamation, cooperation and decentralization in order to analyse the effects of the two forms of centralization in term of welfare instead of distance from the optimal level of provision.

Substituting (14) and (15) into equation (7) we obtain a level of social welfare in case of compulsory amalgamation ($W^M$) equal to:

$$W^M = \frac{2k^2\alpha_B - k^2 + 4k\alpha_S + 2\alpha_B - 1}{4p}. \quad (35)$$

Substituting the levels of $g_S$ and $g_B$ in equation (28) into equation (7) we obtain a level of social welfare in case of compulsory cooperation ($W^{FC}$) equal to:
Substituting (10) and (11) into equation (7) we obtain a level of social welfare in case of decentralized provision ($W^*$) equal to:

$$W^* = \frac{4k\alpha_B\alpha_S + \alpha_B^2 + \alpha_S^2}{4p}. \quad (37)$$

We first study the difference:

$$W^M - W^* = \frac{(k-1)^2(2\alpha_B - 2\alpha_S - 1)}{8p}. \quad (38)$$

Note that $W^M - W^*$ is greater than zero, that is, the total welfare under amalgamation is greater than the total welfare under cooperation, when $\alpha_B > \alpha_S + 1/2$. That is, when there is a large difference in the size of the bigger and the smaller municipality. It follows that, in the presence of a large city and a small village, is better to merge the two municipalities instead of creating a municipal consortium.

Now we study the difference:

$$W^M - W^* = \frac{(\alpha_B + \alpha_S - 1/2)(k + 1)^2}{4p}. \quad (39)$$

Note that $W^M - W^*$ is always greater than zero. It follows that, in the presence of spillover in local expenditure, municipal mergers increase welfare in any case if compared to the decentralized solution.

We can now study the difference:

$$W^C - W^* = \frac{k^2\alpha_S + (2\alpha_B - 1)k + \alpha_S}{2p}. \quad (40)$$

Note that $W^C - W^*$ is greater than zero when $\alpha_B > A$, where $A = -\frac{k^2\alpha_S - k + \alpha_S}{2k}$. Note that $A > 0$ when $\alpha_S > \frac{k}{k^2+1}$. We also can note that $\frac{\partial A}{\partial \alpha_S} = -\frac{k^2 + 1}{2k}$ and that $0 < \alpha_S < \frac{1}{2}$ for hypothesis. It follows that $\alpha_B$ must be greater than a threshold value that decrease in $\alpha_S$. In the case limit when $\alpha_S = 0$ we have that $A = 0$ and that the difference $W^C - W^* > 0$. It follows that $W^C - W^* > 0$ for each value of $\alpha_S$ greater than zero too.

From the present welfare analysis, it follows that both compulsory amalgamation and compulsory cooperation increase social welfare. However, in the presence of great disparities in the population size of the two districts,
amalgamation is preferred to cooperation. In the presence of similar sizes, cooperation is preferred to amalgamation.

6. Final remarks

The above analysis of the different allocations of local public goods under decentralization, compulsory municipal amalgamation and compulsory municipal cooperation shows that there are different effects of the two forms of centralization on the provision of the local public goods. In this section we will refer to “better” and “worst” allocation of \( g_B \) and \( g_S \) in terms of distances from the optimal levels.

Looking at Figures 1 and 3 we can see that amalgamation and cooperation do not lead to the same effect on the public good provided by jurisdiction \( B \). Figure 5 reports a comparison between the two situations.

Looking at Figure 5 it is apparent that, in the presence of high spillover and relatively small quota of inhabitants in the bigger district (region A of the graph), both amalgamation and cooperation leads to an improvement in the allocation of the local public good \( g_B \) in terms of distance from the social optimal amount. On the other hand, in the presence of small spillover and a relatively small population in district \( B \) (similar districts), cooperation leads to a better allocation of \( g_B \) while amalgamation is worst than decentralization (region B).

On the contrary, in the presence of high spillover and relatively high population in district \( B \) (high size disparities between districts), amalgamation leads to a better allocation of \( g_B \) while cooperation is worst than decentralization (region C).

Figure 6 reports a similar comparison between the two situations for the local public good \( g_S \).

Looking at Figure 6 it is apparent that, in the presence of high spillover, both amalgamation and cooperation lead to an improvement in the allocation of the local public good \( g_S \). On the other hand, in the presence of small spillover and a relatively high population in district \( S \) (similar districts), cooperation leads to a better allocation of \( g_S \) while amalgamation is worst than decentralization (region B).

Differently, in the presence of small spillover and relatively small population in district \( S \) (high size disparities between districts), amalgamation leads to a better allocation of \( g_S \) while cooperation is worst than decentralization (region C).

It follows that, while in the presence of high spillovers both compulsory amalgamation and compulsory cooperation are likely to leads to a better
allocation of local public goods, in the presence of small spillover and comparable districts, municipal consortia are preferred to municipal mergers. On the contrary, in context characterized by high disparities between districts amalgamation would be preferred.

Furthermore, looking at Figures 5 and 6 we can see that in the presence of low spillovers centralization in both forms do not necessarily lead to a better allocation of local public goods (blank area of the graphs).

Figure 5: Values of $\alpha_B$ and $k$ that makes the functional union and municipal amalgamation better than the decentralized solution in terms of distance from the optimal levels of local public good $g_B$.

The analysis of the distances from the social optimal levels of the public goods does not allow for any consideration on the effect of the two forms of centralization on the social welfare.

In Section 5 we have provided the analysis of the level of social welfare in all cases under consideration and we have showed that, in the presence of great disparities in the population size of the two districts, amalgamation is preferred to cooperation. In the presence of similar districts, cooperation is preferred to amalgamation.

The policy implication of this results are clear, the ideal reform on the reorganization of local jurisdiction would contain some elements of the reforms actuated in Denmark, Greece and Germany and other elements contained in French and Italian reforms. That is, amalgamation is preferred in case of metropolitan areas consisting of a densely populated core city and its less-
Figure 6: Values of $\alpha_S$ and $k$ that makes the functional union and municipal amalgamation better than the decentralized solution in terms of distance from the optimal levels of local public good $g_S$.

populated surrounding small districts, municipal consortia are preferred in the presence of metropolitan areas that include homogeneous satellite towns.

References


**Appendix: Nash Bargaining Solution and Kalai and Smorodinsky Solution** to bargaining problems

The first formal treatment of the bargaining agreement is due to John Nash, who defined a bargaining situation as one in which individuals have the opportunity to collaborate for mutual benefit in more than one way (Nash 1950).

There are two important ideas here. First, individuals must be in a position to generate a cooperative surplus. Second, because there are different ways in which they can cooperate, they cannot realize any of the surplus until they have decided exactly how they intend to cooperate. They must therefore come to some agreement about how their interaction will be organized.

Nash begins by defining the *bargaining space*. This space is constructed by first plotting the set of possible cooperative outcomes in terms of their payoffs as in Figure 7. Each point in this space represents a particular allocation of utility to the two players, and so can be represented \((u_1, u_2)\).

In this context, it is the expected utility that each player can achieve by refusing to cooperate. This is referred to as the *disagreement point*, and the associated outcome the *non-cooperative outcome*. Together, the bargaining space and the disagreement point specify a bargaining problem.

One common solution to bargaining problems is provided by Ehud Kalai and Meir Smorodinsky (1975).
According to Kalai and Smorodinsky (1975), important elements in a bargaining problem are the disagreement point, the bargaining space, and the “utopia point” or “claim point”. The utopia point is the outcome that would satisfy each player’s maximum claim, or “best-case” scenario.

When the bargaining problem is graphed, the claim point is easy to locate. Its coordinates are given by the maximum utility level each player can obtain. This is illustrated, for a typical bargaining space, in Figure 7.

The Kalai and Smorodinsky (1975) is based on the following axioms.

1 Efficiency: If \( a \) is a point in \( S \) such that there is another point \( b \) which is Pareto-superior to it, then \( a \) is not the bargaining solution.

1 Symmetry: If \( S \) is symmetric, then the bargaining solution is a point of the form \((a, a)\), that is, a point on the line \( u_1 = u_2 \).

1 Monotonicity: If a second bargaining set \( T \) is given, which has the same claim point as \( S \), but where player \( x \)’s maximum feasible utility level is higher at every utility level that player \( y \) may demand, then the bargaining solution of \( T \) should give player \( x \) at least as high a utility level as in \( S \).

Informally, the last axiom states that if the bargaining space is expanded in such a way that the welfare of one player can be improved without worsening that of the other, then that player should get at least as much in the expanded problem as in the initial one.

Kalai and Smorodinsky (1975) demonstrate that there is a unique point that satisfies all three axioms. If one constructs a line joining the disagreement point and the claim point, the bargaining solution is located at the point where this line intersects the Pareto frontier. This is illustrated in Figure 8.
Figure 7: A bargaining problem with utopia points. The area $S$ is the bargaining space.

Figure 8: A bargaining problem with utopia points