Inter-municipal cooperation between rent-seeking administrators in the presence of fiscal and institutional disparities

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Abstract

Asymmetric fiscal needs of municipalities bias yardstick competition between pure rent-seeking local administrators. There are cases where differences in institutional quality may mitigate this bias, in other cases the bias is exacerbated. While incumbents gain control over the political yardstick competition by cooperating in inter-municipal consortia, they increase the extracted rent lowering the quality of public services. The yardstick competition bias leads to asymmetric rent share that makes possible inter-municipal cooperation only if the institutional quality of the municipal consortia is low enough, depending on the minimum service quality set by the central government, and the average institutional quality of the single municipalities. Matching grants from upper levels of government or economies of scale may be incentives to cooperation since they reduce the cost of local public goods supply increasing the amount of total cooperative rent. However, they fail to increase the quality of local public services.

Keywords: Yardstick competition, Fiscal disparity, Institutions, Rent appropriation, Inter-municipal cooperation

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1 INTRODUCTION

Motivation and aim. By means of cooperation within municipal consortia, municipalities can pool expertise, and benefit from economies of scale (Bel and Warner, 2015). For these reason, inter-municipal cooperation (IMC) in public service delivery has become frequent (Bel and Warner, 2015; Tavares and Feiock, 2018), both in developed countries and in developing countries (Silvestre et al., 2020; Muraoka and Avellaneda, 2021). Many studies have found increased efficiency with cooperation (Bel and Sebő, 2021). However, this result is not unanimous, and more research is still needed, particularly regarding extended costs involved by cooperation (Drew et al., 2019), costs implied by more complex governance (Sørensen, 2007; Garrone et al., 2013), and greater rent extraction in municipal consortia (Di Liddo and Giuranno, 2016). In this paper we focus on this last side of the phenomenon of local cooperation. That is, the interplay among voluntary centralisation (cooperation), yardstick competition (YC) and rent seeking, when local government are characterized by different institutional quality. Indeed, the difference in the institutional quality of municipalities affects the YC functioning, and the amount of rent extracted in the non-cooperative setting (Farah, 2019), which in turn may affect the incentive to cooperate for rent-seeking incumbents.

Setting and results. We construct a theoretical model representing two different jurisdictions over a time horizon of two periods, capturing the usual municipal term limit in a variety of institutional settings (e.g., Italy, the US, the UK). In particular, municipalities differ in the cost of provision of the public service (fiscal disparity), and in the institutional quality. Following, Farah (2019), differences in the institutional quality lead to asymmetric costs of rent appropriation. The following theoretical model is an extension of the model of Di Liddo and Giuranno (2016), who studied the effects of fiscal disparity on IMC. Here we introduce a further source of disparity between jurisdictions, i.e., the asymmetric costs of rent appropriation.

In our model, in the first period, the public service is provided with a certain quality and new elections take place; in the second period, the public service is provided with the same or different quality. Each incumbent aims at extracting the highest attainable rent, considering the other incumbent's behaviour and its impact on the probability of re-election. As in Kotsogiannis and Schwager (2008), voters are uninformed of the cost of services and do not observe the rent-seeking behaviour of the incumbent of their jurisdiction. Hence, they assess her performance being based on the supplies of public services in both jurisdictions. An incumbent providing poorer services will see her jurisdiction fare worse in this comparison and her chances of re-

election will decrease. As an alternative to the non-cooperative decentralized provision, incumbents may reach an agreement over the constitution of a municipal consortia in which the rent extraction is based on the centralized provision of the local service.

The results of our analysis suggest that fiscal and institutional disparities lead to a bias in the YC mechanism, since it does not result in reaction functions with an identical slope for different jurisdictions, as has been assumed in the literature (Allers, 2012, Besley and Case, 1995). However, there are cases in which the institutional disparity compensates the fiscal disparity, resulting in almost unbiased YC. However, the presence of disparities between jurisdictions make possible cooperation only under certain conditions related to the institutional quality of the municipal consortia. In addition, if pure rent-seekers administrators decide to cooperate, the quality of local services decreases.

Outline. The remainder of the paper is organized as follows. In Section 2 we briefly describe the background of the literature on IMC and YC. In Section 3 we present the model, and the non-cooperative and cooperative equilibria, In Section 4 we provide some final comments and policy implications.

2 BACKGROUND

Inter-municipal cooperation. Over the last 15 years, inter-municipal cooperation (IMC) has attracted the attention of scholars - mostly from public administration - who have compiled a large body of empirical studies on the emergence of this alternative form of public provision of local public goods modes, covering a large variety of different services. For example, sewage and waste-disposal, or tasks like regional development or tourism marketing (Bergholz, 2018).

IMC has been recognised to be especially attractive for smaller, rural municipalities that have lower contracting capabilities and where private enterprises encounter higher costs of sparsity (Bel and Costas, 2006; Bel and Fageda, 2017). Empirical studies have demonstrated that especially fiscally weak municipalities are more likely to cooperate (Warner and Hefetz ,2002; Bel et al., 2013; Schoute et al., 2018) and contract out service provision (Bel and Fageda, 2007; 2017). Other empirical and theoretical investigations show that municipalities with similar characteristics are more likely to cooperate (Di Liddo and Giuranno, 2016; Feiock et al., 2009).

Besides factors like population size and fiscal stress (Bischoff and Wolfschütz, 2021), the literature places a special focus on political factors, analysing whether interest groups influence

the decision to cooperate. Garrone et al. (2013) argue that public managers favour IMC to reinforce managerial dominance and limit the influence of elected politicians on public service provision (see also Sørensen, 2007). On the other hand, Bergholz and Bischoff (2018), using data from a survey among local council members in 60 German municipalities, provide evidence suggesting that German politicians consider IMC a loss in political power.

Inter-municipal cooperation and yardstick competition. The YC mechanism was first formalized by Besley and Case (1995). They offered a political economy model of tax-setting in a multi-jurisdictional world, which has been further explored in several research pieces thereafter. Those models all represent the fact that voters cannot directly observe the cost of the services provided by the local administrator. Nor can they observe the rent the administrator is able to extract while being in office. To overcome these political agency problems and be able to decide whether to vote again for the incumbent in the next election, citizens compare their own administrator with those in office in other jurisdictions, being based on some observable index of performance, such as the quality/quantity of the provided services. This rests on the common assumption that there exist jurisdictions which are identical or "similar" and can thus be compared. The comparison forces incumbents into a competitive mechanism, in which each incumbent takes the behaviour of the neighbour administrator into account to maximize her own rent, considering how the probability of re-election will thereby be affected. To be confirmed in office, incumbents will attempt to make the government they lead well placed in the cross-jurisdiction comparisons made by their respective voters. In this way, although YC cannot eliminate the informational asymmetry between administrators and voters, it will nonetheless mitigate its consequences (Di Liddo and Vinella, 2021).

Several empirical analyses provide evidence of the existence of a tax-mimicking behaviour across local governments. Among others, Besley and Case (1995) find confirmation of this phenomenon using US State data over the period 1960–1988. In turn, using data about 143 adjacent Italian municipalities, Bordignon et al. (2003) find a positive spatial autocorrelation in local property tax rates in jurisdictions whose mayors run for re-election in uncertain contests. By contrast, no interaction is found in jurisdictions whose mayors face a term limit. In a more recent study, relying on data about German States and local governments, Buettner and von Schwerin (2016) find empirical evidence of the existence of YC among sub-national jurisdictions in the choice of business tax rates.

Whereas, as we said, most studies have hitherto assumed the existence of identical (or "similar") jurisdictions to be compared, only in recent years some attention has been devoted to the effects that disparities across jurisdictions may have on political YC. In a theoretical investigation, Allers (2012) highlights that when jurisdictions display fiscal disparities, differing in terms of revenue capacity and/or spending needs, administrators of "richer" jurisdictions can provide high-quality services, still keeping the local tax burden low. Thus, whereas they extract high rents, they are also likely to be re-elected. When incumbents do not face the same expected rent, given the respective probabilities of re-election, and, hence, the ratio between rents is different from the ratio between probabilities, political yardstick competition is biased. Other theoretical investigations highlight that those fiscal disparities may be endogenously induced by local incumbents. For example, Di Liddo and Vinella (2021) highlight that, when local rent-seeking administrators who undertake identical infrastructure projects, can choose between two contractual arrangements - traditional procurement (TP) and public-private partnership (PPP) – in the YC equilibrium, incumbents provide different levels of public services, face different re-election probabilities, and obtain different rents. In addition, by differentiating the project governance, incumbents specialize in rent extraction over time, thus hindering YC although jurisdictions are otherwise identical.

The existence of the YC bias, due to differences in revenue capacity and/or expenditure needs, has been also corroborated by the outcome of laboratory experiments (Di Liddo and Morone, 2017).

However, exogenous, and endogenous fiscal disparities are not the only source of asymmetries in political YC. Farah (2019) studies how differences in the quality of institutions, implying differences in the costs of rent appropriation, affect the YC outcomes. In particular, she finds that, when rent appropriation induces high costs for one incumbent, this also restricts rent appropriation by the other incumbent. Accordingly, the incumbent of the rich jurisdiction cannot fully exploit his or her fiscal advantages. Thus, political accountability increases in a counter-intuitive manner.

About the impact of YC on IMC, the public choice literature highlights that IMC can be an instrument to decrease the accountability of local administrators. Indeed, centralizing the provision of some local public goods and services, local administrator can weaken voters' control, since the pooling of the provision eliminate the YC mechanism between local government. That's the framework provided by Di Liddo and Giuranno (2016) in a theoretical

model showing that local governments interested in extracting rents make use of IMC to weaken the YC between local administrators and increase the rent extracted. This could be a theoretical explanation to the results obtained by Bel et al. (2022) regarding the absence of cost reduction associated with IMC in some contexts. Indeed, for Spain and the Czech Republic they find lower costs with cooperation. On the other hand, for the Netherlands, Germany, Poland, Norway, and Italy evidence is mixed.

From this brief analysis of the literature, it follows that YC may play an important role in determining the success of IMC agreements and the resulting quality of the municipal consortia and, in turn, of local public goods provided, via its effect on the non-cooperative rent extraction, which constitute the disagreement payoff of IMC (Di Liddo and Giuranno, 2016). In the following section we extend the model of Di Liddo and Giuranno (2016), introducing some elements of Farah (2019). More precisely, we extend the analysis of Di Liddo and Giuranno (2016), allowing for a double source of disparity: i) in the cost of provision of local services and ii) in the cost of rent extraction. The aim is to study how these differences interact in determining the IMC outcomes in the presence of pure rent-seeking local administrators.

3 THE MODEL

Consider two identical municipalities $i \in \{1, 2\}$ with identical voters and exogenously determined tax revenues, facing common exogenous shocks. We normalise both municipal population and tax revenues, set by the central government (CG), to unity. The democratically elected governments in each jurisdiction collect taxes to provide public good or service; but they only care about rent and re-election. We suppose that, as in many local electoral systems (Italian municipalities, UK districts, etc.), incumbents can be in office for a maximum of two mandates. Therefore, we can model the choice problem in two periods $t \in \{1, 2\}$.

Jurisdictions provide a certain quality of a local public service, s_{it}, under constant return to scale. Furthermore, there are no spillovers between jurisdictions except for informational spillovers. Without loss of generality, since tax revenues are exogenous, we model fiscal disparities between jurisdictions assuming that the only difference between jurisdictions is in their expenditure needs e_i, or standard cost of provision of public service. We normalize the cost of the disadvantaged municipality (the municipality characterized by the highest cost of provision), namely municipality 2 to the unity, and we set the cost of the advantaged municipality equal to $e_1 \in]0,1[$.

Administrators know the entity of the cost (fiscal) disparity, voters do not. Incumbents may decide whether they want to provide the service by themselves or jointly, constituting a consortium of municipalities. One example of such consortia is provided by Italian *Unioni di comuni* (Luca and Mondrego, 2021; Di Liddo and Giuranno, 2020).

Following Di Liddo and Giuranno (2016), we assume that there is a minimum required standard for the local service. A lower quality of provision will trigger immediate investigation by the judicial authorities, which will lead to no rent for the incumbent. We assume that the judicial authority knows e_i and can weight the minimum standard. This is the case, for example, of the Italian experience of "standard expenditure needs".[1] Consequently, we express the standard level of service as $s_{min} = \frac{\sigma}{e_i}$, where $\sigma \in]0,1[$.

During the mandate t, the incumbent administrator of jurisdiction i, extracts a rent R_{it}. Municipalities are also characterized by disparity in the costs of rent appropriation caused by the difference in the institutional quality between municipalities, that leads to different accountability of local administrators (Farah, 2019). These costs involve any cost that the incumbent should incur in appropriating the rents, such as finding, approaching, and bribing the tax officials who want to cooperate in appropriating tax revenue. The higher the value of the parameter $\gamma_{it} \in]0,1]$, the lower the costs of rent appropriation and the higher the rents. Following Farah (2019), we assume that incumbents learn how to appropriate rents in period 1 and, therefore, have better knowledge of appropriating rents in period 2, i.e., incumbents have already acquired know-how about appropriating rents. Furthermore, incumbents do not invest in improving revenue-raising institutions. This implies that costs of rent appropriation should decrease over time. Assuming that after the period 1 both incumbents perfectly learn how to extract rent, it is $\gamma_{i2} = 1$. It follows that we can express $\gamma_{i1} \equiv \gamma_i$ for simplicity. This assumption simplifies the reporting of results without affecting the logic of the problem.[2]

Following Farah (2019), Di Liddo and Giuranno (2016), and Di Liddo and Vinella (2021), we model the re-election probability P_i using the ''contest success function'' (Tullock, 1980, Van Long, 2015):

$$P_i(s_{i1}, s_{j1}) = \frac{s_{i1}}{s_{i1}+s_{j1}}. \quad (1)$$

[1] https://www.sose.it/it/comuni/fabbisogni-standard.
[2] The results in the case of $\gamma_{i2} \neq 1$ are available on request.

In the case of perfect service-mimicking behaviour, $s_{i1} = s_{j1}$, it is $P_i = P_j = 1/2$. Instead, when $s_{i1} > s_{j1}$, then $P_i > P_j$. Furthermore, $\frac{\partial P_i}{\partial s_{i1}} > 0$ and $\frac{\partial P_i}{\partial s_{j1}} < 0$.

Both incumbents care enough about re-election and have the same discount factor $\delta \in [0,1]$. Furthermore, in the first period of the game, both incumbents are in their first mandate.

Given our assumptions, we can express the generic rent of incumbent i in period t as:

$$R_{it} = \gamma_{it}(1 - e_i s_{it}). \tag{2}$$

In the next sections, we will compute, the rents extracted in the non-cooperative equilibrium, comparing them with those in the cooperative solution. The extent of cooperation then depends on which scenario provides higher rents to both incumbents.

3.1 NON-COOPERATIVE EQUILIBRIUM

The decentralised non-cooperative Nash equilibrium is given by the service levels that maximise the total rent of the incumbents over the two mandates. During the second mandate, since there are no re-election concerns, both incumbents set the minimum service quality s_{min} (Di Liddo and Giuranno, 2016). This allows us to express, for simplicity, $s_{i1} \equiv s_i$. In the first period, the service quality set by incumbent i is chosen to maximise the expected total rent over the two mandates as follows,

$$\max_{s_i} \left(\gamma_i (1 - e_i s_i) + \frac{s_i}{s_i + s_j} \delta (1 - \sigma) \right), \quad with \quad i, j \in 1,2 \quad and \quad i \neq j \tag{3}$$

The first order condition (FOC) of incumbent 1 is:

$$\frac{(\delta (1-\sigma) - 2 e_1 \gamma_1 s_1) s_2 - e_1 \gamma_1 (s_1^2 + s_2^2)}{(s_1 + s_2)^2} = 0. \tag{4}$$

The FOC of incumbent 2 is:

$$\frac{(\delta (1-\sigma) - 2 \gamma_2 s_2) s_1 - \gamma_2 (s_1^2 + s_2^2)}{(s_1 + s_2)^2} = 0 \tag{5}$$

Note that, dividing FOC (4) by FOC (5), we obtain:

$$s_1 = s_2 \frac{\gamma_2}{e_1 \gamma_1}. \tag{6}$$

That is, the level of the public service set by incumbent 1 is proportional to the level of the service in jurisdiction 2, and the factor of proportionality is the ratio between the products of the share of rent and the costs of the public services.

The Nash equilibrium of the game is given by

$$(s_1^*, s_2^*) = \left(\frac{\gamma_2 \delta\,(1-\sigma)}{(e_1\gamma_1+\gamma_2)^2}, \frac{e_1\gamma_1\delta\,(1-\sigma)}{(e_1\gamma_1+\gamma_2)^2}\right). \tag{7}$$

Accordingly, $s_1^* > s_2^*$ if $e_1\gamma_1 < \gamma_2$. Note that $\frac{\partial s_1^*}{\partial e_1} < 0$, $\frac{\partial s_1^*}{\partial \gamma_1} < 0$, and $\frac{\partial s_2^*}{\partial \gamma_2} < 0$. That is, the level of the service in each jurisdiction is decreasing in the costs of provision and rent extraction in that jurisdiction. Furthermore, regarding the effect of the cost of rent extraction of the neighbour jurisdiction, we have:

$$\frac{\partial s_1^*}{\partial \gamma_2} = \frac{\delta\,(1-\sigma)(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^3}. \tag{8}$$

Note that $\frac{\partial s_1^*}{\partial \gamma_2} > 0$ if $e_1\gamma_1 > \gamma_2$.

Regarding the fiscally disadvantaged incumbent, we have that:

$$\frac{\partial s_2^*}{\partial \gamma_1} = -\frac{\delta\,(1-\sigma)e_1(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^3}; \tag{9}$$

$$\frac{\partial s_2^*}{\partial e_1} = -\frac{\delta\,(1-\sigma)\gamma_1\left(e_1\gamma_1-\gamma_2\right)}{\left(e_1\gamma_1+\gamma_2\right)^3}. \tag{10}$$

From (9) and (10) we have that $\frac{\partial s_2^*}{\partial \gamma_1} > 0$ and $\frac{\partial s_2^*}{\partial e_1} > 0$ if $e_1\gamma_1 < \gamma_2$. To conclude, looking at (2), we can note that, when there are no disparities, i.e., $\gamma_1 = \gamma_2 = \gamma$ and e_1=1, then both incumbents provide the same quality of the local service $s_i^* = 1/4\ \frac{\delta\,(1-\sigma)}{\gamma}$.

3.2 RE-ELECTION PROBABILITIES IN THE NON-COOPERATIVE EQUILIBRIUM

From (7) it follows that, in the equilibrium, the resulting re-election probabilities are:

$$(P_1^*, P_2^*) = \left(\frac{\gamma_2}{e_1\gamma_1+\gamma_2}, \frac{e_1\gamma_1}{e_1\gamma_1+\gamma_2}\right). \tag{11}$$

From (11) it follows that $P_1^* > P_2^*$ if $e_1\gamma_1 < \gamma_2$. Note that $\frac{\partial P_1^*}{\partial \gamma_1} < 0$, $\frac{\partial P_1^*}{\partial e_1} < 0$, and $\frac{\partial P_2^*}{\partial \gamma_2} < 0$. In addition, $\frac{\partial P_1^*}{\gamma_2} > 0$, $\frac{\partial P_2^*}{\partial \gamma_1} > 0$, and $\frac{\partial P_2^*}{\partial e_1} > 0$. Indeed, it is:

$$\frac{\partial P_1^*}{\partial \gamma_2} = \frac{e_1\gamma_1}{(e_1\gamma_1+\gamma_2)^2}, \tag{12}$$

$$\frac{\partial P_2^*}{\partial \gamma_1} = \frac{e_1\gamma_2}{(e_1\gamma_1+\gamma_2)^2}, \tag{13}$$

$$\frac{\partial P_2^*}{\partial e_1} = \frac{\gamma_1\gamma_2}{(e_1\gamma_1+\gamma_2)^2}. \tag{14}$$

To conclude, note that, when there are no disparities, i.e., $\gamma_1 = \gamma_2$ and e_1=1, then both incumbents have the same re-election probability $P_1^* = P_2^* = \frac{1}{2}$.

3.3 RENTS IN THE NON-COOPERATIVE EQUILIBRIUM

Replacing (7) in (2) we obtain the equilibrium rents extracted in the first period:

$$(R_{11}^*, R_{21}^*) = \left(\gamma_1\left(1 - \frac{e_1\gamma_2\delta\,(1-\sigma)}{(e_1\gamma_1+\gamma_2)^2}\right), \gamma_2\left(1 - \frac{e_1\gamma_1\delta\,(1-\sigma)}{(e_1\gamma_1+\gamma_2)^2}\right)\right). \tag{15}$$

Note that, interestingly, $R_{11}^* > R_{21}^*$ if $\gamma_1 > \gamma_2$. That is, the cost of rent extraction affects the differences between the rents extracted in the first period. In particular, the incumbent of the jurisdiction with smaller cost of rent extraction extracts always higher rent in the first period. Regarding the influence of the various parameters on the size of rents extracted, we have:

$$\frac{\partial R_{11}^*}{\partial \gamma_1} = 1 + \frac{e_1\gamma_2(1-\sigma)(e_1\gamma_1-\gamma_2)\delta}{(e_1\gamma_1+\gamma_2)^3}. \tag{16}$$

From (16) we have that $\frac{\partial R_{11}^*}{\partial \gamma_1} > 0$ if $e_1\gamma_1 > \gamma_2$.

Furthermore, we have:

$$\frac{\partial R_{11}^*}{\partial e_1} = \frac{\gamma_1\gamma_2\delta\,(1-\sigma)(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^3}. \tag{17}$$

From (17) it follows that, $\frac{\partial R_{11}^*}{\partial e_1} < 0$ if $e_1\gamma_1 < \gamma_2$. In addition, we have:

$$\frac{\partial R_{11}^*}{\partial \gamma_2} = -\frac{e_1\gamma_1\delta\,(1-\sigma)(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^3}. \tag{18}$$

From (18) it follows that $\frac{\partial R_{11}^*}{\partial \gamma_2} > 0$ if $e_1\gamma_1 < \gamma_2$.

Now we can study how the rent of incumbent 2 is affected by $e_1, \gamma_1 \; and \; \gamma_2$. We have:

$$\frac{\partial R_{21}^*}{\partial \gamma_2} = 1 - \frac{e_1\gamma_1(1-\sigma)(e_1\gamma_1-\gamma_2)\delta}{(e_1\gamma_1+\gamma_2)^3}; \tag{19}$$

$$\frac{\partial R_{21}^*}{\partial e_1} = \frac{\gamma_1\gamma_2\delta\,(1-\sigma)(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^3}; \tag{20}$$

$$\frac{\partial R_{21}^*}{\partial \gamma_1} = \frac{e_1\gamma_2\delta\,(1-\sigma)(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^3}. \tag{21}$$

As expected, from (19)-(21) it follows that it is $\frac{\partial R_{21}^*}{\partial e_1} > 0$ and $\frac{\partial R_{21}^*}{\partial \gamma_1} > 0$ if $e_1\gamma_1 > \gamma_2$. Instead, it is $\frac{\partial R_{21}^*}{\partial \gamma_2} > 0$ if $e_1\gamma_1 > \gamma_2$ and $\delta < \acute{\delta}$ and $\frac{\partial R_{21}^*}{\partial \gamma_2} < 0$ if $e_1\gamma_1 < \gamma_2$ and $\delta > \acute{\delta}$, where $\acute{\delta} = \frac{(e_1\gamma_1+\gamma_2)^3}{(1\text{-}\sigma)e_1\gamma_1(e_1\gamma_1-\gamma_2)}$. However, given our assumptions on δ, it is $\frac{\partial R_{21}^*}{\partial \gamma_2} > 0$ if $e_1\gamma_1 > \gamma_2$ and $\frac{\partial R_{21}^*}{\partial \gamma_2} < 0$ if $e_1\gamma_1 < \gamma_2$.

3.4 COMMENTS ON NON-COOPERATIVE OUTCOME

Here we discuss the main results of the non-cooperative setting, summarized in table 1. As we can see, the effect of e_1 on the service level and the re-election probability of jurisdiction 1 is unambiguous, both are decreasing in e_1. The impact on the rent extracted by incumbent 1 is ambiguous since, when e_1 increases, the service decreases and, if the decrease in the service quality compensates the increasing cost, then the rent increases. In the opposite situation rent decreases. More precisely, when $e_1\gamma_1 < \gamma_2$, then R_{11}^* decreases in e_1. When $e_1\gamma_1 > \gamma_2$, then R_{11}^* increases in e_1. That is, R_{11}^*increases in e_1 when γ_1 is relatively high, it decreases in the opposite case..

The effect of e_1 on the non-cooperative outcome of jurisdiction 2 is more articulated. On one hand, since the re-election probability of incumbent 1 decreases in e_1, then the re-election probability of incumbent 2 increases in e_1. On the other hand, if γ_2 is larger enough $(e_1\gamma_1 < \gamma_2)$, then for incumbent 2 it is convenient to increase the quality of the service when the cost of provision of the neighbour municipalities increases, still extracting enough rent, gaining and even higher re-election probability. When γ_2 is relatively small the incentive is to decrease the quality of the service to extract the higher rent as possible in the first period. This impacts on the effect of e_1 on the rent extracted by incumbent 2 in the first period, that moves in the opposite direction of the equilibrium service quality s_2^*.

Table 1 Effects of the various parameters on the non-cooperative outcome.

	Case 1: the cost of rent extraction inverts fiscal disparities: $e_1\gamma_1 < \gamma_2$	**Case 2: the cost of rent extraction does not invert fiscal disparities: $e_1\gamma_1 > \gamma_2$**
Effect of the cost of provision e_1	$\frac{\partial s_1^*}{\partial e_1} < 0; \frac{\partial s_2^*}{\partial e_1} > 0$	$\frac{\partial s_1^*}{\partial e_1} < 0; \frac{\partial s_2^*}{\partial e_1} < 0$
	$\frac{\partial P_1^*}{\partial e_1} < 0; \frac{\partial P_2^*}{\partial e_1} > 0$	$\frac{\partial P_1^*}{\partial e_1} < 0; \frac{\partial P_2^*}{\partial e_1} > 0$
	$\frac{\partial R_{11}^*}{\partial e_1} < 0; \frac{\partial R_{21}^*}{\partial e_1} < 0$	$\frac{\partial R_{11}^*}{\partial e_1} > 0; \frac{\partial R_{21}^*}{\partial e_1} > 0$
Effect of the own cost of extracting rent γ_i	$\frac{\partial s_1^*}{\partial \gamma_1} < 0; \frac{\partial s_2^*}{\partial \gamma_2} < 0$	$\frac{\partial s_1^*}{\partial \gamma_1} < 0; \frac{\partial s_2^*}{\partial \gamma_2} < 0$
	$\frac{\partial P_1^*}{\partial \gamma_1} < 0 ; \frac{\partial P_2^*}{\partial \gamma_2} < 0$	$\frac{\partial P_1^*}{\partial \gamma_1} < 0 ; \frac{\partial P_2^*}{\partial \gamma_2} < 0$
	$\frac{\partial R_{11}^*}{\partial \gamma_1} < 0; \frac{\partial R_{21}^*}{\partial \gamma_2} < 0$	$\frac{\partial R_{11}^*}{\partial \gamma_1} > 0; \frac{\partial R_{21}^*}{\partial \gamma_2} > 0$
Effect of the cost of extracting rent of the neighbour municipality γ_j	$\frac{\partial s_1^*}{\partial \gamma_2} < 0; \frac{\partial s_2^*}{\partial \gamma_1} > 0$	$\frac{\partial s_1^*}{\partial \gamma_2} > 0; \frac{\partial s_2^*}{\partial \gamma_1} < 0$
	$\frac{\partial P_1^*}{\gamma_2} > 0; \frac{\partial P_2^*}{\partial \gamma_1} > 0$	$\frac{\partial P_1^*}{\gamma_2} > 0; \frac{\partial P_2^*}{\partial \gamma_1} > 0$
	$\frac{\partial R_{11}^*}{\partial \gamma_2} > 0; \frac{\partial R_{21}^*}{\partial \gamma_1} < 0$	$\frac{\partial R_{11}^*}{\partial \gamma_2} < 0; \frac{\partial R_{21}^*}{\partial \gamma_1} > 0$

Now we can provide some intuitions on the effect of the own cost of extracting rent in jurisdictions on the non-cooperative outcome. From table 1 we can note that, in general, when the cost of extracting rent in period 1 in jurisdiction i decreases, there is an incentive to decrease the quality of the local service, also decreasing the re-election probability. The effect on the amount of rent extracted in the first period depends again on the relative size of $e_1\gamma_1$ and γ_2, which changes the direction of the effects on the rents.

The effect of the cost of extracting rent in the neighbour jurisdictions j on the non-cooperative rent of incumbent i is more articulated. From table 1 first note that, in general, when the cost of

extracting rent in period 1 in the neighbour jurisdiction j decreases (γ_j increases), the neighbour incumbent decreases her service quality to extract higher rent in period 1 and the re-election probability of incumbent j decreases while the re-election probability of incumbent i increases. It follows that incumbent i can react in two different ways, depending on its costs profile. She may increase the service quality to further increase re-election probability if her net available rent share in period 1 is higher enough to ensure a satisfactory rent in period 1. Alternatively, she may decrease the service quality to further increase rent in period 1 if her available net rent share in period 1 is relatively small, still ensuring a satisfactory re-election probability. Consequently, the effect of the cost of extracting rent in the neighbour jurisdiction has opposite sign on the first period rent of incumbents and the sign of this effect changes when the relative advantage in costs of provision and rent extraction changes.

3.5 YC BIAS

Following Allers (2012), YC is biased when it does not result in reaction functions with an identical slope for different jurisdictions, as has been assumed in the literature (Besley and Case, 1995). In fact, the slope of the reaction function depends on the relative fiscal advantage of the municipality. Looking at FOCS (4) and (5), it is apparent that the differences between costs (of provision and rent extraction) lead to a bias in the YC. Here we are interested in the magnitude of this bias. Indeed, if $R_{11}^* > R_{21}^*$ and $P_1^* < P_2^*$, then YC is still partially functioning even if the ratio between re-election probability does not reflect the ratio between the rent extracted in the first period, and, at least, the administrator who extract higher rent is re-elected with lower probabilities.

We have already seen that $P_1^* > P_2^*$ if $e_1\gamma_1 < \gamma_2$, and $R_{11}^* > R_{21}^*$ if $\gamma_1 > \gamma_2$. It follows that we must distinguish different cases.

- *Case 1:* $\gamma_1 < \gamma_2 < \frac{\gamma_2}{e_1}$. In this case $R_{11}^* < R_{21}^*$ and $P_1^* > P_2^*$. It follows that YC partially works since the incumbent who extracts higher rent in the first period is re-elected with smaller probability.
- *Case 2:* $\gamma_2 < \gamma_1 < \frac{\gamma_2}{e_1}$. In this case $R_{11}^* > R_{21}^*$ and $P_1^* > P_2^*$. It follows that YC does not work since the incumbent who extracts higher rent in the first period is re-elected with greater probability.

- *Case 3:* $\gamma_2 < \frac{\gamma_2}{e_1} < \gamma_1$. In this case $R_{11}^* > R_{21}^*$ and $P_1^* < P_2^*$. YC is partially effective, similarly to case 1.

It follows that YC competition is biased by the presence of fiscal disparities and different institutional quality at local level since the incumbent reaction functions have different slope (Allers, 2012). However, in some cases, when the difference in the institutional quality compensates the difference in expenditure needs, the bias is mitigated.

This concludes the analysis of the results of the non-cooperative provision of local public services. In the next section we will study how the yardstick bias affects the centralized, cooperative provision of the local service, and the decision to cooperate or not between the two incumbents.

3.6 RENT SEEKING UNDER IMC: THE COOPERATIVE OUTCOME

In this section, following the approach of Di Liddo and Giuranno (2016), we study the determinants of rent-seeking when incumbents can voluntarily cooperate and constitute an inter-municipal consortium. The latter also affects both the quality of the local service s in the two jurisdictions and the distribution of the joint rent between incumbents, assuming both incumbents exert the same fiscal effort in producing of the local service.

The quality of the service and the rent share q will be the result of a Nash bargaining (Nash, 1950) between the two incumbents. Note that q and $(1 - \mathrm{q})$ denote the shares of the rent assigned to incumbent 1 and 2 respectively, where $q \in [0,1]$.

Incumbents cannot commit on future provision, as they cannot know whether they will be reappointed. Therefore, in each period, there will be a different bargaining round between the administrators in office in the two jurisdictions in that period. During the second and last mandate, to maximise the extracted rent, the re-elected incumbents will certainly set the lowest quality of service either with or without cooperation. As a result, both incumbents will extract a second period rent equal to one. This is true whether both incumbents, or only one of them, will be reappointed. Indeed, in the second period, three possible scenarios are possible. In the first scenario, no one is re-elected. In the second scenario, both incumbents are re-elected. Here, an agreement on an $s > s_{min}$ will lead to negative net gains for both incumbents, as rent creation declines. In the third case, only one incumbent is re-elected. Again, an agreement on $s > s_{min}$ will reduce rent creation in both jurisdictions, as the probability of being re-appointed

for the first mandate incumbent cannot increase with respect to the non-cooperative outcome. As a result, the incumbent in her second mandate will always set the minimum standard s_{min}.

Therefore, cooperation during the second period is intrinsically unstable, as incumbents will be indifferent between cooperating or not cooperating in their second mandates. Following Di Liddo and Giuranno (2016), given the second period uniform outcome, the expected total rent R, jointly extracted by the consortium over the two periods is:

$$R = (2 - e_1 s - s)\gamma_c + 2\frac{s}{s+s}\delta(1-\sigma) = (2 - e_1 s - s)\gamma_c + \delta(1-\sigma), \tag{22}$$

where the parameter $\gamma_c \in [0,1]$ reflects the institutional quality of the consortium.

From (22) we can note that, interestingly, the service quality that maximises the consortium rent, independently from the rent quota q, is $s^* = s_{min}$. In fact, there is no conflict of interest on the service quality as both incumbents are interested in maximising the total consortium rent.

From (22), substituting $s^* = s_{min}$, we obtain the agreement payoffs ω_i as a function of the quota q of the rent allocated to incumbent 1 ($1 - q$ is the quota of incumbent 2):

$$\omega_1(q) = q\big((2 - 2\sigma)\gamma_c + \delta(1-\sigma)\big), \tag{23}$$

$$\omega_2(q) = (1-q)\big((2 - 2\sigma)\gamma_c + \delta(1-\sigma)\big). \tag{24}$$

The disagreement payoffs are the expected total rents R_i of incumbents over the two periods in the non-cooperative scenario:

$$R_1^* = \gamma_1 + \frac{(1-\sigma)\gamma_2^2\delta}{(e_1\gamma_1+\gamma_2)^2}; \tag{25}$$

$$R_2^* = \gamma_2 + \frac{(1-\sigma)e_1^2\gamma_1^2\delta}{(e_1\gamma_1+\gamma_2)^2}. \tag{26}$$

The value of q that constitutes the Nash bargaining solution is:

$$q^* = \arg\max\big((\omega_1 - R_1)(\omega_2 - R_2)\big). \tag{27}$$

After substituting (23)-(26) in (27), maximizing we obtain:

$$q^* = \frac{\big((1-e_1)\gamma_1 + 2(1-\sigma)(\delta+\gamma_c)\big)\gamma_2 + 2e_1\gamma_1\left(\frac{\gamma_1}{2} + \gamma_c(1-\sigma)\right) - \gamma_2^2}{2(1-\sigma)(\delta+2\gamma_c)(e_1\gamma_1+\gamma_2)}. \tag{28}$$

Accordingly, the joint provision of the local service is equal to the minimum quality allowed in each jurisdiction in both mandates and is independent of the ex-ante disparities in expenditure needs. Furthermore, according to the bargaining solution (28), incumbents equally split the total rent produced by the consortium when there is no fiscal disparity ($e_1 = 1$) and the same institutional quality ($\gamma_1 = \gamma_2$), indeed in this case from (28) we have $q^* = 1/2$. In the presence of fiscal and institutional disparities, the consequent YC bias leads to asymmetric rent share

Here we can derive the condition for cooperating. Indeed, in equilibrium, the net gains from cooperating must be positive, if at least one of the net gains is negative, then incumbents cannot reach a cooperative agreement. By other words, incumbents will cooperate during the first mandate, only if they extract more expected rent. It follows that the necessary conditions for cooperation are $\omega_i(q^*) - R_i^* > 0$. That is, the net gains from cooperation must be positive for both incumbents.

Such condition is satisfied for both incumbents if the available rent share is higher (the cost of rent extraction in the municipal consortia is lower) than a threshold value $\underline{\gamma}$:

$$\gamma_c > \underline{\gamma} \equiv \frac{\gamma_1+\gamma_2}{2(1-\sigma)} - \frac{\delta\, e_1\gamma_1\gamma_2}{(e_1\gamma_1+\gamma_2)^2}. \tag{29}$$

Note that:

$$\frac{\partial \underline{\gamma}}{\partial e_1} = \frac{\gamma_1\gamma_2\delta(e_1\gamma_1-\gamma_2)}{(e_1\gamma_1+\gamma_2)^2}. \tag{30}$$

In (30) we must distinguish the same two different cases illustrated previously in table 1.

When $e_1\gamma_1 < \gamma_2$, then $\frac{\partial \underline{\gamma}}{\partial e_1} < 0$. Accordingly, even if an increase in e_1 leads to a decrease in the pooled rent of IMC, since it also reduces the first period rents, and consequently, the disagreement payoffs. Consequently, the threshold value of the cost of rent extraction decreases. That is, cooperation is more likely to occur when e_1 increases in this case.

On the other hand, when $e_1\gamma_1 > \gamma_2$, then $\frac{\partial \underline{\gamma}}{\partial e_1} > 0$ because an increase in an increase in e_1 leads to an increase in the first period rents, and consequently, in the disagreement payoffs. Consequently, the threshold value of the cost of rent extraction increases and cooperation is less likely to occur.

The effects of the costs of rent extraction on $\underline{\gamma}$ is more articulated and it is convenient to examine them jointly. It is:

$$\frac{\partial \underline{\gamma}}{\partial \gamma_1} = \frac{1}{2(1-\sigma)} + \frac{(e_1\gamma_1-\gamma_2)e_1\gamma_2}{(e_1\gamma_1+\gamma_2)^3}\delta; \tag{31}$$

$$\frac{\partial \underline{\gamma}}{\partial \gamma_2} = \frac{1}{2(1-\sigma)} - \frac{(e_1\gamma_1-\gamma_2)e_1\gamma_2}{(e_1\gamma_1+\gamma_2)^3}\delta. \tag{32}$$

From (31) and (32) it follows that $\underline{\gamma}$ is increasing in both costs of rent extraction $\left(\frac{\partial \underline{\gamma}}{\partial \gamma_i} > 0\right)$ if σ is larger enough. That is if CG sets a reasonably high level of the minimum standard:

$$\sigma > \underline{\sigma} \equiv 1 - \frac{(e_1\gamma_1+\gamma_2)^3}{2e_1\gamma_1(e_1\gamma_1-\gamma_2)\delta}. \tag{33}$$

If $\sigma < \underline{\sigma}$, the sign of $\frac{\partial \underline{\gamma}}{\partial \gamma_i}$ are different and they are inverted depending on the sign of $e_1\gamma_1 - \gamma_2$. It follows that below a certain minimum standard set by CG, the effects of the costs of rent extraction of the two jurisdictions on $\underline{\gamma}$ are attenuated from each other and the value of $\underline{\gamma}$ in this case is lower than the case of high minimum quality, making cooperation more likely to occur. The intuition is that lower σ lead to higher pooled rent and this effect is stronger than that on the disagreement payoffs, which also increase when σ decreases. As a result, cooperation is more convenient for both incumbents since they can extract a pooled rent higher than the sum of the disagreement payoffs more easily.

4 FINAL REMARKS

The joint provision of local public goods and services is a central issue in the agenda of many local and central governments. Local administrators find cooperation appealing as they can gain control over the yardstick competition mechanism, which is used to manipulate voters' choice. They may use this control to increase rent extraction by lowering the quality of the provision of local public goods and services. As a result, inter-municipal cooperation decreases political accountability. On the other hand, fiscal disparities, and differences in the institutional quality of local jurisdiction do not affect policy outcome under cooperation. Rather, they affect the cooperative rent share among incumbents.

In addition, in the presence of pure rent-seeking incumbents, cooperation is possible only if the institutional quality of the municipal consortium is lower that a certain threshold value. Such threshold depends on the standard on the minimum quality of public services set by CG and the institutional quality of the separate jurisdictions. In particular, if the minimum level of service is high, then, when the decentralized global institutional quality decreases, IMC is less likely to occur because there is need of very low consortia's institutional quality to increase the pooled rent and reach an agreement between local incumbents on the centralized rent shares. If the minimum level of service is low, then even relatively high centralized institutional quality may lead to IMC, since setting the minimum level of the service in the centralized provision, still provide enough centralized rent that leads to positive net gains to both incumbent.

As a final policy implication, note that either matching grants from upper levels of government or economies of scale may be incentives to cooperation since they reduce the cost of local public goods supply increasing the amount of total cooperative rent. However, noting that grants imply a further additive term in equation (22), without changing the maximization of the rent, we can observe that even if these incentives may enhance cooperation, as they increase rent extraction, they fail to increase both the quality of local policies and the political accountability of local governments. The same is true for economies of scale, they reduce the average cost of provision in (22) without changing the cooperative optimal service level.

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