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A comprehensive approach to intergovernmental grants' tactical allocation. Theory and estimation guidelines

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Abstract
Political economy literature highlights the tactical use of intergovernmental grants for electoral purposes; however, it provides different mechanisms and explanations behind these patterns. In this paper, we propose a model that includes 3 branches of the literature in order to provide a comprehensive explanation behind the tactical allocation by central governments. We identify 3 key parameters that shape the tactical allocation of grants: the electoral rule, the relative importance of the objective of the central government with respect to the local government, and the extent to which citizens attribute local expenditure to the direct action of the local government vs the central government (local political appropriability). In addition, our model also provides a guideline for designing and interpreting empirical results on the tactical allocation of grants distribution.

Keywords Tactical allocation · Intergovernmental grants · Comprehensive theoretical model

JEL H11 · H77 · R53

1 Introduction

There is a common understanding that the allocation of funds by incumbents, including intergovernmental transfers, is based not only on explicit legal criteria but may be also influenced by political (opportunistic) behaviours. One of the seminal models in political economy literature finds that risk-averse incumbents award more funds to local governmental units (LGUs) with higher numbers of supporters (Cox and McCubbins 1986). Another important model shows that the central government may provide

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funds towards LGUs with higher numbers of undecided voters (swing voters), trying to influence their voting patterns (Lindbeck and Weibull, 1987). More recently, theoretical scholars have found that in a multi-layer government, central incumbents tactically allocate resources towards aligned jurisdictions in order to increase the probability of re-election of aligned mayors (Brollo and Nannicini 2012; Bracco et al. 2015).

Although the above models confirm the importance of political motivations in the distribution of resources, they propose contrasting explanations. Our paper contributes to the theoretical literature of political economy by presenting a comprehensive theoretical model including the several and opposing branches that explain the tactical allocation of funds from central to local governments. By identifying 3 structural parameters, we develop a theoretical model that explains the various tactics that the incumbent may elaborate during the allocation of resources to the local government. We show that the strategy employed by central governments in the allocation process, and therefore, the model that theoretically explains this strategy, depends on 3 parameters: the electoral rules in place, the relative importance of the strategic interest of the central government in its re-election as compared to its interests in supporting local government re-election, and how much citizens attribute local spending to the direct efforts of local government instead of national government actions (local political appropriability).

Another contribution we make is on empirical design. Building on theoretical arguments, we propose general indications for designing an econometric strategy based on the structural parameters of the specific country. Based on our theoretical model, we develop a number of empirical predictions. The first prediction is that in countries with a strong central government role (and weak local government), in the case of a pure proportional electoral rule, the incumbent would tactically allocate larger resources to partisan local jurisdictions (captured by variables reflecting a high share of supporters). In the case of a pure majoritarian system, the same type of government allocates larger resources to local swing jurisdictions (reflected by variables that assign swing-voting behaviour). On the other hand, to study the tactical distribution of funds of the incumbent in countries with a strong local government role, we assess the extent to which the local government is able to take credit for spending resources in its own jurisdiction. When citizens perceive the local government as responsible for local spending, the regression discontinuity design (RDD) provides the estimation strategy that would better capture the tactical distribution of funds from the central to the local government because it captures the discontinuity of funds distribution between aligned and non-aligned local jurisdictions. Conversely, a regression that captures the swing trend of the voters would be more appropriate.

After the literature review (Sect. 2), we describe our model in Sect. 3 and suggest the guidelines for the empirical design in Sect. 4. Section 5 provides the conclusions.

2 Literature review

Our work is related to various streams of literature. We contribute to the theoretical literature with the development of a model that combines 3 theoretical approaches exploring the tactical allocation of resources. The first one is the

"core supports model," developed by Cox and McCubbins (1986), which finds that risk-averse central governments allocate resources to jurisdictions with the largest number of supporters, as the risk of not receiving a vote is higher in jurisdictions with few supporters of the incumbent. The second one, developed by Lindbeck and Weibull (1987, 1993), shows that the incumbent supports jurisdictions with higher numbers of voters with uncertain preferences, namely "swing" voters, who may react far more quickly to any stimulus (the allocation of larger transfers). The intuition of these scholars is that core voters keep their preferences, regardless of the distribution of grants, while only voters with weak party preferences can change their votes. Therefore, the incumbent chooses to tactically distribute funds aiming at persuading voters with weak party preferences. A third theoretical approach has recently been developed by Brollo and Nannicini (2012) and Bracco et al. (2015). The authors find that the central government would tactically allocate resources to support the re-election of local aligned governments (and to support the non-re-election of non-aligned local governments). In their model, the central government tries to convince local swing voters in aligned jurisdictions to re-vote for the aligned local incumbent, and swing voters in non-aligned jurisdictions to vote against the local incumbent.

So far, the above mentioned 3 approaches have been analysed separately in the literature. Noteworthy attempts to combine these approaches were introduced by the work of Snyder (1989) and Case (2001) by modifying Lindbeck and Weibull's (1987, 1993) swing model, showing that governments could allocate resources not only to swing jurisdictions but also to "pivotal" (core) jurisdictions, and that this strategic allocation is due to the objective of maximizing the total amount of votes instead of the number of seats. We aim at filling this gap by generalizing in a single model not only the model of Cox and McCubbins (1986) and Lindbeck and Weibull (1987, 1993), as in the studies of Snyder (1989) and Case (2001), but also the contribution of Brollo and Nannicini (2012) and Bracco et al. (2015).

From the empirical point of view, our paper is related to the literature on political alignment effects. It is a common finding that transfers are tactically distributed. Dahlberg and Johansson (2002) and Johansson (2003), regarding Sweden; Veiga and Pinho (2007), regarding Portugal; Banful (2011), regarding Ghana; and Caldeira (2012), regarding Senegal, find that the allocation is distorted towards "swing" jurisdictions. More transfers have been found to be granted to aligned jurisdictions where the electoral competition is tough in Italy (Bracco et al. 2015), Brazil (Brollo and Nannicini 2012; Litschig 2012), Spain (Solé-Ollé and Sorribas-Navarro 2008) and Chile (Lara and Toro, 2019). A mixed result towards both supporters and swing jurisdictions is found in Albania (Case 2001). Kauder, Potrafke and Reischmann (2016), regarding Germany, show that supporter jurisdictions are awarded more funds from the central government. Khemani (2003) finds different strategies of tactical allocations for different type of transfers in India.

Each of these studies is based on an ad hoc theoretical model that can be attributed to one of the theoretical branches mentioned above. Our empirical strategy is based on a comprehensive theoretical model that includes the 3 seminal models and permits to define the central incumbent's strategy depending on the structural parameters of the analysed country.

3 A theoretical guideline to the empirical strategy

As we show in the literature review section, there is a common view that an incumbent's ultimate objective may not necessarily be to maximize the citizens' welfare, but rather to maximize electoral support in order to prolong the incumbent's rule. In order to achieve this objective, central incumbents tactically allocate resources to voters and/or jurisdictions with the highest political return. In this section, we integrate the different theoretical approaches that the political economy literature proposes into a model.

Central incumbents allocate resources to jurisdictions in order to achieve their objectives:

1. Being re-elected in the next national election, as in Cox and McCubbins (1986) and Lindbeck and Weibull (1987, 1993);
2. Having the highest number of aligned local governments, through the re-election of local aligned incumbents and the election of challengers in non-aligned jurisdictions, as in Brollo and Nannicini (2012) and Bracco et al. (2015).

We assume only 2 parties and G jurisdictions, each with the same population and a fixed total amount of resources $Y = \sum_g X_g$. As in Cox and McCubbins (1986), we can consider resources in a broad sense—intergovernmental transfers, patronage and other kinds of policies—and thus X_g is the resource allocated to jurisdiction g.

We use only 3 structural parameters in order to guide the theoretical interpretation of the specific context.

The first parameter (α) describes the importance that the central incumbent government assigns to its own re-election, compared to the election of an aligned government at the local level. In Cox and McCubbins (1986) and Lindbeck and Weibull (1987, 1993), the central government is interested only in its own re-election, while in Brollo and Nannicini (2012) and Bracco et al. (2015), it only cares about the local election of aligned local governments.

The second parameter of the model is connected to the national electoral rule (β), as the electoral rule has the power to transform each jurisdiction's number of votes in parliament seats, thereby defining the rules of the game for re-election. As Snyder (1989) and Case (2001) state, there is a difference whether the government wants to maximize the probability of re-election by maximizing the number of votes or by maximizing the number of seats in the parliament. In a system with a pure proportional electoral rule, in order to be re-elected, the central incumbent has to provide a national share of votes higher than 0.5; therefore, to meet its objective, the incumbent needs to maximize the number of votes. On the other hand, with a majoritarian rule, where the "first-past-the-post" rule is followed in each district, the central incumbent, in order to maximize the probability of re-election, will try to maximize the number of seats. In our model, we represent national electoral rules by the parameter (β), which measures the distance between a pure proportional electoral rule and a pure majoritarian one. It uses the value of 1 in the case of a pure

majoritarian system, the value of 0 in the case of a pure proportional system, and values between 0 and 1 in mixed-electoral-rule countries.

The utility function of the incumbent is:

$$\max_{\underline{X}} U(\underline{X}) = \alpha\left[(1-\beta)p(S(\underline{X}) \geq .5) + \frac{\beta}{G}\sum p(S_g(X_g) > .5)\right] + \frac{1-\alpha}{G}\sum_g \left[A_g p(L_g(X_g) > .5) + (1-A_g)p(L_g(X_g) < .5)\right]$$
$$s.t \sum X_g = Y \tag{1}$$

where α is the weight that the central incumbent government assigns to its own re-election. $\underline{X} = (X_1;...;X_g;...X_G)$ is the vector of resources[1] devoted to jurisdiction $g \in [1, G]$. S_g is the share of supporters of central incumbents in jurisdiction g. When the national electoral rule is pure proportional ($\beta = 0$), the incumbent will maximize the probability that the share of supporters $S = \frac{\sum_g S_g}{G}$ is higher than 50%, $p(S \geq .5)$, since this guarantees the majority in parliament. On the other hand, in the case of a majoritarian first-past-the-post rule ($\beta = 1$), the central incumbent tries to maximize the probability to win in each district $p(S_g > .5)$, maximizing the number of seats.

Let us define the binary parameter A_g, which takes the value 1 in case the jurisdiction g is aligned, and 0 otherwise. When the local government in jurisdiction g is aligned, the central government is interested in the local incumbent's re-election; therefore, supporters of the local incumbent should be the majority $(L_g > 0.5)$ in the next election. In the case of a non-aligned local incumbent $(A_g = 0)$, the central government wants the share of the local incumbent's supporters to go from greater than 50% in the previous election $\left(L_g^0 > 0.5\right)$ to a minority in the next term $(L_g < 0.5)$.

To complete the model, we define how the number of supporters changes both at the national and at the local level. In line with the literature (analysed in the previous section), we assume that the share of national supporters increases based on the amount of resources the central government has allocated to each jurisdiction. Moreover, this increase becomes greater with the number of supporters in the jurisdiction. The rationale behind this is that, in general, a higher level of resources increases the number of incumbent supporters; in jurisdictions with a strong opposition, it is harder to organize consensus for the incumbent, and thus the same resources produce lower effects in terms of votes.

Furthermore, in our model, the share of supporters is not deterministic but depends also on a stochastic component, both at national and local level. Therefore, the growth rate of the share of central incumbent supporters at the national level in the jurisdiction g (s_g), compared to the share of supporters in the previous election ($S_g{}^0$), is

$$s_g = \frac{S_g - S_g^0}{S_g^0} = a(X_g) + \eta_g \tag{2}$$

[1] As in Cox and McCubbins (1986), X_g can be negative, but it is lower bounded $X_g \geq \underline{X}$; in this case, the central government drains resources from jurisdiction g.

where $a(X_g)$ is the deterministic impact of resources on the share of supporters, and the marginal return of resources on the share of supporters is positive but decreasing, $a(0) = 0; a' > 0; a'' \leq 0$.

The variable η_g captures the stochastic component of the supporters' growth rate, and it is a random variable symmetrically distributed, unimodal and with mean $E(\eta_g) = 0$ and $E\left(\mu_g^2\right) = \sigma_\eta^2$.

The growth rate of the local incumbent's supporters is

$$l_g = \frac{L_g - L_g^0}{L_g^0} = \mu\left(a(X_g) + \lambda_g\right) + (1-\mu)\left[s_g A_g - \left(1 - A_g\right) s_g \frac{S_g^0}{1 - S_g^0}\right] \quad (3)$$

where λ_g is the stochastic component, and it is a random variable symmetrically distributed, unimodal and with mean $E(\lambda_g) = 0$ and $E\left(\lambda_g^2\right) = \sigma_\lambda^2$. Moreover, λ_g and η_g are independently distributed.

The third key parameter of our model is $0 \leq \mu \leq 1$, which describes the extent to which the local incumbent is able to take the credit for the spending of resource X_g in its own jurisdiction g (local political appropriability[2]). When local appropriability is complete ($\mu = 1$), the deterministic impact of resources[3] on the number of the supporters of each local incumbent is $a(X_g)$. Hence, in the case of high local appropriability, local election results could be different from national results, since the random parts are generally different $(\lambda_g \neq \eta_g)$. In the case of no local appropriability ($\mu = 0$), citizens do not give the merit for the spending of resources to the local government but to the central government. Therefore, when the local incumbent is aligned with the central government ($A_g = 1$), local incumbent supporters coincide with national incumbent supporters $(l_g = s_g)$. In the case of no local appropriability ($\mu = 0$) when the local incumbent is not aligned ($A_g = 0$) and supporters of the local incumbent are voting for the national opposition party, the increase in local supporters equals the decrease in national supporters $\left(l_g = \frac{1 - S_g - 1 + S_g^0}{1 - S_g^0} = -s_g \frac{S_g^0}{1 - S_g^0}\right)$. Therefore, tactical resource allocation to jurisdiction g impacts the number of supporters of the national incumbent and not the number of supporters of the local incumbent. In this case, local elections are merely a signal for the central government consensus.

On the basis of the values of these 3 parameters, we provide a guide to select which branch of theory applies to different institutional contexts and to interpret the

[2] Local appropriability is very similar to the complement to 1 of the proportion of goodwill amongst voters, generated by resources, which is captured by the central government incumbent in the model of Arulampalam et al. (2009).

[3] Note that in order to focus only on the key parameters α, β and μ and to avoid unnecessary details, we assume that the deterministic impact is the same both at national and local level. Moreover, we do not make the timing of the tactical allocation explicit in the model.

different empirical results.[4] The general solution of our model derives from Eqs. 1, 2 and 3. From Eq. 1, it is obvious that the general solution is a weighted mean of the solution $\left(X_g^S\right)$ that we have if the objective of central government is only central election ($\alpha = 1$) and the solution $\left(X_g^L\right)$ that we obtain if the central government is concerned only about the local aligned incumbent's election ($\alpha = 0$). We can study these 2 cases separately, since all the other solutions are a linear combination of these polarized cases.

3.1 *Case 1: The central government cares only about its own re-election* ($\alpha \sim 1$).

As previously discussed, one of the most determinant factors that the incumbent government considers when maximizing its probability to be re-elected is the national electoral rule. Our model for the first time explicitly parameterizes the role of the electoral rule as a crucial factor in designing tactical allocation of resources between swing and/or core jurisdictions.

Proposition 1 *When the central incumbent is concerned only about its re-election, in the case of proportional electoral rule* ($\beta = 0$)*, resources are allocated in the jurisdiction where the share of central incumbent supporters is high (core jurisdictions). In the case of first-past-the-post rule* ($\beta = 1$)*, the central government allocates more resources to jurisdictions where the difference between the vote shares of the incumbent and the opposition is low (swing jurisdictions).*[5]

Proof in the appendix.

The intuition we model is that, with a proportional rule, a single vote lost in a jurisdiction has the same weight as a vote gained in another one. In such a scenario, our model converges to Cox and McCubbins' (1986), where the central incumbent is concerned with its own re-election and prefers to allocate resources to core jurisdictions, because it is less risky[6] to have a lower number of votes in these jurisdictions than in others. On the other hand, with a first-past-the-post rule, a single vote lost in a jurisdiction cannot be balanced by a vote gained in another one; therefore, for the central incumbent, it is crucial to win the seat in every single jurisdiction. As highlighted by Lindbeck and Weibull (1987, 1993), the marginal cost of using resources in order to win the elections in every jurisdiction is lower in swing than in core ones, because swing jurisdictions have small differences in the share of votes between the winning party and the opposition, and therefore, the central incumbent will choose to distribute more resources to swing jurisdictions. The farther the electoral rule is from a pure proportional rule, the more resources are devoted to swing jurisdictions compared to core ones.

[4] We do not consider the electoral cycle in order to focus the analysis on resource allocation.

[5] In a two-party model like ours, swing districts are equivalently characterized by low differences in vote shares between the incumbent and the opposition or by the vote for the incumbent near 50%.

[6] We measure risk aversion as $S_g^0 \frac{f_\eta'}{f_\eta} - \frac{a''}{a'}$. See appendix.

Our model also explains the results of Snyder's (1989) and Case's (2001) models, which are modified versions of Lindbeck and Weibull's (1987, 1993) work. They consider the objective of maximizing not only the number of seats, but also the total amount of votes, which is the equivalent of considering not only a pure majoritarian rule but also a proportional one. They find that resources are allocated not only to swing jurisdictions but also to pivotal (core) ones, which is coherent with Proposition 1.

3.2 *Case 2: The central government cares only about local election results* ($\alpha \sim 0$)

When the central government cares only about the local elections, resource allocation influences not only the results of the national elections but also the results of local elections. Local voters decide their vote in local elections based on their perception about which level of government decides on the spending of resources (local political appropriability). We use the parameter μ to measure how much the local incumbent is able to take the credit for the spending of resource X_g in its own jurisdiction g. When local appropriability is complete, $\mu = 1$; in the case of no appropriability,$\mu = 0$.

In this case, the rate of growth of local incumbents becomes (from Eq. 3):

$$l_g = \frac{L_g - L_g^0}{L_g^0} = a(X_g)\left(\mu + (1-\mu)\frac{A_g - S_g^0}{1 - S_g^0}\right) + \theta_g \tag{4}$$

where $\theta_g = \mu\lambda_g + (1-\mu)\frac{A_g - S_g^0}{1 - S_g^0}\eta_g$ is a random variable symmetrically distributed with $E(\theta_g) = 0$. This variable is a linear combination of (η_g, λ_g); thus, the random part at local votes depends not only on the local random variable (λ_g), but also on the stochastic component at national level η_g, meaning that the evolution of local supporters depends not only on local election shocks but also on national election ones. This correlation determines all the propositions that follow in our model.

Lemma 1 *The estimated correlation coefficient between the rates of growth of shares of local and national supporters is a good proxy of the complement to one of local political appropriability* $(1 - \mu)$.

The idea behind the lemma is that in order to measure local appropriability, it is sufficient to estimate the correlation of local and national votes for aligned and non-aligned jurisdictions. When the merit of expenditure is assigned to the local incumbent, we show that there is no correlation between the growth rates of local and national shares of votes for the incumbent. On the contrary, in the case of no appropriability, in aligned (non-aligned) jurisdictions, this correlation is 1 (−1), and thus the rate of growth of local and national votes for the incumbent has the same (the opposite) path.

Proof in the appendix.

Proposition 2 *When the local political appropriability is high (higher than the share of central incumbent supporters in the previous national election* $\left[S_g^0 \leq \mu \leq 1\right]$*), central government allocates resources to aligned local governments, leaving only a minimum to non-aligned jurisdictions* ($X_{\min}$)*. Among aligned local governments, the central government prefers to allocate more resources where the number of supporters of the central incumbent is low.*

Proof in the appendix.

When the political appropriability of resources is high, the local incumbent takes the merit for the expenditures, and this can be translated into more votes in local elections; therefore, the central government allocates more resources to aligned than to non-aligned jurisdictions, because resources allocated to non-aligned jurisdictions will award the national opposition party. Among aligned jurisdictions, it is more convenient for the central government to allocate fewer resources where the local aligned incumbent is strong (electoral competition is low), because in this case, the aligned local incumbent does not need help from the central government to be re-elected. This result converges to the one of Brollo and Nannicini (2012) and Bracco et al. (2015).

Proposition 3 *When the local political appropriability is low (lower than the share of central incumbent supporters in the previous national election* $\left[0 < \mu < S_g^0\right]$*), the central government allocates more resources to jurisdictions where the difference between the vote shares of the incumbent and the opposition is low (swing jurisdiction).*

Proof in the appendix.

When the central government is focused on local elections, but the local government is perceived as being dependent on the national one because the local policies are actually attributed to the national government (low local appropriability), local elections become only a way to have an aligned local incumbent that could easily organize the consensus for the national government. The local election is a test for measuring the consensus for the central government at local election time in each jurisdiction.

Actually, Proposition 3 converges to the second part of Proposition 1. In fact, the central incumbent in this case is concerned with the local electoral results of each single jurisdiction, as in the national first-past-the-post rule. Moreover, in the case of low appropriability, local supporters are strongly correlated to national ones, meaning that the share of votes in local elections is a good proxy of national electoral preferences. Therefore, also in this case, our theoretical model converges to Lindbeck and Weibull's (1987, 1993) model.[7]

[7] In the appendix, the proof of Proposition 3 is the same as the one of the second part of Proposition 1.

4 From theoretics to empirics

Our model is a general model that, based on the value of the key parameters (α, β and μ), enables us to identify the right empirical strategy to adopt in analysing the tactical allocation of the central government. The values of these parameters change based on the institutional context and the type of resource allocated. For instance, the local appropriability parameter (μ) can be lower in the case of allocation of investment funds than in the case of allocation of general administration funds. Moreover, the type of transfers also matters,[8] as different transfers are characterized by their own specific parameter; resources directly managed by the central government, conditional transfers and unconditional formula-based ones have different values of the parameters.

In Table 1, we consider only polarized scenarios, but infinite mixed scenarios can happen in real life that are a combination of the polarized ones. In effect, the propositions are true in the neighbourhood of the values of the parameters in Table 1. When the parameters are not in the neighbourhood, a mixed empirical strategy should be adopted. For example, if the central government is interested in both national and local election outcomes (α assumes intermediate values between 0 and 1), both national electoral rule and local appropriability are important to determine the strategy of the government. Since national elections matter, in the presence of an electoral proportional rule at national level, the central government devotes resources to supporters, as in Cox and McCubbins (1986). In this mixed case, local election outcomes also matter; therefore, a discontinuity in transfers between aligned and non-aligned may occur in the case of high local appropriability, as in Brollo and Nannicini (2012) and Bracco et al. (2015), while in the case of low appropriability, the central government will allocate more resources to swing local governments independently from their alignment, as in Lindbeck and Weibull (1987, 1993).

When the central incumbent cares mainly about its own re-election ($\alpha=1$), in the case of a proportional electoral rule ($\beta=0$), we should find a positive impact of the share of central supporters in each jurisdiction on transfers, and no discontinuity should emerge between aligned and non-aligned jurisdictions. In this case, the dummy that describes the alignment is a poor proxy of the share of supporters. On the other hand, in the case of a majoritarian electoral rule ($\beta=1$), the model suggests that the empirical investigation should find a negative impact of the absolute difference in vote share between incumbent and opposition. No predictable discontinuity between aligned and non-aligned jurisdictions emerges from the model. We predict the same result when the central government is concerned about the local election and local appropriability is low (Proposition 3).

If the central incumbent cares especially about the re-election of a local aligned government ($\alpha=1$) and local appropriability is high ($\mu=0$), the empirical strategy should be based on the regression discontinuity design, and the difference between aligned and non-aligned should be positive.

[8] Also, the interplay between transfers could have a role.

Table 1 Summary of our model's guidelines

Proposition of the model	Key parameters of the model			Expected sign of the variables used in empirical studies				The model that should be prevalent
	Parameter A	Parameter β	Parameter μ	Vote share for the incumbent (S_j^0)	Absolute difference in votes between incumbent and opposition	RDD	Aligned dummy	
Proposition 1	1 (the central incumbent cares mainly about its own re-election)	0(proportional electoral rule)	Whatever value	Positive	NA	NA	Positive (in this case 2*Vote share for the incumbent* is a better proxy)	Cox and McCubbins (1986)
		1(majoritarian electoral rule)	Whatever value	Positive if S_j^0 <50% and negative if S_j^0 >50%	Negative	NA	NA	Lindbeck and Weibull (1987, 1993)
Proposition 2	0 (the central incumbent cares mainly about local election results)	Whatever value	1(full local appropriability)	N/A	Negative if S_j^0 >50%	Positive difference between aligned and non-aligned	Positive	Brollo and Nannicini (2012) Bracco et al. (2015).
Proposition 3	0 (the central incumbent cares mainly about local election results)	Whatever value	0(no local appropriability)	Positive if S_j^0 <50% and negative if S_j^0 >50%	Negative	NA	NA	Lindbeck and Weibull (1987, 1993)

The value of β is straightforward, as the electoral rule is a known institution. On the contrary, the inclination of the central incumbent to care about its own re-election or about the re-election of a local incumbent is more difficult to be approximated, since it depends on historical legacy, cultural attitude and so on. A partial proxy can be the ratio of local public expenditure to total public expenditure. For the third parameter of local appropriability, our model suggests that the right proxy is the estimated correlation between the shares of local and national supporters (Lemma 1).

Our guideline can be used to explain the differences in the empirical results observed in the literature.[9] In Italy, because of the importance of local government, which is perceived as responsible for local policies, the allocation is found to be tactically distributed towards swing and aligned jurisdictions (Bracco et al. 2015). The same results are found for Spain (Solé-Ollé and Sorribas-Navarro 2008) and Brazil (Brollo and Nannicini 2012; Litschig 2012). Tactical allocation can also differ for different types of transfers, as witnessed by Khemani (2003). Non-pure proportional rule, together with partial local appropriability, can explain the attention of the central incumbent to swing jurisdictions in Ghana (Banful 2011), Senegal (Caldeira 2012) and Portugal (Veiga and Pinho 2007). The allocation strategy in favour of swing jurisdictions in Sweden (Dahlberg and Johansson 2002; Johansson 2003) can be explained only by the fact that the policies based on conditional transfers are partially imputed to the local governments (low local appropriability), since the electoral rule is proportional. The role of proportional rule is strong in the case of Germany (Kauder, Potrafke and Reischmann 2016), where the tactical allocation for a not high local appropriability type of transfer flows towards supporters. In this case, we can argue that the importance of the election of local incumbents is high.

Merkaj et al. (2020a, b) applied our theoretical guidelines with an original data set on Albania for the period 2004–2011.[10] Albania, as a post-socialist country, offers a useful laboratory for proving the predictions of our theoretical model, as we can imply the values of the key parameters. The literature[11] suggest that in Albania, as often in countries with a socialist legacy, the incumbent is not very supportive of the re-election of the local leaders but rather focuses on maintaining patronage-type relations with them (Kopecký 2006). In this context, we expect Albania to be represented by a high value of the parameter α in our model (near 1). Moreover, different studies (Dauti 2013, 2017) reveal the distrust of Albanian citizens towards local leaders and also to local organizations' participatory processes, which makes us imply that Albania is characterized by low local appropriability (μ is low). For countries with a high value of α and a low value of μ, our guidelines suggest that the model that explains the tactics used by the central government is determined by the electoral rule (parameter β). Until 2008, the electoral system in Albania was a mixed member system,

[9] We implicitly argue on structural parameters.

[10] Scholars (Merkaj et al, 2017, 2020a, b,) argue about the fairness and transparency of transfers' distribution in Albania. See Zhllima et al, (2020) for more details.

[11] Similar to other scholars (Shih, Zhang and Liu, 2007; Sadanandan, 2011; Arulampalam et al., 2009).

while after 2008[12] it was transformed into a proportional one (thus β is not far from 0). Findings[13] suggest that the Cox and McCubbins (1986) model prevails in explaining the tactical strategy used in Albania, confirming the guidelines of our model.

5 Conclusions

This paper contributes to the theoretical literature on political economy by presenting a comprehensive theoretical model that includes the several theories that explain the tactical allocation of funds from the central to the local government. We propose a theoretical model that explains the different tactics that the incumbent may elaborate during the allocation of resources to the local government. We show that the strategy employed by the central government in the allocation process, and therefore, the model that theoretically explains this strategy depends on 3 structural parameters: the electoral rules in place, the relative importance of the strategic interest of the central government in being re-elected as compared to its interest in supporting local government re-election, and the extent to which citizens attribute local spending to the direct efforts of the local government instead of national government actions (local political appropriability). Such parameters guide the central incumbent to allocate grants to supporters' jurisdictions, to swing jurisdictions with aligned mayors, or simply to swing jurisdictions.

Our theoretical model shows that central governments display strategies more prone to rewarding supporter regions in the case of a proportional electoral rule, especially when the actual importance of the local government to the central incumbent is low and/or when citizens perceive the central government as responsible for local policies. More transfers are provided to swing regions in the case that the national electoral rule is a first-past-the-post one. The provision to swing regions can follow 2 different paths; when the relative importance of the local government is low and/or when the central government is perceived by citizens as responsible for local policies, grants will be allocated to swing jurisdictions regardless of whether they are aligned. On the contrary, when the relative importance of the local government is high, and the local government is perceived by citizens as responsible for local policies, the central incumbent will assign more grants to aligned swing jurisdictions.

Depending on different structural conditions, this paper provides a guideline to suggest how scholars can design empirical strategies and interpret their empirical results. The structural and historical conditions of the countries studied, the electoral system in place and the importance of the local government determine not only the empirical results but also the empirical strategy to follow. Reviews made on the empirical studies on political economy of intergovernmental transfers would have alternative interpretations in the light of the conditions and approach used in this

[12] GoA, 2008, Constitution of Republic of Albania, as ammended, in 21 April 2008, available at: https://www.gjk.gov.al/web/constitution_of_albania_1722.pdf

[13] The authors use Fixed Effect (FE), Random Effect (FE) and Regression Discontinuity Design (RDD) to test the validity of all the models.

paper. Our theoretical guidelines can be applied to any country; having an idea of the structural and context parameters of that country, we may formulate the correct empirical model and the correct robustness checks, declaring the expected results and the variables that should be tested. Different countries and different types of transfers can be represented by different structural parameters, revealing the conditions that motivate the incumbent to follow different tactical allocation strategies.

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Appendix 1: Proofs of Propositions

Proof Proposition 1

The utility function with ($\beta = 0$) is

$$\max_{\underline{X}} U(\underline{X}) = p(S(\underline{X}) \geq .5) = p\left(S^0 + \sum_g S_g^0 s_g(X_g) \geq .5\right) = p\left(\eta \geq .5 - S^0 - \sum_g S_g^0 a(X_g)\right)$$
$$s.t \sum X_g = Y$$

Let us call $\eta = \sum_g S_g^0 \eta_g$, in which distribution is the convolution of η_g, thus η is a symmetrically distributed, unimodal random variable with mean $E(\eta) = 0$. In this case, before the central election, the overall share of supporters of the national incumbent (S^0) is obviously greater than 50%.

Since

$$p\left(\eta \geq .5 - S^0 - \sum_g S_g^0 a(X_g)\right) = 1 - F\left[.5 - S^0 - \sum_g S_g^0 a(X_g)\right] = 1 - \int f_\eta(x)dx.$$

Maximizing the objective function of the central incumbent, we obtain the following FOCs

$$\frac{dp(S > .5)}{dX_g} = S_g^0 f_\eta\left(.5 - S^0 - \sum S_g^0 a(X_g)\right) a'(X_g) = \chi$$

where χ is a Lagrangean multiplier. While SOCs are:

$\frac{d^2p(S>.5)}{dX_g^2} = -\left(S_g^0\right)^2 f_\eta'\left[a'\left(X_g\right)\right]^2 + \left(S_g^0\right) f_\eta a''\left(X_g\right) < 0$ because $f_\eta' > 0$ since f_η is unimodal symmetric and increasing in $.5 - S^0 - \sum_g S_g^0 a\left(X_g\right) < 0$.

$\frac{d^2p(S>.5)}{dX_g dX_j} = -\left(S_g^0 S_j^0\right) f_\eta' a'\left(X_g\right) a'\left(X_j\right) < 0$ thus the Hessian is a semidefinite negative matrix, the solution is a maximum. Note that $S_g^0 \frac{f_\eta'}{f_\eta} - \frac{a''}{a'}$ is the coefficient of risk aversion. From FOCs,

$S_g^0 f_\eta a'\left(X_g\right) = S_j^0 f_\eta a'\left(X_j\right) = \chi$, since $a'' < 0$, if $S_g^0 > S_j^0$ thus $a'^{(X_g)} < a'^{(X_j)}$ hence $X_g > X_j$. Resources are allocated to core jurisdictions; the first part of Proposition 1 is proved.

The utility function with $(\beta = 1)$ is

$$\max_{\underline{X}} U(\underline{X}) = \frac{1}{G}\sum p(S(X_g) \geq .5) = \frac{1}{G}\sum p\left(S_g^0 + S_g^0 s(X_g) \geq .5\right) = \frac{1}{G}\sum p\left(\eta_g \geq \frac{.5}{S_g^0} - 1 - a(X_g)\right)$$

Hence, $p\left[\eta_g \geq \frac{.5}{S_g^0} - 1 - a\left(X_g\right)\right] = 1 - F\left[\frac{.5}{S_g^0} - 1 - a\left(X_g\right)\right] = 1 - \int f(x)dx$ FOCs are.

$\frac{dp(S_g>.5)}{dX_g} = f\left[\frac{.5}{S_g^0} - 1 - a\left(X_g\right)\right] a'\left(X_g\right) = \delta$ where δ is a Lagrangean multiplier. While SOCs are:

$\frac{d^2p(S_g>.5)}{dX_g^2} = -f'\left[a'\left(X_g\right)\right]^2 + fa''\left(X_g\right) < 0$ in order to have a maximum.

Let us consider the solution X_M, which we obtain when jurisdiction M is a pure swing jurisdiction $\left(S_M^0 = 50\%\right)$ then $\delta = f\left[-a\left(X_M\right)\right] a'\left(X_M\right)$. If we consider a jurisdiction j where $S_j^0 > S_M^0 = 50\%$, we always have $f\left[\frac{.5}{S_j^0} - 1 - a\left(X_M\right)\right] a'\left(X_M\right) < \delta$; thus, in order to maximize the utility, the central incumbent should assign fewer resources to jurisdiction j than to pure swing jurisdiction M, $X_j < X_M$. Let us consider a jurisdiction g where $S_g^0 < S_M^0 = 50\%$; note that for S_g^0 big enough[14] thus $f\left[\frac{.5}{S_g^0} - 1 - a\left(X_M\right)\right] a'\left(X_M\right) < \delta$ in a neighbourhood of $\left(S_M^0; X_M\right)$. In this case, in order to maximize the utility, for SOCs, the central incumbent has to assign fewer resources to jurisdiction g than to a pure swing one. The second part of the proposition is proved.

Proof of Lemma 1

$$E\left(\theta_g^2\right) = E\left[\mu^2\lambda_g^2 + (1-\mu)^2\left(\frac{A_g - S_g^0}{1 - S_g^0}\right)^2 \eta_g^2\right] = \left[\mu^2\sigma_\lambda^2 + (1-\mu)^2\left(\frac{A_g - S_g^0}{1 - S_g^0}\right)^2 \sigma_\eta^2\right]$$

[14] $\frac{0.5}{S_g^0} - 1 - a\left(X_M\right) < a\left(X_M\right)$, thus $0.5\frac{1}{2a(X_M)+1} < S_g < 0.5$

$$COV\left(l_g;s_g\right)=E\left(\theta_g\eta_g\right)=E\left[(1-\mu)\left(\frac{A_g-S_g^0}{1-S_g^0}\right)\eta_g^2\right]=\left[(1-\mu)\left(\frac{A_g-S_g^0}{1-S_g^0}\right)\sigma_\eta^2\right]$$

Thus, the correlation coefficient between the rate of growth of local supporters and of national ones is:

$$\rho_g(\mu)=\frac{COV\left(l_g;s_g\right)}{\sqrt{E\left(\theta_g^2\right)E\left(\eta_g^2\right)}}=\frac{A_g-S_g^0}{\left|A_g-S_g^0\right|}\sqrt{\frac{(1-\mu)^2\left(A_g-S_g^0\right)^2\sigma_\eta^2}{\mu^2\left(1-S_g^0\right)\sigma_\lambda^2+(1-\mu)^2\left(A_g-S_g^0\right)^2\sigma_\eta^2}}$$

when $\mu=1$, $\rho_g=0$. When $\mu=0$, for aligned jurisdictions $\left(A_g=1\right)$, $\rho_g=1$, for non-aligned jurisdictions $\rho_g=-1$. The estimated correlation for aligned jurisdictions is $E\left(\rho_g\vee A_g=1\right)$, while it is $E\left(\rho_g\vee A_g=0\right)$ for non-aligned ones. The lemma is proved.

Proof Proposition 2

For $\left(S_g^0\le\mu\le1\right)$.

Calculating the FOCS.

$$f_\theta\left[\frac{0.5}{L_g^0}-1-a\left(X_g\right)\right]a'\left(X_g\right)=\chi \text{ with } A_g=1$$

$$-f_\theta\left[\frac{0.5}{L_j^0}-1-a\left(X_j\right)\frac{\mu-S_j^0}{1-S_j^0}\right]a'^{\left(X_j\right)\frac{\mu-S_j^0}{1-S_j^0}}<\chi \text{ with } A_j=0$$

Since the second FOCs are impossible, in non-aligned jurisdictions, the central government provides only the minimum resources $X_j=\underline{X}$. The discontinuity between aligned and non-aligned jurisdictions is proved.

Let us consider an aligned jurisdiction $A_g=1$, for the implicit function theorem, from FOCs we have:

$$\frac{d^2p}{dX^2}=-f_\theta'\left[\frac{0.5}{L_g^0}-1-a\left(X_g\right)\right]\left[a'\left(X_g\right)\right]^2+f_\theta a''\ll0 \textit{ and}$$

$$\frac{\mathrm{d}^2 p}{\mathrm{d}X_g \mathrm{d}L_g^0} = \frac{-1}{L_g^0} f'_\theta \left[\frac{0.5}{L_g^0} - 1 - a\left(X_g\right)\right]\left[a'\left(X_g\right)\right] \ll 0$$

thus, for the implicit function theorem.

$$\frac{\mathrm{d}X}{\mathrm{d}L_g^0} = \frac{\frac{-\mathrm{d}^2 p}{\mathrm{d}X \mathrm{d}L_g^0}}{\frac{\mathrm{d}^2 p}{\mathrm{d}X^2}} < 0$$

the more supporters the aligned incumbent has, the fewer resources are devoted to the incumbent's jurisdiction. Proposition 2 is proved.

Proof Proposition 3

With $\left(0 < \mu < S_g^0\right)$ from the previous appendix, we have the following FOCs:

$$f_\theta \left[\frac{0.5}{L_g^0} - 1 - a\left(X_g\right)\right] a'\left(X_g\right) = \chi \ with \ A_g = 1$$

$$f_\theta \left[\frac{0.5}{L_j^0} - 1 + a\left(X_j\right)\frac{S_j^0 - \mu}{1 - S_j^0}\right] a'\left(X_j\right)\frac{S_j^0 - \mu}{1 - S_j^0} = \chi \ with \ A_j = 0$$

The SOCs are:

$$-f'_\theta \left[\frac{0.5}{L_g^0} - 1 - a\left(X_g\right)\right]\left[a'\left(X_g\right)\right]^2 + f_\theta a'' \ll 0 \ with \ A_g = 1$$

$$f'_\theta \left[\frac{0.5}{L_j^0} - 1 + a\left(X_j\right)\frac{S_j^0 - \mu}{1 - S_j^0}\right]\left[a'\left(X_j\right)\frac{S_j^0 - \mu}{1 - S_j^0}\right]^2 + f_\theta a'' \ with \ A_j = 0$$

The second SOCS should be assumed negative in order to have a maximum. Moreover:

$$\frac{\mathrm{d}^2 p}{\mathrm{d}X_g \mathrm{d}L_g^0} = \frac{-1}{L_g^0} f'_\theta \left[\frac{0.5}{L_g^0} - 1 - a\left(X_g\right)\right]\left[a'\left(X_g\right)\right] \ll 0 \ with \ A_g = 1$$

$$\frac{\mathrm{d}^2 p}{\mathrm{d}X_g \mathrm{d}L_g^0} = \frac{-1}{L_j^0} f'_\theta \left[\frac{0.5}{L_j^0} - 1 + a\left(X_j\right)\frac{S_j^0 - \mu}{1 - S_j^0}\right]\left[a'\left(X_j\right)\frac{S_j^0 - \mu}{1 - S_j^0}\right] \ with \ A_j = 0$$

Let us consider the solution X, for implicit function theorem,

$$\frac{\mathrm{d}X}{\mathrm{d}L_g^0} = \frac{\frac{-\mathrm{d}^2 p}{\mathrm{d}X\mathrm{d}L_g^0}}{\frac{\mathrm{d}^2 p}{\mathrm{d}X^2}} \text{ thus } \operatorname{sign}\left(\frac{\mathrm{d}X}{\mathrm{d}L_g^0}\right) = \operatorname{sign}\left(\frac{\mathrm{d}^2 p}{\mathrm{d}X\mathrm{d}L_g^0}\right)$$

hence for aligned jurisdiction if $L_n^0 < L_g^0$ then $X_n > X_g$. For non-aligned jurisdictions $\operatorname{sign}\left(\frac{d^2p}{dX_g dL_g^0}\right) = -\operatorname{sign}\left[f'_\theta\left[1 - \frac{0.5}{L_j^0} - a\left(X_j\right)\frac{S_j^0-\mu}{1-S_j^0}\right]\right]$ because of symmetry of distribution. Therefore $\operatorname{sign}\left[f'_\theta\left[1 - \frac{0.5}{L_j^0} - a\left(X_j\right)\frac{S_j^0-\mu}{1-S_j^0}\right]\right] > 0$.

if $1 - \frac{0.5}{L_j^0} - a\left(X_j\right)\frac{S_j^0-\mu}{1-S_j^0} < 0$ then $\frac{1}{L_j^0} > 2 - 2a\left(X_j\right)\frac{S_j^0-\mu}{1-S_j^0} < 0$ thus for $\frac{1}{2} < L_j^0 < \frac{1}{2-2a\left(X_j\right)\frac{S_j^0-\mu}{1-S_j^0}}$. In a neighbourhood of $L^0 = 1/2$, if $L_n^0 < L_j^0$ then $X_n > X_j$. The proposition is proved.

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