"A COMPREHENSIVE APPROACH TO INTERGOVERNMENTAL GRANTS TACTICAL ALLOCATION. THEORY AND ESTIMATION GUIDELINES"

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ABSTRACT

Political economy provides alternative arguments and empirical validations for a tactically motivated use of intergovernmental grants. Both theoretical and empirical literature agree on the importance of political motivation, but propose contrasting explanations In this paper we propose a comprehensive model that includes these three branches of literature, in order to identify the structural parameters that determines tactical allocation. We propose three key parameters which shape tactical allocation of grants: the electoral rule, the relative importance of the objective of the central government with respect to the local government, and how much citizens attribute local expenditure to the direct action of local government instead of national government (local political appropriability). In addition the model provides also a guideline for designing and interpreting empirical results on tactical allocation.

We apply such indications to investigate the formula based unconditional grants in a post-socialist economy, namely Albania. As a transition country in its early phases of decentralisation it is characterized by low local political appropriability and high importance of central government objectives. Empirical estimation confirms the suggestion of the model: countries characterised with these parameters shape tactical allocation in favour of supporters.

Acknowledgment:

Special thanks to SDC RRPP Program, to Luca J. Uberti and Geoffrey Pugh for their comments and suggestions

JEL: H11, H77, R53
Keywords : tactical allocation, intergovernmental grants, fiscal federalism

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1. INTRODUCTION

The fact that funds for any public policy are distributed not only based on explicit legal criteria, is nowadays rarely contestable in literature. Other informal factors such as political objective of the incumbent, clientelism, etc., are relevant in determining the distortion in funds allocation. One of the seminal models in political economy literature finds that risk-adverse incumbent award more funds to LGUs with the higher number of supporters (Cox and McCubbins 1986). Another important model shows that certain type of incumbent distort the allocation of funds towards LGUs with the higher number of undecided voters (swing voters), trying to influence their votes (Lindbeck & Weibull, 1987). More recently, theoretical scholars have found that in a multi-layer government when the central incumbent is also interested in the re-election of aligned local government, there is an advantage for the central government to 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 agree on the importance of political motivation in the distribution of resources, they propose contrasting explanations. In this paper we contribute to the theoretical literature of political economy by presenting a comprehensive theoretical model that includes the previously discussed three branches that explain the tactical allocation of funds from the central to local government. By identifying three structural parameters, 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 governments in the allocation process, and therefore the model that theoretically explains this strategy, depends on the electoral rule in power, the relative importance of the objective of the central government re-election with respect to the local government re-election, and how much citizens attribute local expenditure to the direct action of local government instead of national government (local political appropriability).

Another contribution we make is on empirical design as, through the guidelines provided by the model, we propose general indications for designing econometric strategy based on the structural parameters of the specific country. In fact, we develop a number of empirical predictions of our theoretical model. The first prediction is that in countries with a strong central government role (and weak local government), in case of pure proportional electoral rule the incumbent would tactically allocate resources to jurisdictions with high number of supporters. In this scenario variables that capture the share of supporters are important in the empirical analysis. In the presence of a strong central government role, in case of pure majoritarian system the incumbent would bias the allocation towards swing jurisdictions, and this effect would be captured by variables that measure the swing voter effect. On the other hand, to study the tactical distribution of funds of the incumbent in countries with a strong local government role, we have to look if the local government is able to take credit for the spending resources in its own jurisdiction. In case the citizens perceive the local government as responsible for local spending, then the regression

discontinuity design would better capture the tactical distribution of funds from the central to the local government. On the opposite, a regression that captures the swing trend of the voters would be more appropriate.

We tested our predictions with an original data-set on Albania for the period 2004-2011. As a post-socialist country, Albania offers a very useful laboratory for proving the predictions of our theoretical model, as we can imply the values of the key parameters. Literature suggest[1] that in transition countries with post socialist legacy the role of central government being still strong, the incumbent shows more interest in its own re-election than its affiliated mayors' re-election and that the citizens still perceive the central government as responsible for local policies. Albania underwent a transition from planned to free-market economy beginning in the early 1990s which resulted in a major reshuffling of the legal and institutional framework. The establishment of a local government structure in the first decade of transition (1990-2000) was slowly accompanied by a fiscal decentralization. In this context, intergovernmental transfers have been very important for reducing regional imbalances and making local government function.

Limited number of studies and reports carried out to date show signs of political influence on the allocation of economic aid targeting the poor in specific periods of transition in Albania (Case 2001, Alderman, 1998; Mangiavacchi and Verme, 2009). In countries where institutions are recently created, there is a high risk that central government allocates funds at its discretion, even in the case of formulae transfers (Lowry and Potoski 2004; Boex and Martinez-Vazquez 2004). In this paper we focus on the analysis of the formula based unconditional grants. We aim to assess whether there is political influence in the allocation of unconditional grants following our model guidelines. The study explores the period from 2004 to 2011 for all of the Albanian districts, taking as a reference period the first year of the implementation of the intergovernmental scheme in Albania.

For a country in transition with proportional electoral rule, our model predicts that the incumbent would behave as in the Cox model awarding the supports. The empirical results of the Albanian case confirm the prediction of our model. We tested the effects of alignment and also the margin of alignment to better analyse the incumbent strategy. We found that the distortion is higher during national elections.

Being a study on a country in its later phase of transition, it also contributes to the literature of post-socialist economies, answering various authors' call (Demetropoulou, 2002; Yoder, 2003; and Stubbs 2005) for a refinement of the policy approach and a stepwise and country-specific adoption of EU-guided policies.

[1] See section 4.

After discussing the relevant literature (section 2), we describe our model and suggest the guideline for the empirical design in section 3. Albania background and transfers evolution is discussed before (in section 4) we design our estimation strategy in section 5. Afterwards we discuss our main findings (section 6). Section 7 concludes.

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 brings/combine three branches of theoretical literature on tactical allocation of resources. These models consider the central state behaving as an "opportunistic planner" aiming to maximize electoral support and re-election, but give contrasting explanations of how transfers emerge as a result of the political decisions and interactions among political actors at the central and local level. The "core supports model", developed by Cox & McCubbins, (1986) finds that risk-adverse central government will allocate resources to jurisdiction with the largest number of supporters, as the risk of not receiving a vote is higher in jurisdiction with few incumbent's supporter. The alternative model of Lindbeck & Weibull (1987, 1993) shows that the incumbent supports jurisdictions with the higher number of voters with uncertain preferences, namely "swing" voters, who may react much more quickly to any stimulus (the allocation of larger transfers). The intuition of these scholars is that core voters, being ideologically bound to the ruling party, can hardly be persuaded to change their vote allocated resources. Strong supporters remain supporters, strong opposition remains opposition regardless the distribution of grants, only voters with weak party preferences can change their votes. Therefore, the incumbent chooses to tactically distribute funds aiming to persuade voters with weak party preferences. Recently, Brollo & Nannicini (2012) and Bracco, Lockwood, Porcelli, & Redoano, (2015) considering a multi-layer government, find that the central government would tactically allocate resources to make local aligned government re-elected (and not aligned ones not re-elected). In their model the central government try to convince the local swing voter in aligned jurisdiction to re-vote for aligned local incumbent, and to convince the swing voters in not aligned jurisdiction to vote for the local challenger and against the local not-aligned incumbent.

On the contrary, little theoretical effort has been applied in order to combine these three branches of literature. The only attempt is proposed by the work of Snyder (1989) and Case (2001) starting from Lindbeck & Weibull (1987, 1993)'s swing model show that governments could allocate resources not only to swing 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 try to fill this gap by generalizing in a model not only the model of Cox & McCubbins, (1986) and Lindbeck & Weibull (1987, 1993) as in the studies of Snyder (1989) and Case (2001) but also the contribution of Brollo & Nannicini (2012) and Bracco et al., (2015)

Moreover, from theoretical point of view tactical allocation changes (or occurs) before electoral year in order for the incumbent to signal competences to the voters (Nordhaus (1975); Lindbeck (1976); Rogoff & Sibert (1988); Brollo & Nannicini (2012) and Bracco et al., (2015). According to Worthington and Dollery (1998) the central incumbent can have different behaviour in national and local election. During central elections he is more oriented to allocate central direct expenditure instead of transfers for local governments.

From the empirical point of view, our paper is related to the literature on the political alignment effects. It is a common finding that transfers are tactically distributed. Dahlberg & Johansson, (2002) for Sweden, Veiga and Pinho (2007) for Portugal, Banful (2011) for Gana, Caldeira (2012) for Senegal, find that the allocation is distorted towards "swing" jurisdictions. More transfers are found to be granted to aligned jurisdiction where the electoral competition is tough in Italy (Bracco et al. 2015), Brasil (Brollo & Nannicini, 2012; Litschig, 2012) and Spain (Solé-Ollé and Sorribas-Navarro 2008). A mix result towards supporters and swing jurisdictions is found by Albania (Case 2001). Kauder, Potrafke, and Reischmann (2016) for Germany show that the supporter jurisdictions are awarded more funds from the central government. Khemani (2003) finds different strategies of tactical allocations for different type of transfers for India. Each of these studies is based on an *ad-hoc* theoretical model that can be reconducted to one of the theoretical branches mentioned above. Our empirical strategy is based on a comprehensive theoretical model that includes the three seminal models and permits to define the strategy depending on the structural parameters of the country.

A tool to limit the directionality of the incumbent and therefore possible clientelistic or opportunistic political influence on the allocation of grants is the use of a distribution formula. The formula may use social (population and poverty), geographical (marginalization and size) or economic (tax collection and economic dynamism) criteria in order to achieve an efficient and equitable distribution of grants[2]. Empirical literature has found divergent results for non-discretion funds distributed through formula. Scholars like Kauder, Potrafke, & Reischmann, 2016) have found formula driven funds to be impervious to political control. However other studies (Banful, (2011) for Gana; Caldeira, (2012) for Senegal; Khemani, (2003) for India; Litschig, (2012) for Brasil) mostly in emerging and developing countries, indicate that formula-based allocation does not always assure objectivity, fairness, efficiency or stability of transfer distribution, because the incumbent may somehow manipulate the factors, the weights and/or data used in the allocation formula from year to year. (Boex & Martinez-Vazquez, 2004).

[2] Kraemer (1997) highlights the principles to be followed in setting a grant formula: (i) Equity Principle which means that poorer regions should not receive less funds than richer ones (ii) Incentive Principle which implies that per capita transfers in case of lower tax ratios should be constant or even decrease, and (iii) Political Nondiscrimination Principle - political or electoral interests should play no role in determining the distribution. These principles are in line with the normative economics scholars (Oates, 1972; Gramlich, 1977; Musgrave, 1983) that promotes the equity and the efficiency principle in order for a central state to behave as a "social planner".

As a country in transition, Albania offers a useful laboratory for proving political economy theories. The government has often been accused of undermining the financial independence of local governments by frequently changing the intergovernmental transfer scheme. There have been several studies expressing doubts over the fairness of intergovernmental distribution schemes in Albania. Merkaj, Zhllima, & Imami (2017) highlights that a major weakness of the decentralization process in Albania is the lack of transparency and predictability of the intergovernmental transfers system, providing a window for clientelistically or electorally motivated intervention in the process of grant distributions to local government.

Our work, applied on the Albanian unconditional transfers, expands this stream of literature in three ways. First, differently from the other studies that empirically test for manipulation of the formula, we give also a deeper insight of the formula analysing every component of it in time. Second we contribute to fill the gap that exists in this literature on the formula-driven programs in post-socialist counties, that, even though country specific differences, share the same issues on decentralization and political legacy. The third contribution is that through the empirical guidelines we build, we are able to explain the different result we obtain from the work of Case that studies Albania, as we do.

In effect, our study relates mostly to the work of Case (2001) that analyses the block transfer of assistance aid in Albania in 1996. She finds that the central government allocates more social aid to both swing and supporter communes. She analyses cross section data for economic aid, which is a formula-driven conditional program for poor households, in year 1995, only four years after the first democratic elections in Albania. The central state was only 5 years old. Moreover, at that time, the country had not yet an autonomous local government. Our work differs from Case's because of the type of grants, methodology, electoral and institutional rules and period of time studied.

3. A THEORETICAL GUIDELINE TO THE EMPIRICAL STRATEGY

As we show in the literature review, there is a common concern that the incumbents' ultimate objective may not necessarily be maximizing the citizen's welfare but rather aiming to maximize the electoral support in order to prolong its rule. In order to achieve this objective, central incumbents tactically allocate resources among voters and/ or jurisdictions. In this section we resume in a model the different models the political economy literature proposes.

The central incumbent allocates resources to jurisdiction in order to achieve its objective:

1. be re-elected in the next national election, as in Cox and McCubbins (1986) and in Lindbeck and Weibull (1987, 1993);

2. have the highest number of aligned local government, therefore re-elect local aligned incumbents and elect the challenger in not-aligned jurisdiction, as in Brollo and Nannicini (2012) and Bracco et al. (2015).

We assume only two parties and G jurisdictions, each with the same population and a fixed the 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 kind of policies, thus X_g is the resource allocated to jurisdiction g.

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

The first parameter (α) describes the importance that central incumbent assigns to its own re-election compared to the election of aligned government at 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 that transforms each jurisdiction votes in parliament seats, defines the rule of the game for the central incumbent re-election. As Snyder (1989) and Case (2001) state, there is a difference if the government wants to maximize the probability to be re-elected by maximizing the number of votes or the number of seats in the parliament. In a system with pure proportional electoral rule in order to be re-elected the central incumbent has to provide national share 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 in each district the first past the post, central incumbent in order to maximize the probability to be re-elected 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 takes the value of 1 in case of pure majoritarian system, the value of 0 in case of pure proportional one and values between 0 and 1 in mixed electoral rule countries.

The utility function of the incumbent will be:

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

Where α is the weight that the central incumbent assigns to its own re-election.

$\underline{X} = (X_1; \ldots; X_g; \ldots X_G)$ is the vector of resources[3] devoted to jurisdiction $g \in [1, G]$. S_g is the share of supporters of central incumbents in jurisdiction g.

When 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 it guarantees the majority in parliament, where $S = \frac{\sum_g S_g}{G}$. On the other hand, in case of a majoritarian first past the post rule, $(\beta = 1)$ the central incumbent tries to maximise the probability to win in each district $p(S_g > .5)$,maximizing the number of seats.

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

α is the weight that the central incumbent assigns to its own re-election.

To complete the model we define how the number of supporters changes both at national and at local level. As done by quoted literature, we assume that the share of national supporters increases on the amount of resources the central government has allocated to each jurisdiction. Moreover, such increase rises with the number of supporters in the jurisdiction. The rationale behind that is that, in general, more resources increase the number of incumbent supporters; in jurisdiction with strong opposition it is harder to organize consensus for the incumbent, thus the same resources produce lower effects in terms of votes.

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

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

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

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

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 $E(\mu_g^2) = \sigma_\eta^2$.

The growth rate of local incumbent's supporters is

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

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

$0 \leq \mu \leq 1$is the third key parameter of our model, that describes how much local incumbent is able to take the credit for the spending of resource X_g in its own jurisdiction g (local political appropriability). When local appropriability is complete ($\mu = 1$), the deterministic impact of resources[4] on the number of the supporters of each local incumbent is $a(X_g)$. Hence, in case of high local appropriability, local election results could be different by national results since the random part are generally different $(\lambda_g \neq \eta_g)$.

In 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 local incumbent is aligned ($A_g = 1$) local incumbent supporters coincide with national incumbent ones$(l_g = s_g)$. In case$\mu = 0$ the local incumbent is not aligned, ($A_g = 0$) supporters of local incumbent are voting for national opposition party, hence the increase of local supporter equals the decrease of 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 resources allocation to jurisdiction g impacts on the number of supporters of national incumbent and not on local incumbent supporters. In this case local elections are merely a signal for the central government consensus.

On the basis of the values of this three parameters we provide a guide to select which branch of theory apply to different institutional context and interpret the different empirical results.[5]

The general solution of our model derives from the equations 1, 2 and 3. From equation 1 is obvious that the general solution is a weighted mean of the solution(X_g^S)that we have if the objective of central government is only central election$(\alpha = 1)$and the solution (X_g^L)that we

[4] 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 explicit in the model the timing of the tactical allocation.

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

obtain if the central government is concerned only for the local aligned incumbents' election ($\alpha = 0$). We can study this two cases separately, since all the other solutions are a linear combination of these polarized cases.

3.1. CASE 1: THE CENTRAL GOVERNMENT CARES ONLY FOR ITS OWN RE-ELECTION. ($\alpha \sim 1$).

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

> ***Proposition 1***. *When central incumbent is concerned only about its re-election, in 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 case of first past the post rule* ($\beta = 1$) *,central government allocates more resources to jurisdictions where the difference between vote shares of incumbent and opposition is low (swing jurisdiction* [6].
>
> *Proof*. 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 scenario our model converges to Cox and McCubbins's (1986) one, where central incumbent is concerned with its own re-election and it prefers to allocate resources to core jurisdictions, because it is less risky [7] to have the lower number of votes in these jurisdictions.

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 is crucial to win the seat in every single jurisdiction. As in 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 jurisdiction have small difference in the share of votes between the winning party and the opposition, therefore the central incumbent will chose to distribute more resources to swing jurisdictions. The farer is the electoral rule from a pure proportional rule, the higher are resources devoted to swing jurisdiction compared to core ones.

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[6] In a two party model, like ours, swing district are equivalently characterize by low difference in votes share between incumbent and opposition or by the vote for incumbent near 50%.

[7] Which we measure risk aversion as $S_g^0 \frac{f'\eta}{f\eta} - \frac{a''}{a'}$, see appendix.

Our model explains also the results of Snyder's (1989) and Case's (2001) attempts to modify the Lindbeck and Weibull (1987, 1993) model. They consider the objective of maximizing not only the number of seats, but also the total amount of votes, which is 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 FOR LOCAL ELECTIONS RESULT. $(\alpha \sim 0)$

Resource allocation influences not only the results of the nation elections but also the results of local elections. In case the central government cares only for the local elections, local voters decide their vote in local elections based on their perception on which level of government decides on the spending of resources (local political appropriability). We use the parameter μ to measure how much 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 case of no approbriability $\mu = 0$.

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

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

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 elections shocks but also on national elections ones. Such correlation determines all the propositions that follows in our model.

Lemma 1

> T*he estimated correlation coefficient between the rates of growth of local and national supporters share is a good proxy* $(1-\mu)$*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 not aligned jurisdiction. When the merit of expenditure is assigned to local incumbent, we show that, there is no correlation between growth rate of local and national share of votes for the incumbent. On the contrary, in

case of no-appropriablity, in aligned (not-aligned) jurisdiction this correlation is 1 (-1), thus the rate of growth of local and national votes for the incumbent have 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 not aligned jurisdictions* $(\underline{X})$*. Among aligned local governments, central government prefers to allocate more resources where the number of central incumbent's supporters is low.*

Proof in the appendix

When the political appropriability of resources is high, local incumbent takes the merit for the expenditures and this can be translated in more votes at local elections, therefore the central government allocates more resources to aligned than not-aligned jurisdiction, because resources allocated to not aligned jurisdiction 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 in 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) Bracco et al. (2015).

Proposition 3.

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

Proof in the appendix

When the central government is focused on local election but local government is perceived as dependent from national one, because the local policies are effectively attributed to national government (low local appropriability), local elections become only a way to have an aligned local incumbent which could easily organize the consensus for the national government. Local election is a test for measuring the consensus for 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 to the local electoral results of each single jurisdiction as in the national first past the post rule. Moreover in case of low appropriability, local supporters are strongly correlated to national ones, meaning that the share of votes at local elections is a good proxy of national electoral preferences. Therefore also in this case our theoretical model converges to the Lindbeck and Weibull (1987, 1993) model[8].

3.3. FROM THEORETICS TO EMPIRICS

Our model is a general model that based on the value of the key parameters (α, β and μ) enables to identify the right empirical strategy to adopt in analysing 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 parameter local approprioability (μ) can be lower in case of allocation of investment funds than of general administration funds. Moreover, also the type of transfers matters as different transfers are characterized by their own specific parameter; resources directly managed by the central government, conditional transfers and unconditional formula-based one[9] have different values of the parameters.

In table 1 we consider only polarized scenarios, but infinite mixed scenarios can happen in real life, which are a combination of the polararized ones. In effect the prepositions are true in the neighborhood of the values of the parameters in table 1. When the parameters are not in the neighborhood, 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) both national electoral rule and local appropriability are important to determine the strategy of the government. Since national elections matters, in presence of a electoral proportional rule at national level the central government devotes resources to supporters as in Cox and McCubbins (1986). In this mixed case also local election outcomes matters, therefore a discontinuity in transfers between aligned and not aligned may occur in case of high local appropriability as in Brollo and Nannicini (2012)and Bracco et al. (2015), while in case of low appropriability central government will allocate more resource 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 (α=1), in case of a proportional electoral rule (β=1), we should find a positive impact of the share of central supporters in each jurisdiction on transfers and no discontinuity emerges from theoretical support between aligned and not-aligned jurisdictions. In this case the dummy which describes the

[8] In the appendix, the proof of proposition 3 is the same as the one of the second part of proposition 1.
[9] Also the interplay between transfers could have a role.

alignment is a poor proxy of the share of supporters. On the other hand in case of majoritarian electoral rule (β=0), the model suggest 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 not aligned jurisdiction emerges from the model. We predict the same result in case the central government is concerned about local election and local appropriability is low (proposition 3).

Table 1: Summary of our model's guidelines

Proposition of the model	**Model key parameters**			**Expected results of the variables used in empirical studies**				**The model that should be prevalent**
	Parameter α	Parameter β	Parameter μ	Vote share for the incumbent (S_j^0)	Absolute difference in vote between incumbent and opposition	RDD	Aligned dummy	
Proposition 1	1	0	Whatever value	Positive	NA	NA	Positive (In this case Vote share for the incumbent is a better proxy)	Cox and McCubbins (1986)
		1	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	Whatever value	1	N/A	Negative if S_j^0>50%	Positive difference between aligned and not-aligned	Positive	Brollo and Nannicini (2012) Bracco et al. (2015).
Proposition 3	0	Whatever value	0	Positive if S_j^0 <50% and negative if S_j^0>50%	Negative	NA	NA	Lindbeck and Weibull (1987, 1993)

If the central incumbent cares especially about the re-election of local aligned government (α=1), and local appropriability is high (μ=0) the empirical strategy should be based on regression discontinuity design and the difference between aligned and not aligned should be positive.

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 local one is more difficult to be proxied, since it depends on historical legacy, cultural attitude and so on. A partial proxie 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 rates of growth of local and national supporters share (lemma 1).

Our guideline can be used to explain the different empirical result observed in the literature[10]. 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 Brasil (Brollo and Nannicini 2012; Litschig 2012). Tactical allocation can also differ for different type of transfers, as witnessed by Khemani (2003). Not-pure proportional rule together with a 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 favor of swing jurisdiction in Sweden can be explained only by the fact that the policy based on conditional transfers are partially imputed to the local governments (not high 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 landers incumbents is very high.

4. COUNTRY BACKGROUND

Former socialist countries experienced the change from centrally planned to a private market economy during the 1989-1990 period. They had to adapt from an authoritarian centralist party to a pluralist democracy where decentralization and accession to the EU were seen as fundamental steps toward a sustainable development and future wellbeing for the citizens. However, the inherited centrally governing legacy often made these processes slow and challenging. Even nowadays, despite historical and social differences among them, many post-socialist countries often still encounter the same challenges and share similar issues regarding governance (Loewen and Raagmaa, 2018).

4.1 ALBANIA INSTITUTIONAL CONTEXT

To test our guidelines we focus our empirical analysis on Albania, a small country in the Balkans, which had its first democratic elections, after a very centralized communist regime, in the first 90s. Albania represents a good laboratory to study post socialist countries. We expect from our model guidelines that a central government with a post-socialist legacy, could be more interested in the central elections outcomes than in local elections results, since ex-socialist countries, especially in earlier phases of decentralization when communist legacy is strong,

[10] We implicitly argue on structural parameters.

assign a great importance to central government,. Therefore we expect these governments to be represented by a high value of the parameter α in our model. In other words, we assume in our model, similar to other scholars (Niskanen, 1975; Shih, Zhang, and Liu 2007; Sadanandan 2011; Arulampalam et al. 2009) that in Albania the central leader's political ambitions may diverge from those of their local government representatives, as often in countries with socialist legacy the incumbent is not very supportive for the re-election of the local leaders, but rather focus on maintaining patronage type relations with them, meanwhile providing direct and selective incentives schemes to citizens (Kopecký 2006). Moreover the institutional and political legacy of the post-Communist systems left a highly centralized fiscal regime characterized by high inability of local leaders to provide credible promises (as described by Keefer and Vlaicu 2007). Therefore, citizens reflected distrust to local leaders and a widespread belief that local needs should be resolved by extra-local actors or higher standing authorities represented by the central state or the region (Kleibrink, 2015). Consequently provision of public goods and services is vested to the power of central leadership and voters choose to mobilize the votes and political support to these external "patrons" (Rose et al. 1995; Kitschelt et al, 1999; Keefer, P. 2007). Albania reveals same distrust toward local leaders and also to participatory processes toward formal local organization (Dauti, 2013 and Dauti, 2017), which consequently makes citizens to de-evaluate the local provision of goods and services and assert all to the stronger role of the "central patrons". In other words, we assume that Albania is characterized by low local appropriability (μ is low) as citizens often attribute the merit for local policies to the central government.

Albania held the first democratic elections in the early 90s. Central elections are organized to elect 140 members of the National Assembly, an unicameral parliament, for four-year terms. Till 2008 the electoral system was a mixed member system. In this system 100 members were elected directly (based on votes taken from 100 "single member" consistencies with equal number of voters) while other 40 members were elected from multi-name list defined by parties or party coalitions. The electoral system after 2008[11] was transformed into a closed list of proportional representation of the parties.

In this context, in the presence of proportional rule elements, as in Albania, our model suggest that the central incumbent could distort the formula in the allocation of unconditional grants towards supports, as in Cox and McCubbins (1986). But we can not exclude *a priori* some interest of the incumbent towards swing votes, as in Lindbeck and Weibull (1987, 1993), because of the presence of some majoritarian element in the election rule during our timespan.

4.2. UNCONDITIONAL TRANSFERS SYSTEM

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

Albania implemented for the first time the intergovernmental transfers system in 2002 using both discretionary (conditional) and formula-based (unconditional) transfers. Formula-based transfers represent the most important grants for local government and are defined in the organic law[12] as state budget money distributed to LGUs to perform exclusive and shared functions. These transfers are part of the autonomous local budget and may be used either for expenditures or capital investments as LGU have complete independence in administrating these funds. Thus testing a political manipulation also in the formula-based transfers could make us suspect that such manipulation could be a distinct feature of transition countries.

The main purpose of unconditional grants is the horizontal equalization of revenues imbalances across LGUs. In Albania, imbalances are generated by the different capacities of the LGUs to collect taxes, to the area of the LGU and its location (mountainous or not), to the number of inhabitants and their poverty level[13]. Unconditional grants are distributed across communes, municipalities and regions according to a formula, made public with the annual state budget law. The total annual amount of transfers is not tied to any macroeconomic or state budget index but is decided every year in the budget law.

The total unconditional grant for communes/municipalities is divided in two sub-pools: the general grant and the equalization grant (Table 2)

(i) In the general grant, population is the dominant criterion, since the population is an indicator closely related to the costs and needs for services at the local level. The second criterion of the general grant differs if the LGU is considered rural of urban. For rural LGUs the need for services for roads and infrastructure is captured by the land area of the commune and the geographic conditions (degree of mountainous). Urban LGUs needs for funds is measured by the geographic conditions and the poverty index.

(ii) The equalization grant is used for transferring funds from LGUs with high income to those with low income compared with the national income per capita. LGUs that after the equalization are assigned a grant lower than the previous year are compensated by those that are assigned a higher grant, taking into consideration the minimum income per capita to be guaranteed.

The elements of the formula try to capture LGU's need for funds in order to achieve equity and efficiency with the distribution of the grant. In fact these criteria are commonly used in the distribution of grants in various countries and are in line with theory. However the source of the data and the methodology of calculation of the indexes used in the formula by the Albanian Ministry of Finance are not transparent and not made public. For example, data for the

[12] Law nr.8652 "On the organization and functioning of local government", Art 19/2

[13] The formula does not penalize explicitly LGUs which makes lower efforts for collection of taxes.

population, the element with highest weight in the formula, except for year 2013, is taken from National Civil Register (NCR), which is argued to have many duplications and out-dated information, due to unreported movement of people from one area to the other (CoPlan, 2012). On the other hand, there exist no official data on the area of LGUs, the second most important element in the formula; only non-official estimates made by INSTAT are available.

Moreover, the formula states that LGUs "in need" and/or "mountainous" should receive more funds according to the equity principle. However, it is not clear what criteria do the central government use to define LGUs "in need" or "mountainous". For example, in 2004 budget law the number of mountainous communes is declared to be 156, while in the 2005 budget law it changes in 174 and 178 in 2006, while the following years the number is not reported.

Another peculiarity of the elements of the formula is that several important changes can be noticed in specific figures within various elements from year to year. For example in the calculation of the "Land Area of Communes": mountainous communes in 2004 have received 3 times more than other communes for this sub-pool, in 2005 they have received 8 time more, in 2006 and 2007 the coefficient changes in 5 times, in 2008 it is transformed in 4. All the highlighted figures in Table 11 have experienced frequent revisions during the years leaving room for doubts regarding the fairness of the distribution of unconditional grants.

Table 2: Formula of unconditional transfer for communes and municipalities for year 2014 (in thousands ALL[14])

1.General Grant (11.450.453 ALL)	Population 70%	Allocation of this sub pool is divided proportionally to the relative population of each municipality/commune against the total population. For 2014, the population data were obtained from ***Civil Registry Office*** of ***September*** 2013.
	Land area of Communes (only for communes/rural dominated) 15%	Allocation of this sub pool is divided proportionally to the relative area of each commune compared to the total area. Communes classified as ***mountainous*** is calculated as ***four*** times the total surface area base.
	Urban services (only for municipalities/urban dominated) 15%	This coefficient for symmetry with municipalities is 15% of the total fund and divided proportionally to the relative population of each municipality against municipalities' total population. Municipalities classified as municipalities ***"in need"*** urban services coefficient is calculated by adding ***two*** times the actual number of the population. For municipalities classified as "***mountainous"***, urban service coefficient is calculated by adding ***two*** times the actual number of the population. For municipalities classified as ***"mountainous and in need"***, the urban service coefficient is calculated by adding ***four*** times the actual number of the population of these municipalities
2.Equalization Grant	Fiscal equalization 1.087.397 ALL	Fiscal equalization is based on 2012 ***realized*** income of local tax on small business, local tax on vehicles. Municipalities/Communes whose per capita incomes are higher than national income per capita contribute with ***25%*** of the difference between the two, multiplied by their population. Municipalities/Communes whose per capita incomes are lower than national income per capita receive ***25%*** of the same margin calculated in the same way.
	Transition adjustment lower bound 292.566 ALL	Municipalities/Communes which after fiscal equalization results have a grant lower than ***101%*** of 2013 are compensated for the difference.
	Transition adjustment upper bound (752326.ALL)	After the results of fiscal equalization, Municipalities/Communes which benefit ***8%*** increase compared to 2013, contribute to the compensation fund for the excess over ***8%*** compared with the result of the 2013 transfer.
	Compensation for minimum revenue per capita 299.864 ALL	To ensure a minimum guaranteed income per capita, it is compared the final income per capita (Grant customized transition, plus tax revenues listed previously) with minimum guarantee revenue per capita (***2.000 ALL***/capita for communes, ***3.220*** ALL/capita for municipalities). Municipalities/communes receive the difference between the two, multiplied by their population.

[14] ALL stands for Albanian Lek, which is the official currency. 1 USD is exchanged with 113 ALL, 1 Euro is exchanged with 134 ALL (Bank of Albania, October 2017)

Net Compensation Fund 159.895 ALL	This fund is the product of the following elements: -Transition Compensation of the lower bound +Transition compensation of the upper bound -Compensation for minimum revenue per capita This fund is used according the following criteria: 1- To compensate for inprecise indicators used in the formula 2- For other financial needs of communes and municipalities 3- For student dorms in the local unit

Source: The law budget for year 2014

Note: The highlighted figures have experienced frequent revisions during the years

5. DATA AND METHODS

We analyze a panel dataset for all the communes and municipalities in Albania during the period from 2004 to 2011 to explore the use of the formula and to exploit the factors that persist in time in the distribution of unconditional transfers. Our analysis covers the results of two local elections (October 2003, February 2007) and two parliamentary elections (October 2005, and June 2009). This gives us the variation in alignment that is needed to test our model.

In order to test hypotheses on unconditional transfer's tactical allocation we use two vectors of variables. The first group controls for the components of the allocation formula, while the second investigate whether the allocation is affected by politics or electoral objective of the incumbent.

$$UNCON_{TRANFER\,i} = \alpha + \beta FORMULA_i + \gamma POLITICAL_i + \varepsilon_i$$

We followed the general empirical framework used in the literature that regresses per capita amounts of transfers on different categories of independent variables (Veiga and Pinho 2007; Caldeira 2012; Treisman 2009; Boex and Martinez-Vazquez 2004; Dahlberg and Johansson 2002). Our dependent variable is the annual unconditional transfer per capita, expressed in natural logarithms, allocated to all 373 Albanian LGUs during the period 2004-2011.

Although the formula is public, the data used to calculate the exact amount to allocate to each LGU is not transparent. Hence it is not easy to analyse the way the Ministry of Finance distributed these funds. However, we used data available[15] from a variety of sources to analyse the (use of) allocation formula. We used variables such as, *population*, *area*, *tax revenues per capita*, *geographic index* and *poverty headcount index*, as proxies to control for the fiscal need and fiscal capacity stated in the formula (Table 2). *Population* and *density* are used in the formula to capture the LGUs' need for expenditures. LGUs with a high population face greater expenditure needs to maintain the same standard of local public goods as smaller LGUs. On the other hand, LGUs with high density encounter economies of scale compared to less dense local units[16].

To test whether the allocation of unconditional transfers has targeted the equity criterion, as stated in the allocation formula, and has been pro-poor oriented we included the *Poverty headcount index* and the *Tax revenue per capita* collected by the LGU. The first variable, the headcount index, is calculated by the World Bank and proposes to measure the number or people living below the poverty line in each LGU in the years 2001 and 2005. The indexes, however,

[15] Some of the data are not official, but are the only available.

[16] Pereira (2005) has criticized this argument arguing that central governments tend to allocate to smaller jurisdictions because of the need to have broader support and because of the recognized lobbying power of small groups.

are calculated based on different methodologies and therefore are not comparable and cannot be used simultaneously in the analysis of the panel data. Therefore, we used them separately as robustness to check of our results. The second control variable for equity used is the per capita tax income collected by the LGUs in the previous year. LGUs with low fiscal capacity should be targeted by the transfer allocations of a benevolent planner.

The second vector of variables includes political and electoral variables which allow us to analyze whether the central government pursues tactical political objectives through transfers' allocation to the local governments. Since in Albania, as previously discussed, the role of central government is prevalent (α is high) the incumbent will allocate depending on the electoral rule. In Albania the electoral rule is proportional only from 2008, therefore we can find evidence of either Cox and McCubbins (1986) or Lindbeck and Weibull (1987, 1993)

The literature uses both the dummy "*Aligned" and "Votes for aligned"* to test the allocation towards supporters (Cox and McCubbins, 1986). *Aligned* is a dummy that takes the value of one if the LGU mayor has the same affiliation as the central government. As an alternative to test Cox and McCubbins model we also use *"Votes for aligned"*, which is the share of votes the national incumbent party has gathered in the local elections in each LGU. In the case that the Cox and McCubbins model finds support, these variables are expected to be positive. However, in the case of Albania where central government cares mainly about its own re-election, suggest that "*Votes for aligned"* should be a better proxy than the dummy *"Aligned".*

In this scenario (alpha near 1 and μ is low) we cannot exclude that the central government could be interested in allocating also to swing jurisdiction as in Lindbeck and Weibull (1987, 1993)[17]. In empirical terms, to investigate whether transfers are distorted towards swing jurisdictions we use the variable *"Difference in votes*", widely used in literature that measures the difference in vote shares between the two main parties. It is constructed as the absolute value of the difference in vote share between the incumbent party and its main opponent during the last local election in each LGU. This variable is used as a proxy for swing LGUs (Case 2001; Dahlberg and Johansson 2002; Johansson 2003; Veiga and Pinho 2007; Caldeira 2012). The rationale behind it is that if the share of votes for the incumbent party in an LGU is close to the share of votes of the second candidate belonging to the opposition party it means that a majority of voters in that specific LGU have different party preferences, making that LGU a potential swing LGU. "*Difference in Votes*" captures the inclination of a risk taker central government that might use transfers to persuade voters belonging in LGUs with weak party preferences and attempt to change their preferences toward the party in power.

We used also a RDD model to test the Brollo and Nannicini (2012) model that finds discontinuity between aligned and not aligned jurisdiction. Since Albania is characterized by low

[17] Case 2001 found similar results.

local appropriability the merit of the local policy is often attributed to the central government (μ is low), our model suggests no discontinuity would arise between aligned and not aligned jurisdiction.

Table 3: Descriptive statistics of key analysed variables

Variable	Description	Number of observation	Mean	Standard deviation	Min	Max	Source
Per capita unconditional transfers		2983	3217	1727	0	11412	MoF
Formula based variables							
Population	Population of each LGU	2984	11426.8	35426.4	731	618288	MoF
Area	Area of LGU in km square	2984	75.9	54.8	2	378	Instat
Total tax revenues per capita	Total tax revenues collected by LGU per capita	2984	1070.3	1742.9	0	37278.3	MoF
Poverty headcount 2001	% of population living below the poverty line in 2001	2984	34.8	13.5	0.26	80.4	WB
Poverty headcount 2005	% of population living below the poverty line in 2005	2984	0.24	0.16	0	84	WB
Geographic index	Dummy to identify mountainous communes with 600m level of altitude and 20 of steepness.	2984	0.46	0.4	0	1	MoA
Political variables							
Aligned	Dummy = 1 if mayor is affiliated with the same party in power	2972	0.5	0.4	0	1	CEC
Difference in votes	Absolute value of the difference between the number of votes of the 2 biggest parties in the last election	2968	0.2	0.1	0	0.9	CEC
Votes for aligned	Percentage of votes for the party in power at central government received in the last local election	2968	0.4	0.1	0	0.9	CEC
National election years	Dummy to identify the year national elections took place	2984	0.25	0.4	0	1	CEC
Local election years	Dummy to identify the year local elections took place	2984	0.25	0.4	0	1	CEC

Source: Ministry of Finance, Instat, Central Election Commission, World Bank

Finally we checked the behaviour of the central government during local and general elections. Following the literature we use dummies for local and general elections during 2004-2011, we used also interactions of election dummies with political variables to better analyse the strategy used by the central government to allocate unconditional grants. *Trend* and *Trend square* variables are used to control for patterns in the allocation of unconditional transfers from year to year. These variables also capture economic conjectures or various shocks that equally affect all LGUs (Veiga and Pinho 2007).

For explanatory variables that are not fixed in time (i.e. *population* and *tax revenue per capita*) we use a time lag of one year because as stated in the formula policy makers use indicators of the previews year in the calculation of the grant. By lagging we exclude to a certain extent endogeneity and reverse causality of the variables.

We estimate OLS, FE, random effect panel data and RDD models to observe the stability of grants towards political objectives of the incumbent for different samples. FE is not appropriate to look into the component of the formula because most of the formula variables are time invariant (e.g. area, geographic index). The Breusch-Pagan test suggests that RE is preferred to OLS, therefore we use RE as our baseline model. However we discuss the results of all models in the robustness test section.

6. DISCUSSION OF RESULTS

Results from the regression of unconditional transfer per capita reveal that the central government tends to apply some elements of the formula leaving, however, some room for discretion. The element of the formula that does not appear significant in all the specifications is the *poverty headcount index*. We do not find evidence that poorer LGUs receive more transfers as stated in the formula. The results were essentially the same even when we use the *Poverty headcount index* of year 2005, or 2008 as a replace of the poverty headcount of year 2001. Others elements of the formula seems to be used correctly. In fact AREA has highly significant coefficient meaning that more funds are allocated to LGUs with a larger area, considered in the formula as an indicator of expenditure needs, because the larger the area of a commune the more expenditures the LGU has to afford for roads and infrastructure. Another indicator of the formula that has a highly significant coefficient is the *Tax revenue per capita*. According to the results LGUs with higher fiscal capacity do receive less per capita unconditional transfer. It seems that the Equalization Grant sub-pool of the formula is fairly allocated. Moreover, more transfers are allocated to geographically marginalized LGUs. The *geographic index's* coefficient, which identifies LGUs with 600 m of altitude and 20% of steepness, reveals that mountainous LGUs receive higher unconditional transfers per capita, as the formula predicts. The result remains the same even if we use the geographic index that takes into account LGUs with steepness >20%. Moreover, the formula allows redistributing more funds to smaller LGUs. The POP coefficient shows that more per capita transfers are distributed to LGUs with lower number of population.

This may be caused by economies of scale - the smaller communes need more money per inhabitant to carry out certain services (due to diseconomies of scale) and vice-versa.

In Model 1 we considered only the variables described in the formula. Regarding the vector of the political and electoral variables (model 2, model 3 and model 4) we find some evidences tactical allocation of unconditional transfers. In particular, Model 2 does not consider the electoral year and it shows that, on average, transfers are allocated to supporter LGU. Model 3 shows that unconditional transfers per capita tend to change during elections years. Unconditional transfer per capita rise during local election years and decrease during central election years. This is in line with the findings of Worthington and Dollery (1998). According to them central government during central election is more directed toward central direct expenditure to persuade votes. Since in model 3, the variable *Votes or aligned*, that measures the percentage of votes received by the local coalition aligned with the central incumbent is positive but not significant, we further investigate (in model 4) interacting it with the electoral dummies. Model 4 shows that transfers during both local and general elections flow towards supporter LGUs. Moreover during central elections the CG, in average, decreases the pool of unconditional funds for all LGUs, (as Model 3 shows); considering model 4 it seems that for LGUs that have received few votes (less than 45%) for aligned coalition the reduction of transfers during national elections is stronger than the average, whereas for LGUs with share of votes more than 45% this reduction is lower than the average. LGUs that support the central incumbent with a share higher than 67%, do not suffer reduction in the transfers.

The results show no evidence in support of the swing-voter model as the coefficient of the variable *difference in votes* is not significant. The control for the swing-voter model, however, did not change the results on the core-voter model. The Cox and McCubbins (1986) model prevails in Albania confirming that the interest of central incumbent is concentrated in its own re-election (α is in the neighbourhood of 1).

Our model permits to explain why Case (2001) finds a different result for Albania. Her study analyses conditional transfers (economic aid for poor people), in a different time span characterized by different electoral rule. She describes an institutional setting where central government is the only relevant actor since the local government had very little autonomy. In this case also the appropriability is near to zero. Our theoretical model predicts a strategy to reward swing or supporter jurisdictions depending on the electoral rule. Since in that period of time (2005) the electoral rule had some majoritarian characteristics she finds, as our model predicts, elements of both strategies.

We conducted rigorous test to check the robustness of our results taken in consideration the scenarios mentioned in our model using different estimation techniques, different specifications and different samples. All the robustness checks confirm our result that Albania could be

described by value of the parameter α in the neighborhood of 1, as the robustness checks confirm the Cox and McCubbins (1986) model and rule out the other models.

TABLE 4: Unconditional transfers for the period 2004-2011

VARIABLES	1	2	3	4
Area	0.06***	0.06***	0.06***	0.06***
	(0.010)	(0.010)	(0.023)	(0.023)
Poverty headcount index	0.0007	0.06	0.07	0.07
	(0.044)	(0.044)	(0.102)	(0.102)
Tax revenue per capita	-3.66***	-3.67***	-3.62***	-3.65***
	(0.531)	(0.532)	(1.075)	(1.078)
Geographic index	22.51***	22.27***	22.30***	22.29***
	(1.233)	(1.249)	(2.997)	(2.998)
Population	-27.28***	-27.32***	-27.34***	-27.31***
	(0.937)	(0.954)	(2.241)	(2.241)
Difference in votes		2.98	2.95	2.86
		(2.990)	(6.127)	(6.142)
Votes for aligned		6.66**	5.01	0.51
		(3.135)	(5.646)	(5.717)
Local election years			3.27***	0.27
			(0.506)	(1.614)
Local election years*Votes for aligned				6.90*
				(3.853)
National election years			-2.48***	-7.66***
			(0.674)	(2.056)
National election year*Votes for aligned				11.48***
				(4.321)
Trend			40.44***	40.50***
			(0.977)	(0.975)
Trend square			-3.63***	-3.64***
			(0.092)	(0.093)
Constant	7.5873***	792.55***	756.23***	758.31***
	(4.1)	(4.544)	(8.655)	(8.740)
Control for years	yes	yes	no	no
Observations	2,958	2,942	2,942	2,942
R-squared	0.700	0.700	0.694	0.695
F	435.8	373.3	355.4	303.8
AIC	28.228	28085	28134	28135
BIC	28.306	28175	28205	28219
ll	-14101	-14028	-14055	-14054

Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

According to our model, incumbents that care for their own reelection (α near 1) and follow the strategy described by Cox and McCubbins (1986), as in Albania, allocates resources to local units with the larger number of supporters. Therefore our model suggest that the best proxy to capture the allocation strategy of the Albanian central government is the variable that measures the share of votes to the incumbent as we did in our baseline model (votes for aligned). We tested our data using also the dummy Aligned, widely used in literature, that takes the value 1 in case the local leader is aligned with the incumbent and zero otherwise. We performed both FE

and RE panel data models for the entire population of LGUs and for a restricted sample of LGUs composed by only those units governed by mayors that belongs the two biggest coalitions. Results confirm that the central government allocates resources towards supports during national elections. The tendency to expend these grants during local elections and to shrink them during national elections is still confirmed in all the models.

The political environment in Albania is historically mostly composed by 2 large parties; therefore we estimated the same models for a restricted sample composed by LGUs whose mayor belongs to the two largest party. The number of observations dropped from 2942 to 2630; however the results still show the same pattern.

The coefficient of the variable *Difference in votes* remains not significant even using different specifications, different estimation techniques, different samples confirming that we could not find evidence in support of the swing-voter model (as Lindbeck and Weibull (1987, 1993). Even controlling for the swing model, results on the bias distribution towards core supporters remain unaltered.

In order to test the Bracco et al. (2015) model scenario (α=0 and μ=1) that predicts that in case the central government is interested not only in its own reelection, but also in the election of its affiliated mayors in local elections, we conducted also RDD (Figure 1 in the appendix). As expected, contrary to Bracco et al. (2015), we could not find a discontinuity between the barely aligned and barely not aligned units. This confirms our hypothesis that the Albanian incumbent is more interested in its reelection than the local elections of its affiliated. The result didn't change with different bandwidth size, different local polynomial degrees and with the presence of additional controls.

7. CONCLUSIONS

This study provides a comprehensive theoretical approach which permits us an in-depth analysis of grants allocation strategies. We find that the strategy chosen by the incumbent during the allocation of grants depends on countries institutional parameters, in particular it depends on the electoral system, on the relative importance the central incumbent assigns to aligned local government and on the level of government perceived by citizens as responsible for policies. Such parameters guide central incumbent to allocate grants to supporters jurisdiction, to swing jurisdiction with aligned mayor or simply to swing one.

Our theoretical model shows that central governments display strategies more prone to reward supporter regions in case of proportional electoral rule, especially when the actual importance of local government for central incumbent is low and/or when citizens perceive the central government responsible also for local policies. More transfers are provided to swing regions in case the national electoral rule is a first past the post one. The provision to swing regions can follow two different path, when the relative importance of local government is low and/or central government is perceived by citizens as responsible of local policies, grants will be allocated to swing jurisdiction regardless if they are aligned or not. On the contrary, when the relative importance of local government is high and local government is perceived by citizens as responsible of local policies, central incumbent will assign grants to aligned swing jurisdictions.

Depending on different structural conditions, this paper provides a guideline to suggest scholars how to design empirical strategies. Structural and historical condition, the electoral system and the importance of the local government determine not only the empirical results but also the empirical strategy to follow. Our theoretical guidelines can be applied to any country; having an idea on 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 which should be tested. Different countries and different type of transfers can be represented by different structural parameters and because of this the incumbent is incentivized to follow different strategies of tactical allocation.

We tested our theoretical model with data from Albania. As in other transition post-socialist country, in Albania the role of central government is still prominent, also for local policies. Our estimation confirms our priors. We find that unconditional transfers increase during local elections in favor of LGUs with higher number of supporters. Such tactic enables incumbent to increase their electoral leverage through more funding (which can be used to improve local services or employment). On the contrary, during central elections, central incumbent drains resources from local jurisdiction with lower number of supporters.

Finally, some policy recommendation can be applied to post socialist countries. Calculation of the grants distribution should be formula based and should be carried out by an independent

group of experts, in order to minimize the risk of interference by the political factors. Government should make public the data used through the formula to calculate the funds. This way, independent reviewers or researchers can review the calculations for the grants distribution. The formula should not be complicated – the simpler it is, the easer is to implement and to monitor the application of the formula over time. There should be avoided frequent changes of the formula - frequent changes might be caused by political motivation, and makes the implementation and monitoring more difficult.

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9. APPENDIX

Table 1: Robustness check with variable *Aligned*

	(2)	(3)	(4)
Log Unconditional transfers per capita	1 2 3	1 2 3	1 2 3
Area	0.06***	0.06***	0.06**
	(0.010)	(0.010)	(0.023)
Poverty headcount index	0.07	0.07	0.07
	(0.044)	(0.045)	(0.102)
Tax revenue per capita	-3.64***	-3.59***	-3.59***
	(0.533)	(0.534)	(1.084)
Geographic index	22.37***	22.37***	22.36***
	(1.243)	(1.254)	(2.987)
Population	-27.23***	-27.27***	-27.29***
	(0.956)	(0.958)	(2.248)
Aligned	2.43**	1.99*	0.92
	(1.097)	(1.096)	(1.708)
Difference in votes	3.11	3.02	3.08
	(2.974)	(2.994)	(6.071)
Local election years		3.26**	1.77**
		(1.314)	(0.836)
Local election years *Aligned			3.03**
			(1.537)
National election years		-2.49*	-3.23***
		(1.357)	(1.128)
National election years*Aligned			1.34
			(1.598)
Trend		40.45***	40.58***
		(1.144)	(0.958)
Trend square		-3.63***	-3.64***
		(0.121)	(0.089)
Constant	793.72***	757.03***	757.41***
	(4.425)	(4.575)	(8.491)
Control for years	yes	no	no
Observations	2,942	2,942	2,942
R-squared	0.700	0.695	0.695
F	371.2	464.3	312.0
AIC	28.084	28.133	28135
BIC	28.174	28.204	28219.
ll	-14027	-14055	-14054

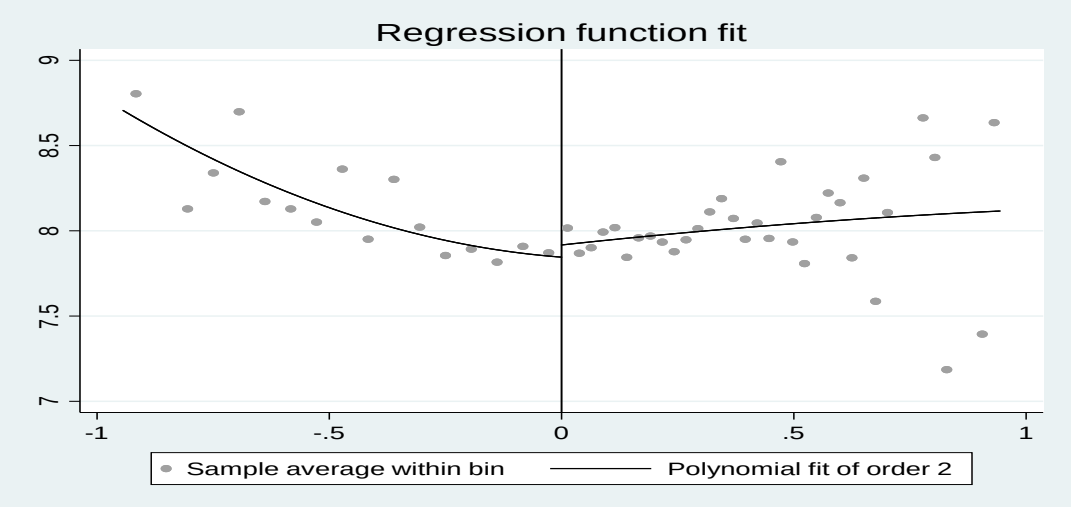
Table 2: Robustness check Enter population other methods

	Entire population			
VARIABLES	FE	RE	FE	RE
Area		0.064***		0.064***
		(0.023)		(0.023)
Poverty headcount index		0.132		0.145
		(0.097)		(0.098)
Tax revenue per capita	0.648	0.234	0.742	0.288
	(0.628)	(0.604)	(0.641)	(0.613)
Geographic index		21.077***		21.222***
		(3.079)		(3.087)
Population	-65.365***	-32.555***	-64.835***	-32.369***
	(7.110)	(2.418)	(6.952)	(2.409)
Aligned	0.597	0.543		
	(1.193)	(1.186)		
Difference in votes	-6.840	-5.594	-2.228	-2.502
	(4.640)	(4.435)	(3.800)	(3.550)
Local election years	1.309**	1.672***	-0.397	-0.539
	(0.602)	(0.581)	(1.200)	(1.125)
Local election years * Aligned	0.690	1.193		
	(0.892)	(0.874)		
National election years	-4.896***	-4.714***	-8.241***	-8.203***
	(1.033)	(0.993)	(1.850)	(1.753)
National election years * Aligned	2.659**	2.580**		
	(1.176)	(1.133)		
Votes for aligned			-6.577	-5.948
			(4.343)	(4.160)
Local election years * Votes for aligned			4.209	6.028**
			(2.850)	(2.671)
National election years * Votes for aligned			10.849***	11.046***
			(3.540)	(3.357)
Trend	38.931***	38.726***	38.793***	38.655***
	(0.852)	(0.855)	(0.870)	(0.876)
Trend square	-3.504***	-3.469***	-3.485***	-3.457***
	(0.079)	(0.081)	(0.082)	(0.084)
Constant	823.859***	747.524***	824.752***	748.644***
	(13.762)	(7.693)	(13.767)	(7.753)
Observations	2,942	2,942	2,942	2,942
R-squared	0.724		0.723	
F	363.7	.	367.3	.
r2_b	0.601	0.678	0.600	0.678
r2_w	0.724	0.719	0.723	0.719
r2_o	0.601	0.687	0.601	0.687
Number of id_nr	373	373	373	373

Table 3: Robustness check Restricted sample other methods

	Restricted sample			
VARIABLES	FE	RE	FE	RE
Area		0.076***		0.077***
		(0.024)		(0.024)
Poverty headcount index		0.067		0.072
		(0.105)		(0.104)
Tax revenue per capita	0.209	-0.278	0.205	-0.298
	(0.648)	(0.610)	(0.669)	(0.626)
Geographic index		20.020***		20.077***
		(3.130)		(3.132)
Population	-66.089***	-32.264***	-65.663***	-32.103***
	(7.432)	(2.451)	(7.215)	(2.449)
Aligned	0.498	0.308		
	(1.233)	(1.226)		
Difference in votes	-8.424	-7.189	-3.833	-4.263
	(5.157)	(4.784)	(4.158)	(3.782)
Local election years	1.137*	1.575**	-0.940	-0.855
	(0.687)	(0.656)	(1.694)	(1.531)
Local election years*Aligned	0.804	1.292		
	(0.974)	(0.952)		
National election years	-4.617***	-4.401***	-9.958***	-10.000***
	(1.149)	(1.088)	(2.455)	(2.288)
National election years*Aligned	2.498**	2.397**		
	(1.262)	(1.198)		
Votes for aligned			-4.232	-4.731
			(4.641)	(4.531)
Local election years* Votes for aligned			5.360	6.674*
			(3.822)	(3.503)
National election years* Votes for aligned			14.486***	14.894***
			(4.619)	(4.303)
Trend	38.990***	38.758***	38.975***	38.775***
	(0.865)	(0.865)	(0.907)	(0.905)
Trend square	-3.497***	-3.459***	-3.497***	-3.462***
	(0.083)	(0.085)	(0.089)	(0.090)
Constant	829.555***	752.652***	830.188***	754.005***
	(14.270)	(7.969)	(14.355)	(8.081)
Observations	2,630	2,630	2,630	2,630
R-squared	0.732		0.732	
F	326.5	.	350.7	.
r2_b	0.606	0.686	0.606	0.687
r2_w	0.732	0.727	0.732	0.727
r2_o	0.601	0.688	0.602	0.689
Number of clusters	359	359	359	359

Figure 1: Regression discontinuity design on unconditional grants



Proof Preposition 1

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

$$\underset{\underline{X}}{max}\, U(\underline{X}) = p(S(\underline{X}) \geq .5) = p\left(S^0 + \sum_g S_g^0\, s_g(X_g) \geq .5\right) = p\left(\eta \geq .5 - S^0 - \sum_g S_g^0\, a(X_g)\right)$$

$$s.t \sum X_g = Y$$

Let us call $\eta = \sum_g S_g^0\, \eta_g$ which distribution is the convolution of η_g, thus η is a random variables symmetrically distributed, unimodal and with mean $E(\eta) = 0$. In this case, before central election the overall share of supporters of 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 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 lagrangean multiplier. While SOCs are:

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

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

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

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 lagrangean multiplier. While SOCs are:

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

Let us consider the solution X_M, which we obtain when jurisdiction M is a pure swing one $(S_M^0 = 50\%)$ then $\delta = f[-a(X_M)]a'(X_M)$. If we consider a jurisdiction j where $S_j^0 > S_M^0 = 50\%$we always have $f\left[\frac{.5}{S_j^0} - 1 - a(X_M)\right] a'(X_M) < \delta$, thus in order to maximize the utility, central incumbent should assign less resources to jurisdiction j then 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^0big enough[18] thus $f\left[\frac{.5}{S_g^0} - 1 - a(X_M)\right] a'(X_M) < \delta$ in a neighborhood of $(S_M^0; X_M)$. In this case, in order to maximize the utility, for SOCs, central incumbent has to assign less resources to jurisdiction g then to pure swing one. The second part of proposition is proved.

[18] $\frac{.5}{S_g^0} - 1 - a(X_M) < a(X_M)$, thus $0.5\frac{1}{2a(X_M)+1} < S_g < 0.5$

Proof of Lemma 1

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

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

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

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

when $\mu = 1, \rho_g = 0$. When $\mu = 0$, for aligned jurisdiction $(A_g = 1)$, $\rho_g = 1$, for not aligned one $\rho_g = -1$. The estimated correlation for aligned jurisdiction is $E(\rho_g | A_g = 1)$, while it is and it is $E(\rho_g \vee A_g = 0)$ for not aligned ones. The lemma is proved.

Proof Proposition 2

For $(S_g^0 \leq \mu \leq 1)$

Calculating the FOCS

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

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

Since the second FOCs are impossible, in not aligned jurisdictions, central government provides only the minimum resources $X_j = \underline{X}$. The discontinuity between aligned and not aligned is proved.

Let us consider an aligned jurisdictions $A_g = 1$, for implicit function theorem,

from FOCs we have:

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

$\frac{d^2p}{dX_g dL_g^0} = -\frac{1}{L_g^0} f'_\theta \left[\frac{0.5}{L_g^0} - 1 - a(X_g)\right][a'(X_g)] \ll 0$ thus for the implicit function theorem

$\frac{dX}{dL_g^0} = -\frac{\frac{d^2p}{dXdL_g^0}}{\frac{d^2p}{dX^2}} < 0$, more supporters the aligned incumbent has, less resources is devoted to her giurisdiction. Proposition 2 is proved.

Proof Proposition 3

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

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

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

The SOCs are

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

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

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

Moreover

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

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

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

$\frac{dX}{dL_g^0} = -\frac{\frac{d^2p}{dXdL_g^0}}{\frac{d^2p}{dX^2}}$thus $sign\left(\frac{dX}{dL_g^0}\right) = sign\left(\frac{d^2p}{dXdL_g^0}\right)$, hence for aligned jurisdiction if $L_n^0 < L_g^0$ then $X_n > X_g$. For not aligned jurisdiction $sign\left(\frac{d^2p}{dX_g dL_g^0}\right) = -signf'_\theta \left[1 - \frac{0.5}{L_j^0} - a(X_j)\frac{S_j^0 - \mu}{1 - S_j^0}\right]$because

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