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A Politico-economic Approach to Intergovernmental Lump-sum Grants

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Abstract

This paper develops a positive approach to grant design as the result of an implicit or explicit bargaining process between central and local governments. It is shown that when per capita grants decrease with community size, central government can either (i) enlarge the majority of (small size) communities that support this sort of grant design when the total amount of grants is *given* or (ii) diminish the total amount of grants when those received by the median-rank size jurisdiction are constant. Both considerations show that it is politically feasible to have a grants scheme where urban communities are in a relatively worst situation than medium size and small communities. An empirical analysis of lump-sum grants in Portugal supports the politico-economic hypothesis and rejects the hypothesis that per capita grants are designed according to the fiscal equalization normative criterion.

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1. Introduction

Normative approaches to intergovernmental lump-sum grants usually assume that central governments are driven by horizontal equity and efficiency goals. In the former context a major rationale behind these grants is to achieve an equalization of the fiscal position of communities with different tax bases and/or needs.

On the other hand positive approaches to grant design do not accept at face value the normative criteria used by decision-makers to choose a particular form of grants. On the contrary it is the purpose of positive analysis to submit to empirical scrutiny central governments' stated rationales and go behind them in the search for alternative explanations for a specific grant design. Following this approach, papers by Inman (1988), Alperovich (1984), Gist and Hill (1981) and Rich (1989) all have pointed out that political factors are as important or even more relevant in explaining intergovernmental grants than mere economic rationales.

One issue that has not been clear in the literature is the relationship between community size and per capita intergovernmental lump-sum grants. Alperovich (1984) argues that the empirical finding of larger communities receiving lower per capita grants indicates the existence of economies of scale in the provision of local services. This empirical finding could also be explained by economies of "sharing" the consumption of local services as found by Brueckner (1981), MacMillan (1989) and Oates (1988). According to these approaches communities receiving lower per capita grants would be a joint effect of economies of scale in production and consumption[2] of local services.

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[1]I would like to thank useful comments from participants at the conference on *Developments in Public Finance Theory and Policy,* Urbino, June 10-11, 1994, in particular Gabriella Briotti, Peter Jackson and Alan Peacock. The usual disclaimer applies.

[2]The concept of economies of scale *in consumption* is clarified in Brueckner (1981).

However, several authors analysing local government expenditures have reached the conclusion that local services have "privateness" characteristics, i.e. that services, as perceived by residents, increase with the *per capita* provision of local public goods. This result was initially stated in the seminal median voter papers of Borcherding and Deacon (1972) and Bergstrom and Goodman (1973) and endorsed by other authors who developed bureaucratic approaches: Gonzalez and Mehay (1985) and Wyckoff (1988).

Empirical evidence regarding economies of scale in production of local public goods is not conclusive of the existence of significant economies of scale particularly if small communities (under 10000 inhabitants) are excluded. Moreover, the fact that many local services (education, swimming-pools, libraries, parks) can be replicated within each community suggests that the usual (median voter model) assumption of constant returns to scale in *aggregate* production seems realistic.

Within this framework of constant returns to scale in consumption *and* production the regressive nature of intergovernmental grants regarding community size appears as a puzzle.

This paper gives a politico-economic rationale for this particular characteristic of grant design. In short it will be argued that more populated communities receiving lower per capita grants enables central government to constrain overall public expenditure while commanding political support from a majority of (small) communities.

Intergovernmental grant design will be seen to be approached as the result of a bargaining process between central and local governments. It will be shown in this paper that using a regressive grant design central government can either (i) enlarge the majority of political support from small communities when the total amount of grants is given or (ii) diminish the total amount of grants when those received by the median rank size jurisdiction are constant. Both considerations show that it is politically feasible to have a grant scheme where urban communities are in a relatively worst situation than medium size and small communities.

Therefore section 2 introduces a simple classical model of intergovernmental grants designed in order to equalize the fiscal position of jurisdictions assuming a homogeneous crowding function and constant returns to scale in the production of local public goods. In section 3 a politico-economic approach to intergovernmental grants is developed. Section 4 analyses empirically the two hypotheses suggested in the earlier sections using Portuguese data. Finally, section 5 concludes with the consideration of the institutional scope where the politico-economic hypothesis might be relevant in explaining grant design.

2. A benchmark model of equalizing grants to local governments

There are several factors, other than population size, which might affect the fiscal "needs" of jurisdictions, most of them related to the production function of local public *services*. It is possible to approach the "production function" of local services as a two stage process. In the "first" stage[3], local public *goods* are produced using public sector inputs and in the "second" they are combined with local characteristics to produce local public *services*. Within this framework there are at least four main factors which might account for differences in per capita fiscal "needs" between jurisdictions. Firstly, there might be differences in unit prices of local inputs purchased by the public sector. Secondly, production functions of local public goods and services, may differ between communities. Thirdly, there might be differences in local *characteristics* of the community (environment, socio-economic characteristics of the population, etc.). Finally, communities have varying population *sizes* and therefore there are differences in the number of citizens sharing the consumption of local public goods.

In the approach developed below it will be assumed that the former two conditions either do not hold or are orthogonal (not correlated) with the latter ones. Therefore, we can isolate the analysis of the latter factors.

The model introduced here is a simple model of centralized fiscal structures. Local government revenues are completely exogenous and come from two sources: inter-governmental lump-sum grants G and local taxes T. Central government sets a local tax rate (t_f) uniformly across communities so that local governments are unable to raise autonomous revenues, at least in the short run, when the tax base B is given. They provide only one local public good (X), have a balanced budget and do not refund any part of the grants received. Moreover, there is no X-inefficiency in the production of the local public good.

Citizens are assumed to consume a private numeraire good y and capture services from the local public good on the basis of the crowding function:[4]

$$x = \psi(z) \equiv \psi(X / N)$$

with $\psi_z > 0$ and $\psi_{zz} < 0$.

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[3]The distinction between first and second stages is an heuristic distinction and does not have any real temporal dimension.

[4]Arguments supporting this crowding function can be found in Pereira (1994). In this paper a distinction is made between *crowding* and *congestion* functions, the former being applied to *communities* and the latter to *facilities*. It is argued that *congestion* functions should have the increasing marginal congestion property (as in club goods theory) but *crowding* functions have to be homogeneous of degree zero in capacity (X) and population size (N).

It is assumed, following almost all median voter literature, that the local public good is produced under constant returns to scale at a unitary cost c. Therefore, jurisdictions will have the cost function,

$$C(X) = cX$$

own fiscal resources,

$$T = t_f B$$

and a resource constraint,

$$C(X) = t_f B + G$$

which can be given in per capita terms by,

$$cz = t_f b + g$$

where b is per capita tax base and g per capita grants. Therefore, per capita lump-sum grants necessary to equalize the provision of local *services* (x), which is tantamount to equalizing the provision of per capita local public *goods* (z),are given by:

$$g = cz - t_f b \qquad (1)$$

i.e. grants are necessary only to offset disparities regarding per capita tax bases. It is no surprise that community population size does not appear in this simple equalization formula.

In fact, it is intuitive, and a classic result in the literature [5], that given the assumptions of constant returns to scale in production and a homogeneous crowding function (degree zero) there is no optimal community size and therefore no economies of community size in the provision of local services. In other words, the *per capita* cost of providing local public goods is *independent* of jurisdiction size when the quality of local *services* is similar across communities.

So far, it has been implicitly assumed that communities have different population size but similar environmental characteristics. In order to allow for different socio-economic characteristics, which might have an implication of different "needs"[6], a vector of environmental variables ($\overline{E}$) can be introduced in the equalization formula. Accordingly, in order to test if there is an equalization goal in designing per capita intergovernmental grants it is possible to estimate the following equation:

$$g^i = \alpha_1 + \alpha_2 b^i + \overline{\alpha_3 E}^i + \varepsilon^i$$

[5]See for instance Berglas and Pines (1991).

[6]The concept of *needs* is very ambiguous and this is the reason why inverted commas are used.

with the predictions that $\alpha_1 > 0$, $\alpha_2 < 0$ and $\overline{\alpha_3}$ are all greater then zero assuming that all variables in $\overline{E}$ are indicators of "needs".

3. A politico-economic approach to intergovernmental lump-sum grants.

Intergovernmental lump-sum grants will be approached as an implicit or explicit bargaining process between central and local governments.

There are two main issues at stake: the determination of the size of the "cake", i.e. total grants to lower level jurisdictions and the distribution of total grants between jurisdictions.

Other things being equal, the total amount of intergovernmental grants may increase due to a rise in the level of general taxation or due to a decrease in central governments' (post-grants) resources. In the former case there is an increase in the overall size of the public sector while in the latter it remains constant.

The general problem of the distribution of resources between tiers of government will be labelled the *decentralization* issue. We will reserve the expression *pure decentralization* for the particular case where overall taxation remains constant.

Finally when the issue is the distribution of grants across communities, keeping the overall amount of grants constant we will refer to the *pure distribution* problem.

In the bargaining process on the decentralization issue local governments are usually hungry for extra funds and lobby for the increase in total grants G but seldom, if ever, is there a proposal to change the *distributional* shares between communities.[7]

The reason for this is simple. The first "game" (decentralization) is a positive sum game for local governments while the second one (distributional) is a zero sum game since in the latter what some jurisdictions win is just offset by the losses of the others. Therefore, unanimity is possible and probable in the first case while it is most unlikely in the second.

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[7] This is based on the knowledge of Portuguese reality . We believe, however, that it is a more general situation since it has a game theory rationale behind it.

From the point of view of central government's macroeconomic objectives, the redistribution game is almost innocuous provided that it does not change the total amount of grants.

On the other hand restraining overall public expenditure is on the agenda of most developed and developing countries. Therefore, containing the amount of grants is clearly an objective of central government policy while the way these grants are distributed seems a second priority.

In periods of economic growth, and due to the relatively elastic nature of fiscal revenues in relation to GDP, total grants have a tendency to increase not only in real terms but also as a proportion of GDP. In recession, faced with shortening resources, central governments will try to reduce grants. The same would happen when there are strong budget deficits.

In conclusion it is predictable that central government is willing to satisfy local governments' preferences regarding the distribution game but unwilling to make many concessions regarding the decentralization issue.

The nature of the redistributive game has to be clarified and also the meaning of a "self-interested" community. Each community is assumed to want to maximize the amount of grants received and therefore the share it has in total grants.

However, it is reasonable to assume that similar communities are treated alike and therefore that redistribution does not go to a particular community but to communities with similar characteristics.

One of the characteristics that differentiates communities is precisely community size. High populated jurisdictions are urban or suburban while low populated communities are usually rural, with distinct socio-economic and productive patterns.

A way of formalizing the distribution problem is to consider that total grants for communities are given by:

$$\overline{G} = \sum_{i=1}^{k} G^i \tag{2}$$

and grants for each jurisdiction are:

$$G^i = AN^{i^{(\mu+1)}} \tag{2a}$$

which in per capita terms is:

$$g^i = AN^{i^{\mu}} \tag{3}$$

where μ is the distribution parameter. If $\mu = 0$ all jurisdictions receive the same amount of per capita grants A.

Thus, each lump-sum intergovernmental grant scheme can be uniquely determined by the total amount of grants ($\overline{G}$) and the distributional parameter (μ) when the size distribution of communities is given.

Empirical analysis in several countries shows that in general the population hierarchy of cities follows a "Pareto" distribution given by:

$$N^i = \left(\frac{i}{D}\right)^{\frac{1}{\beta}}$$

where i is the rank of the community when communities are ordered by decreasing population size and D and β are parameters to be estimated.

In almost every study of nontruncated hierarchies of communities β is close to minus one. Some studies show that β is significantly different from minus one and others that it is not. For purposes of the development of the theory it is convenient to consider that $\beta = -1$ so that we have got the rank size rule:

$$N^i = \frac{D}{i} \equiv \frac{N^1}{i} \tag{4}$$

where N^1 is the population of the largest community.

Under the rank size rule, the size of each community is given by the ratio of the population of the largest community divided by the rank of the community. This enables us to calculate the size of the median rank community m which is defined as being the one
that occupies the median position within the population hierarchy. Assuming for simplicity an odd number of communities k we have:

$$N^m = \frac{2}{k+1} N^1$$

This result is interesting and shows that the medium rank size community is a relatively small one particularly if there is a large number of communities.

Moreover, we can obtain an expression for the total amount of grants introducing equation (4) in (2a) and the result in (2) , so that:

$$\overline{G} = AN^{1(\mu+1)} \sum_{i=1}^{k} \frac{1}{i^{(\mu+1)}} \tag{5}$$

In other words total grants change with the distribution parameter μ , given A and N^1.

It is interesting to analyse what happens to total grants when μ changes and particularly keeping the grants received by the median rank community constant.

In this case if $\mu < 0$ smaller jurisdictions will be better off and bigger jurisdictions worse off. This can be illustrated in figure 1 where *total* grants are measured on the Y axis and the k communities of a country are ranked according to (decreasing) population size on the X axis.

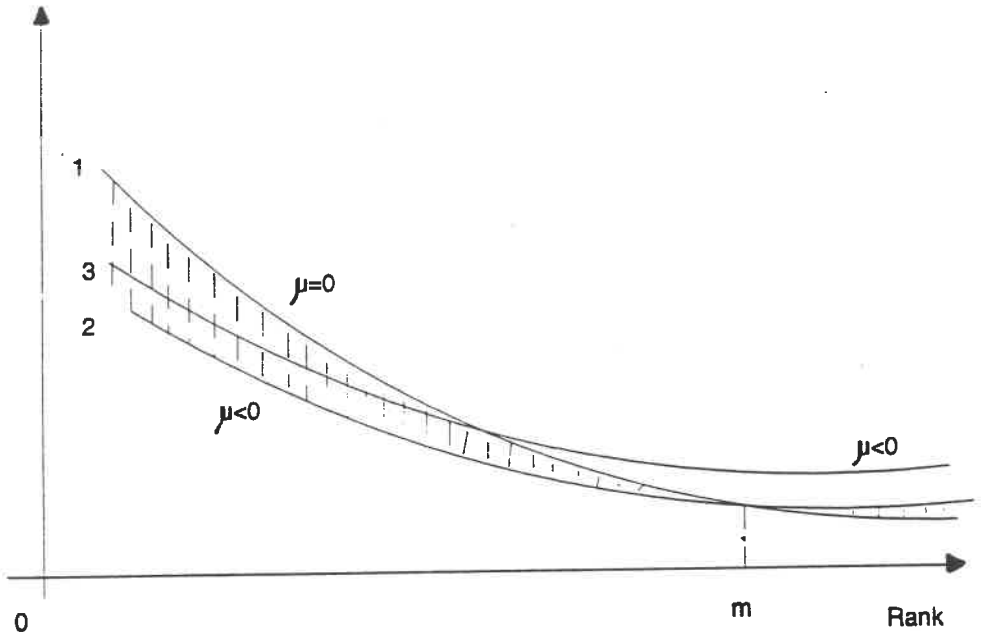

Figure 1: Intergovernmental Grants and Communities' Rank-Size

Since with $\mu = 0$ total grants per jurisdiction are proportional to population, the curve 1 ($\mu = 0$) can measure both the rank-size distribution of communities *and* total grants received by communities when per capita grants across jurisdictions are the same. Total grants ($\overline{G_1}$) is the area under the curve, which can be given by the equation:[8]

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[8] Since $\lim\left(\sum_{i=1}^{k}\frac{1}{i}-\ln n\right)=\gamma$ this area can be *approximated* by $\int_{x=1}^{k}\frac{1}{x}dx+\gamma=\ln k+\gamma$ where γ is the Euler's constant. An expression for total grants can be written using the "big oh" notation (see Apostol

$$\overline{G}_1 = A_1 N^1 \sum_{i=1}^{k} \frac{1}{i}$$

Consider now the curve 2 (with $\mu = a < 0$) drawn so that the median rank community receives the same amount of grants. It is clear that communities bigger than the median (at the left of m) are worse off and communities smaller are slightly better off. Now total grants are given by:[9]

$$\overline{G}_2 = A_2 N^{1(\mu+1)} \sum_{i=1}^{k} \frac{1}{i^{(\mu+1)}}$$

Total grants $\overline{G}_2$ are smaller in this case. The difference $\overline{G}_1 - \overline{G}_2$ is the difference between the two shaded areas at the left and right of the median community respectively.

To put the issue in pure redistributive form, the surplus $\overline{G}_1 - \overline{G}_2$ must be allocated uniformly across jurisdictions resulting in an upwards parallel shift of the curve 2. This is illustrated by curve 3. Under the new scheme ($\overline{G}_3 = \overline{G}_1$, $\mu = a < 0$) the majority of communities that will be better off is enlarged.

The case of $\mu > 0$ is not drawn so as to not overburden the figure. Nevertheless, it can easily be understood that in this case there would be a clockwise rotation of the curve 1, so that all the smaller communities would be worse off. Moreover, the total amount of grants $\overline{G}_4$ would be considerably larger so that a downwards shift of this curve would be necessary to keep total grants $\overline{G}$ constant.

Therefore, some conclusions can be drawn. In a pure distribution issue the large majority of (small) communities will support a scheme of distribution of per capita lump-sum grants that is *regressive* towards the population size of communities (i.e. $\mu < 0$). This scheme is supported by all small communities and a considerable range of medium size ones.

(1974) section 8.13 on "The Big Oh and Little Oh Notation" example 1):

$\overline{G}_1 = A_1 N_1 \left[\int_{x=1}^{k} \frac{1}{x} dx + \gamma + O\left(\frac{1}{n}\right) \right]$, where $O\left(\frac{1}{n}\right)$ is the "big Oh" of $\frac{1}{n}$.

[9] Again we may use the big oh notation to pass from the summation to the integral. However, in this case the expression would be different. (see Apostol op. cit. example 2).

On the other hand, central government can decrease the overall amount of grants by keeping constant the per capita grants of the median size community and improving the situation of all the smaller communities.

4 Empirical Analysis

The analysis of per capita intergovernmental lump-sum grants used 1989 data from a fund for financial imbalance which consolidates the almost totality of transfers from central to local governments in Portugal. The cross-section data concerns 186 communities (*concelhos*) having more than 10.000 inhabitants in 1991 but excluding the largest three urban communities.[10]

The first model considered in section 2 assumes that per capita lump-sum grants aim to equalize the fiscal position of jurisdictions For this reason, per capita grants g are designed in order to offset differentials in the taxbase per capita b (to equalize revenues per capita) taking also into account that jurisdictions have different "needs". Assuming constant returns to scale in consumption and production there is no reason to consider population size as a relevant variable in indicating jurisdictions' per capita "needs". Since socio-economic indicators of communities are correlated the introduction of several variables would introduce multicolinearity in the regression analysis. Therefore, we have decided to incorporate only one variable I which indicates the proportion of houses in each community which are not on main water.

Therefore the following equation was estimated using ordinary least squares:

$$g^i = \alpha_1 + \alpha_2 b^i + \alpha_3 I^i + \varepsilon^i \qquad (6)$$

It would be expected that $\alpha_1 > 0$, $\alpha_2 < 0$, (the higher the per capita tax base the lower per capita grants) and $\alpha_3 > 0$ (the higher the development needs, the lower the per capita grants).

The estimated results are the following:

$$\hat{g}^i = 13.0009 - .001996 b^i + 7.4301 I^i \qquad \bar{R}^2 = .02 \qquad N = 186$$
$$(13.635) \quad (-.7283) \quad (1.6796)$$

[10]Data sources are the following: population data come from INE (1993), intergovernmental grants (fundo de equilíbrio financeiro) from DGAA (1992) , infrastructure data were obtained in DGAA (1989), voting data in STAPE (1989), taxbase was constructed according to Pereira's methodology (1993) using property tax data from DGAA (1992).

It is sufficient to look at the adjusted $\overline{R}^2$ to see that this relationship is meaningless. Intergovernmental lump-sum grants are not designed to equalize the fiscal capacity of jurisdictions and to compensate for differences in communities' development "needs". It is important to note that in order to offset disparities in per capita tax base, the relationship between per capita grants and per capita tax base should be linear.

It is possible to turn now to the politico-economic model developed in section 3. This model was developed on the assumption that the non-truncated hierarchy of communities follows a "Pareto" distribution and in particular the rank-size rule. In this way the present hierarchy of communities. Therefore firstly the actual distribution of Portuguese communities will be estimated. Taking logarithms of both sides of the equation:

$$N^i = \left(\frac{i}{D}\right)^{\frac{1}{\beta}}$$

rearranging and adding an error term yields:

$$\ln i = \ln \overline{D} + \beta \ln N^i + \varepsilon^i \qquad (7)$$

where i is the community rank, $\overline{D}$ is a parameter and β if equal to minus one yields the rank-size distribution.

Estimation of the above equation for all Portuguese communities yields,[11]

$$\ln i = 13.6943 - .9229 \ln N^i \qquad \overline{R}^2 = .93 \quad N = 275$$
$$(93.647)\ (-62.308)$$

This result shows that the distribution of population among communities follows a Pareto distribution but that the rank size rule does not apply strictly. In fact β is significantly different from minus one even at a 90% degree of confidence[12]. However, the argument in section 3 was developed on the basis of $\beta = -1$ for purposes of the analytical tractability of the problem. The actual value of -.92 is close enough to minus one to keep the argument valid.

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[11] t values in parenthesis

[12] $t_{\hat{\beta}} = \dfrac{-.9229 - (-1)}{.014812} = 5.205$

Therefore, we can proceed to the empirical analysis of the politico-economic analysis which will be tested using a generalization of equation (3):

$$g^i = AN^{i\delta_2} b^{i\delta_3} I^{i\delta_4} \qquad (8)$$

In fact if $\delta_3 = \delta_4 = 0$ equation (3) is again obtained. The main predictions are that $\delta_2 < 0$ and $\delta_4 > 0$. The critical parameter is δ_2. If it is not significantly different from zero indicates that, *ceteris paribus*, communities receive the same amount of per capita grants. A negative value for this coefficient would support the hypothesis that central government can either decrease total lump-sum grants or enlarge the proportion of communities that support this grants scheme.

Since b^i is per capita tax base a positive value for δ_3 indicates the existence of a revenue sharing aim for grant design. In fact it means that higher tax base jurisdictions are receiving, *ceteris paribus*, higher per capita grants. On the other hand if δ_3 is significantly lower then zero this indicates an equalization aim.

Furthermore, it is also predictable that per capita grants increase with I ($\delta_4 > 0$) if there is a "needs" element in the distribution of grants.

Taking logarithms of equation (8) and adding an error term enables OLS estimation:

$$\ln \hat{g}^i = 6.9899 - .4568 \ln N^i + .07637 \ln b^i + .05522 \ln I^i \qquad \bar{R}^2 = .78 \qquad N = 186$$
$$(37.474) \quad (-23.396) \quad (2.9217) \quad (2.4905)$$

As can be seen the model performs well in explaining intergovernmental grants' design. As predicted per capita grants decrease with the population size of communities, and there is a population elasticity of -.45 . The design of grants seems also to take into account jurisdiction needs as shown by the positive coefficient of the infrastructure needs variable I.

Another equation was also estimated which incorporates a further variable P which indicates the proportion of votes in local elections for the political party which form the government.[13] This variable was introduced by Alperovich and in his opinion incorporates political factors. It was found positive and statistically significant by Alperovich (1984) who anticipated that intergovernmental grants were designed to reward central governments' political supporters.

The new estimated equation is:

[13]In our regression it applies to local elections for the city councils (*câmaras municipais)* in 1989.

$$\ln \hat{g}^i = 7.1632 - .45336 \ln N^i + .078232 \ln b^i + .067152 \ln I^i - .055854 \ln P^i \qquad \bar{R}^2 = .78 \qquad N = 186$$
$$(34.311)\ (-23.245) \qquad (3.009) \qquad (2.9189) \qquad (-1.8055)$$

the "political" variable P is not statistically significant at a 95% degree of confidence but it is significant at 90% dergree of confidence. However, it has the "wrong" sign according to Alperovich prediction and it does not add very much in the explanation of the variation of per capita grants. There are in our opinion two main reason why this is so. Firstly, central government could either reward his political supporters (in which case the coefficient would be positive) or to buy votes to his opponents (in which case it would be negative). Secondly, P considers the *proportion* of voters and not the total number of voters and it is the latter which could be more relevant for central government.

5.Final comments

The approach developed in this paper introduces a rationale for intergovernmental lump-sum grants that differs from the traditional equalization or efficiency arguments. Under the not unrealistic assumptions of constant returns to scale in consumption and production, per capita lump sum grants regressive with respect to population size can not be justified on equalization grounds. This sort of grant design might be understood as a consequence of central governments' aim to keep overall transfers under control and at the same time command wide political support from a majority of communities. The predictable effects of such a design is to put relatively high fiscal pressure on urban communities when compared with medium size or smaller communities. This can have the effect of enhancing fiscal stress in urban communities.

A final note should be made on the economic and institutional factors which will contribute to the validity of the hypothesis of regressive per capita lump-sum grants.

Firstly, central government aim to constrain overall transfers to local government will be higher during periods of recession rather than economic growth. Moreover, the larger the budget deficit the greater the incentive to cut grants. Therefore it is predictable that, *ceteris paribus,* the lower the rate of economic growth and the larger the deficit the more regressive lump sum per capita grants are likely to be.

Secondly, grant design should also change according to the centralized or decentralized system of government. Almost by definition centralized countries are those where central governments are more active, having power and therefore greater discretion to define grantdesign. This suggests that the hypotesis introduced in this paper applies more to centralized rather than decentralized countries.

Finally, it was assumed in section 3 that the bargaining strength of local governments is a function of their ***number*** and not a function of the respective population. Whenever there is an association of municipalities when decision-making is taken on the basis of one mayor one vote (independently of community size) it is the number that counts for the

majority. On the other hand, if decision-making is based on the population "weight" of each mayor the possibility to lobby against grant formulas that penalize urban communities will be greater. In any case mayors will agree more easily when it comes to demanding larger grants but there will be more controversy as regards the criteria underlying the grant distribution formula.

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