These rules are made for spending: Testing and extending the law of 1/n

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Abstract

What is the influence of the rules of political representation on local spending? This research tests the law of 1/n in the Portuguese local context and finds that the law fails to apply. We suggest an alternative measure – the density of representation – to assess the impact of the rules of city council representation on local public expenditures. Density of representation is defined as the number of elected officials in the city council divided by city population. We find an S-shaped relationship between the density of representation and the level of local government expenditures. The level of municipal spending initially declines with increases in the density of representation, reflecting an increase in the ability of constituents to monitor their elected representatives. At higher levels of representation density, the relationship becomes positive, suggesting that the dynamics of the budgetary commons become salient. The relationship becomes negative again for extremely high density of representation owing to increases in the transaction costs of legislative decision-making. This paper discusses the implications of our findings for the reform of local government institutions and the rules of political representation.

Key Words: law of 1/n, density of representation, local expenditures, city council

JEL Classification: H72, H19

1. Introduction

What implications do the local institutions of political representation have for local spending? Despite a half-century of research, the answer to this question remains incomplete. Some studies have linked institutional changes in forms of government (Clingermayer and Feiock 2001; Morgan and Kickham 1999), council/commission size (Bradbury and Stephenson 2003), direct democracy processes (Farnham 1990; Gabrini 2010; Park et al. 2010) and metropolitan/county fragmentation (Hendrick et al. 2011) to local government expenditures.

The effects of council size, in particular, have received substantial attention, inspired by the theoretical predictions of the law of 1/n (Weingast et al. 1981). Most simply stated, the law of 1/n predicts that the larger is the number of representatives in the council, the higher are the expenditures in the jurisdiction. Most of the empirical tests of the law of 1/n have been conducted at the supra-local level, and only a handful of studies have explored its validity at the *local* level (Drew and Dollery 2016). Given that the existing studies point to ambiguities in the law of 1/n's predictions, more research is needed to explore the effects of the rules of local representation on public spending.

This article advances theory and methods regarding this topic by investigating the effect of the density of representation on the level of local government spending. Thus, the theoretical contribution of the paper is to show how – instead of merely examining the head count of municipal council members (i.e., council size) – an alternative approach, based on the ratio of representatives to constituents, can be applied fruitfully in exploring the effects of the rules of representation on municipal budgets. While the standard approaches to exploring the effects of the law of 1/n allow one to consider the 'budgetary commons' dimensions of public spending, 'density of representation' allows for the capturing of the accountability mechanisms as well (Raudla 2015). To predict how the density of representation influences the level of local government spending, we draw on various streams of the literature from new institutional

economics and public choice that address the question of how different institutional settings influence spending decisions. Using insights from theoretical discussions of collective action problems, rent-seeking, principal-agent problems and transaction costs, we hypothesize an S-shaped relationship between the density of representation and the level of local government expenditures.

First, in a municipality with very low density of representation, a councilor represents a large number of constituents, making it more challenging for constituents to monitor their elected representatives (Ricciuti 2003; Thornton and Ulrich 1999) and to hold them accountable owing to the collective action problems present in larger groups (Azfar 2001; Olson 1965). These problems, in turn, increase the likelihood that officials will engage in rent-seeking (Tullock 1967; Keefer and Knack 2007), resulting in larger expenditures. When we move from very low levels of representation density toward higher levels, we can expect a *reduction* in expenditures initially.

Second, when the number of representatives exceeds a certain threshold, further increases in the density of district representation lead to more public spending because of a phenomenon that can be described as a budgetary commons (Raudla 2010). In addition, a larger number of representatives renders it more difficult for voters to monitor council performance owing to principal-agent problems (Dixit et al. 1997), resulting in more particularistic or wasteful public spending. As a result of these two considerations, as the density of representation increases, local government spending also increases.

Finally, for extremely high representation density, the transaction costs associated with vote trading and the formation of majorities required to approve spending measures rise significantly (Horn 1995; Fiorino and Ricciuti 2007; Thornton and Ulrich 1999). Thus, beyond a certain threshold, if the density of representation increases further, local government spending declines as a consequence of higher decision-making costs.

We test the hypotheses with data from Portuguese cities. Portuguese city councils are the deliberative bodies of local governments that are decisive on budget issues. Portuguese

municipalities thus provide potentially valuable laboratories for examining the political determinants of local public spending, given that they combine two different bases of representation. Portuguese city councils are characterized by a mixed structure, composed of officials elected at large and officials elected indirectly as representatives of local sub-city governmental units, called civil parishes.[1] Thus, while some of the council members represent the municipality as a whole, others fulfill the roles of representatives of specific geographical districts. In its standard formulation, the law of 1/n applies to representative bodies composed of members who represent well-defined geographical areas (Weingast et al. 1981). While some scholars have argued that the insights of the law of 1/n can be extended to proportional electoral systems (e.g., Cox 1990), empirical studies of the law have provided contradictory evidence on that issue. Thus, using data drawn from the Portuguese local government context could also shed light on the effects of the different logics of representation on spending decisions.

We use data on total expenditures from all municipalities in continental Portugal to measure local spending, and we employ panel data (covering the 2009-2013 period) with fixed effects regression to test the proposed theoretical relationship between the density of city council representation and the level of spending. The analysis provides evidence supporting our basic tenet that an S-shaped relationship exists between the density of representation on city councils and local spending.

This study is divided into seven sections. Following this introduction, we present background on the notions of the budgetary commons and the law of 1/n. Section 3 discusses the concept of density of representation and presents the hypotheses relating it to the level of local public expenditures. Section 4 describes the data and methods employed in the empirical analyses conducted in section 5. The findings are discussed in section 6. The article closes with a set of conclusions and the policy implications of this research.

[1] For the purposes of this manuscript, we use the terms ‘parish’ and ‘district’ interchangeably.

2. The budgetary commons and the law of 1/n: Background

In the public choice and political economy literatures, spending decisions in the public sector often have been conceived of as resembling a 'budgetary commons'. According to Tullock (1959, p. 577), the logic of common-pool resources is applicable to "any governmental activity which benefits a given individual or group of voters and which is paid for by general taxation". The tragedy of the budgetary commons was first modeled formally by Weingast et al. (1981), who demonstrated the possible effects of the geographical concentration of interests in a setting wherein legislators have been elected from single-member districts and, to ensure reelection, have the motive to provide targeted spending to their home districts. The gist of the budgetary commons models is that the proposer of spending internalizes its full benefits, but bears only a fraction of the cost since it is financed from the common tax fund (see also Buchanan and Yoon 2002; Perotti and Kontopoulos 2002; Raudla 2010). The divergence between the *perceived* and *actual* costs of public spending programs, in turn, would lead decision-makers on the commons to demand greater levels of particularistic expenditures than would be efficient, leading to spending growth.

Drawing on the budgetary commons model, Weingast et al. (1981) also proposed the first formulation of the law of 1/n. According to the standard version of the law of 1/n, "if district tax share is a declining function of the number of districts (n), then the level of expenditures is an increasing function of the number of districts" (Weingast et al. 1981, p. 654). The geographically defined political jurisdiction can serve as a common pool of resources from which elected officials seek approval for financing their district-specific projects. The law of 1/n argues that the larger the number of districts (with each having one representative in the legislative body) in the jurisdiction, the larger will be the discrepancy between perceived costs and benefits in the case of geographically targeted expenditures. The larger is the number of districts, the smaller is the

district-specific cost burden of any publicly funded project or program, and hence, the greater is the demand for district-specific expenditures financed from the common tax fund. In summary, the larger is the number of districts into which the jurisdiction is divided (and the larger is the total number of legislative representatives), the higher government spending will be (Buchanan and Yoon 2002; Weingast et al. 1981).

Most of the empirical research on the law of 1/n has focused on the supra-local level (e.g., Aidt and Shvets 2012; Bradbury and Crain 2001; Fiorino and Ricciuti 2007; Lee 2015; Gilligan and Matsusaka 1995, 2001; Shughart and Tollison 1986) and has found mixed evidence of the effects of the number of legislators on public spending. Bradbury and Crain (2001), Shughart and Tollison (1986), Lee (2015), Ricciuti (2004), Fiorino and Ricciuti (2007), Aidt and Shvets (2012) and Halse (2016) have provided evidence supporting the law of 1/n. De Figueiredo (2003), in contrast, showed that the number of legislators can in fact *reduce* the level of spending. Examining US states, Gilligan and Matsusaka (1995, 2001) demonstrated that spending increases with the size of legislative upper chambers, but not with the size of lower chambers. Primo (2006) and Crowley (2015) found that, while the size of the upper chamber has significant, positive effects on the level of spending, the size of the lower chamber has significant, negative effects.

The law of 1/n increasingly has received attention at the local level of government. Studies conducted in the US context have mostly pointed to the validity of the law of 1/n. Langbein et al. (1996) demonstrated that a larger council size leads to more spending. Baqir (2002) showed that government spending rises as the number of districts increases and that this relationship persists even in municipalities where the majority of city council members is elected at large. Only the presence of a chief executive with veto powers is able to curb this effect and enforce fiscal discipline in a legislature. Bradbury and Stephenson (2003) used a sample of Georgia counties and found a positive relationship between the number of county commissioners and county government spending. However, MacDonald (2008) showed that the size of the city council does *not* have a significant effect on expenditures. Studies conducted on local

governments outside the United States likewise have led to conflicting results. Egger and Koethenburger (2010) found evidence of the expected positive relationship in the case of German municipalities. Drew and Dollery (2016) showed, in their study of Australian local governments, that the law of 1/n does *not* hold when examining only the number of representatives, but the larger is the number of municipal wards, the higher are per capita expenditures. Pettersson-Lidbom (2012), in contrast, demonstrated that, in Finland and Sweden, larger legislatures lead to lower levels of spending. These diverging results on the effects of the law of 1/n in proportional electoral systems clearly indicate that more research is needed to understand its validity in different systems of representation.

2.1 Does the law of 1/n hold in Portugal?

The expectation that an increase in the number of legislators increases the level of local public expenditures can, at first sight, be applied directly to Portuguese city councils since they include councilors elected from different districts in the jurisdiction. In addition, given that, at least according to some of the theoretical formulations, the effects of the law of 1/n have been predicted to hold in proportional systems as well (Cox 1990), Portuguese city councils potentially can experience the 'worst of both worlds'. Because council size increases with the number of civil parishes, councils with larger numbers of parish-elected representatives faced the 1/n problem, leading to more projects receiving approval and, hence, to higher local government expenditures. Thus, our first step is to test the standard formulation of the law of 1/n in the context of Portuguese municipalities: city councils with larger numbers of district-elected councilors, more councilors in total, or both are expected to engage in more public spending.

Our test of the law of 1/n reported in Appendix A, however, returns inconclusive results. The model specifications for total expenditures show insignificant effects both for the number of district-elected councilors and for the total number of councilors (models I and II, respectively), in agreement with the findings of MacDonald (2008). Thus, our preliminary analysis suggests

that alternative empirical approaches are needed to explore the dynamics of the law of 1/n. Given that the representatives sitting on Portuguese city councils are elected by a combination of proportional and first-past-the-post mechanisms, a more nuanced approach to capturing the effects of such an institutional configuration might be needed.

3. The density of political representation and local public spending decisions

As Raudla (2010), drawing on the extensive work by Ostrom (1990, 2000, 2005) has argued, when using the metaphor of a 'budgetary commons', we should pay careful attention to institutional configurations and complexities. Depicting the overgrazing of the budgetary commons by counting only the number of 'herders' (legislators) might not adequately describe institutional settings in which public finance decisions actually are made. Thus, the relationship between council size and spending could, in fact, be nonlinear and mediated by other rules of collective choice (Mukherjee 2003; Primo and Snyder 2008; Raudla 2010). In her analytical framework for analyzing the effects of electoral rules on public finances, Raudla (2015) proposed that, alongside models of *budgetary commons* (like the law of 1/n), we should also pay attention to *accountability mechanisms* (often analyzed with the help of principal-agent models). Accountability has different dimensions (see, e.g., Lindberg 2013, for a recent discussion). It can refer inter alia to the *incentives* that voters have for monitoring their representatives, but also to their ability (or capacity) to monitor them. In this paper, we propose a measure that might be able to capture both the budgetary commons and accountability aspects – and their potentially non-linear impacts – associated with the rules structuring local government representation.

We propose the concept of density of representation to assess the effects of the rules of representation on local spending. Density of representation is defined as the number of elected officials on the city council divided by the city population. For developing predictions about how representation density influences the level of local government spending through both the

budgetary commons and accountability mechanisms, we draw on various streams of literature from new institutional economics and public choice that address the question of how different institutional settings influence spending decisions. Drawing on insights from theoretical discussions of collective action problems, rent-seeking, principal-agent problems, and transaction costs, we hypothesize an S-shaped relationship between the density of representation and the level of local government expenditures. Figure 1 summarizes our theoretical predictions and will be explained in detail in the following subsections.

[Insert Figure 1 here]

3.1 Collective action, rent seeking, and local government spending

City councils can be understood as institutional forms of representation, accountability, and public participation (Bulut and Taniyici 2006). Low density of representation indicates that each councilor represents a large number of citizens. It also indicates that each councilor is monitored by a large group of constituents (Ricciuti 2003; Thornton and Ulrich 1999).

The larger that each councilor's constituency is, the more challenging it is for the voters to monitor their elected representatives (Ricciuti 2003; Thornton and Ulrich 1999) and hold them accountable owing to the *collective action problems* faced by larger groups (Azfar 2001; Olson 1965). As suggested in Mancur Olson's (1965) seminal work *The Logic of Collective Action*, the larger is a group, the larger is the gap between what is collectively rational and what individual rationality entails (for an overview, see Azfar 2001). Given that monitoring the behavior of elected representatives has the attributes of a public good (with the benefits accruing from the monitoring activities being shared by all), individual voters have incentives to shirk in their contributions to monitoring efforts. Thus, the larger is the constituency size, the more likely voters are tempted to 'free ride' on the monitoring activities of other residents in the municipality.

In addition, the larger is a group of constituents, the larger are the costs of coordinating the group's monitoring activities (Olson 1965). Given the challenges presented to voters' monitoring activities in a municipality with a low representation density and weaker incentives to hold their representatives accountable, elected officials are more likely to engage in *rent-seeking* (Tullock 1967). Legislative rent-seeking entails, inter alia, attempts by actors to appropriate resources from the public budget to their own political advantage (Keefer and Knack 2007; Mohtadi and Roe 2003). As Mohtadi and Roe (2003) and Keefer and Knack (2007) argued, in a context of weak accountability, more rent-seeking opportunities exist, and elected officials are given greater scope for opportunistic or wasteful spending. Thus, if we move from very low levels of representation density toward higher levels (segment 1 in Figure 1), we can expect a *reduction* in expenditures because the collective action problems that voters face in monitoring rent-seeking behavior become less severe and, hence, fewer opportunities are open for self-interest-seeking spending by councilors. In other words, when the density of representation rises, each district representative is responsible for attending to the interests of a smaller set of constituents, which should make elected officials more accountable to their electorates (Thornton and Ulrich 1999).

Hence, we derive our first hypothesis (indicated in segment 1 of Figure 1):

H1: An increase in the density of representation from low levels leads to a reduction in local government expenditures.

3.2 District representation, principal-agent problems, and local government spending

Despite the arguments outlined in the previous sub-section, the general prediction of the law of 1/n can be extended, using the concept of representation density. According to the *budgetary commons* models more legislators representing fewer citizens are likely to engage in overgrazing of the local budget. A smaller group of constituents is likely to have more homogeneous preferences than a larger group (Oliver 1999, 2001; Ricciuti 2003; Thornton and Ulrich 1999;

Tiebout 1956). Municipal fragmentation into districts generates Tiebout-type sorting effects and more (and smaller) communities amongst which citizens can choose. Citizens vote with their feet according to their preferences and communities tend to become more homogenous (Tiebout 1956; Oliver 1999, 2001). A more extensive representation of small groups with internally homogeneous interests on the city council, in turn, will motivate an increase in local expenditures, either in the form of geographically concentrated policies (pork-barrel spending) (Weingast et al. 1981; Crain 1999) or in the form of spending targeted to specific social groups (von Hagen 2003). *Principal-agent* models (Dixit et al. 1997; Miller 2005; Moe 1984) can provide further insights into budgetary dynamics. From this perspective, voters as principals delegate decision-making over the use of resources to their political agents in the legislative body (Dixit et al. 1997; Ferejohn 1986). The central problem of agency is that the goals of the agent(s) might not correspond exactly to those of the principal(s), necessitating monitoring to ensure that the agent's behavior reflects the principal's interests (Moe 1984). As the size of the legislative body increases, constituents face higher monitoring costs since the number of political agents they have to keep track of goes up (Dixit et al. 1997; Ferejohn 1986). Voters are likely to find it more difficult to scrutinize the activities of a larger number of councilors (Feiock et al. 2009), and they have lesser capacity to hold the representatives individually accountable for spending decisions. As a result of diluted accountability, the councilors might be more likely to adopt particularistic and/or wasteful spending.

The arguments linking the law of 1/n, increased monitoring costs, and higher density of representation support our second hypothesis (indicated in segment 2 of Figure 1):

H2: Higher density of representation leads to larger local government expenditures.

3.3 Decision-making costs and local government spending

Representation density is likely to influence the level of *transaction costs* associated with decision-making on the municipal council. In a legislative context, transaction costs refer to the time and effort incurred for reaching decisions (Fiorino and Ricciuti 2007; Ricciuti 2003; Thornton and Ulrich 1999). Following the classic argument of Ronald Coase (1960), we can expect costs to increase significantly with the number of actors [legislators], thereby hampering efficient bargaining. Thus, as the number of decision-makers increases, the transaction costs incurred in finding a viable majority of votes for each spending proposal become greater (Fiorino and Ricciuti 2007; Ricciuti 2003; Thornton and Ulrich 1999). When the size of the city council becomes extremely large, the time and effort required to reach agreements over spending priorities reduce each councilor's ability to propose policies and associated spending (Horn 1995). In addition, the diversity and heterogeneity of policy positions in a very large legislature increase the levels of conflict and uncertainty regarding policy outcomes (Buchanan and Tullock 1962; Horn 1995). Consequently, a larger legislature would reduce legislative production and government spending (Thornton and Ulrich 1999).

Furthermore, higher density of representation also means that each councilor represents a smaller and a more homogeneous constituency (Ricciuti 2003; Thornton and Ulrich 1999). As a result, in negotiating spending proposals, vote trading is costlier, making it more difficult to make decisions (Thornton and Ulrich 1999). As Thornton and Ulrich (1999, p. 591) explained, it is costlier for a representative from a district with homogenous interests to vote against a legislative proposal than for legislators whose districts have more diverse interests.

These arguments suggest a third hypothesis (indicated in segment 3 of Figure 1):

H3: Extremely high density of representation leads to less local government spending.

In summary, bringing together the arguments outlined in the previous subsections, we expect the relationship between representation density and the level of municipal spending to follow a third-degree polynomial (see Figure 1).

Hence, our final hypothesis is the following:

H4: The relationship between the density of representation and local government expenditures is S-shaped.

4. Research context

The Portuguese context provides an excellent opportunity to measure the effects of different council sizes and densities of representation on local government expenditures because the council structure was established by national legislation in 1976 and has remained unchanged ever since. In this context, council structures can be treated as exogenous in formulating our empirical models since the factors accounting for the choice of government structures are uncorrelated with the choice of local expenditure levels (Sass 1991). In contrast to the United States, inefficient expenditure choices do not promote endogenous changes in government structure (MacDonald 2008) because any such changes entail a single, unitary set of rules imposed by national legislation.

The significant variation in the populations of Portuguese municipalities over the past 50 years has compromised the equilibrium that guided the creation of civil parishes in the nineteenth century. As a result, Portuguese municipalities now experience two extreme situations: scarcely populated municipalities with large numbers of city council representatives; and heavily populated jurisdictions characterized by heterogeneous preferences and much smaller numbers of representatives (see Figure 2). The variation in the density of representation is likely to impact the level of local government spending, which, combined with the challenge made to the current institutional configuration, justifies closer scrutiny of the impacts addressed in this work.

[Insert Figure 2 here]

The executive branch in Portuguese municipalities follows a strong mayoral form of government imposed by constitutional rule, while the figure of the city manager is completely absent. Mayors in Portugal are elected as the head of their political party's list. Executive cabinets can hold a minority of seats, meaning that the winning party (and the sitting mayor) might not have a majority of the city's executive branch.

City councils are responsible for approving budgets, establishing land use plans, selling municipal bonds, setting municipal tax rates, and enacting local ordinances and regulations. National rules impose a mixed composition of the city council, combining district/civil parish (*freguesias*) representatives and at-large elected members. District representatives can never outnumber council members elected at large. As a general rule, the number of members elected at large exceeds by one the number of district representatives. Consequently, city council sizes vary with the extent of fragmentation of the municipality into civil parishes. City councils include all civil parish presidents (the equivalent of district elected officials). In municipalities with only a few parishes, the minimum number of council members elected is 15, corresponding to three times the number of members of the municipal executive branch. Table 1 provides a summary of the number of civil parishes per municipality in Portugal (including the Azores and Madeira Islands). Figure 2 displays the relationship between the number of city council members and city populations. The heavy concentration of observations on the lower left side shows that most municipalities have small city councils. Larger cities (more than 50,000 inhabitants) are much more diverse in terms of city council size.

[Insert Table 1]

5. Data and methods

To test the hypotheses outlined above, we collected data from all 278 local governments of Continental Portugal[2] in the 2009-2013 period. We chose to include a full election cycle (2009-2013) to avoid confounding factors. In addition, data for some variables are available only for this specific period, preventing us from conducting a longer time series analysis. The empirical analysis employs two datasets depending on the specification of the theoretical variable of interest. The first specification measures the density of representation using the total number of councilors, while the second measures the density of representation only for the district councilors.

The dependent variable employed in the analysis is the natural log of local government total expenditures per capita (Y_i) measured for the 2009-2013 period. Data for total expenditures are provided by the Portuguese National Bureau of Statistics based on yearly municipal budgets.

The model to be tested can be represented as:

$$Y= \alpha + X\beta+ \mu$$

As mentioned already, the key theoretical variables of interest are the density of representation, its square, and its cube. Representation density is measured in two ways: (1) the total number of members in the city council per 1,000 inhabitants (X_1); and (2) the number of district-elected members in the city council per 1,000 inhabitants (X_2). The relationship between the density of representation and the level of local expenditures is nonlinear and complex (Mukherjee 2003; Primo and Snyder 2008; Raudla 2010). The S-shaped relationship described in hypothesis four follows a third-degree polynomial, in which the coefficients for the additive, quadratic and cubic terms are expected to be negative, positive, and negative, respectively.

[2] The municipalities of the archipelagos of Azores and Madeira were excluded owing both to the uniqueness of their geographical settings and missing data.

The models include nine control variables, divided into socio-economic factors and political variables.

In the socio-economic dimension, we included: population, population density, income, urbanization rate, and intergovernmental grants. Population (X_3) and population density (X_4) are used as controls for the economies of scale that can lead to reductions in local spending. Following MacDonald (2008) and Park et al. (2010), we employ per capita personal income to control for the effect of wealth on the demand for public services. Per capita income (X_5) should be positively related to spending because a larger tax base provides more opportunities for councilors to allocate funds (Bradbury and Stephenson 2003). Urbanization can place additional pressure on urban infrastructure and can lead to a significant increase in expenditures. We employ the proportion of urban land as a proxy for infrastructure needs (X_6). Income, population, and the proportion of urban land data are collected from information made available by the Portuguese National Bureau of Statistics.

An important share of local government funding comes from unconditional grants provided by the Portuguese national government. The national government's transfer mechanism provides approximately 40% of all funding for local governments. Taxes collected by the national tax offices are redistributed to the municipalities according to a predetermined formula to guarantee the municipalities' capacity to face daily needs and to promote economic development and social welfare. Data for the intergovernmental grant variable (X_7) are collected by the General Directorate for Local Governments (*Direcção-Geral das Autarquias Locais*).

We employ four variables to control for the political dimension: political alignment, council alignment, ideology, and the ratio of district to at-large councilors. The first variable gauges the political alignment between district elected officials and the municipal executive branch, and it controls for the effects of political competition for public spending (Hajnal and Trounstine 2010). Political alignment is greater when the councilors elected by district belong to the same political party as the mayor. When the majority of civil parish presidents on the city

council belong to a different party, the opposition can block executive branch spending decisions in an attempt to advance the political preferences of their districts. Political alignment (X_8) is measured as the ratio of the number of districts belonging to the same party of the mayor to the total number of districts. Council alignment (X_9) is entered to capture the effect of having a council majority belonging to the same political party as the mayor. Since the mayor elaborates the budget proposal to submit for council approval, it is expected that expenditures will rise when both bodies belong to the same political party. We use a dummy variable, Partisanship (X_{10}), to control for the effect of having a left-wing (1) or right-wing (0) political party heading the municipal executive branch. Finally, we enter the ratio of district to at-large elected members on the council (X_{11}). We expect to find a positive relationship between this ratio and the size of expenditures because that expectation is consistent with our arguments concerning the law of 1/n.

Lastly, we add a linear time trend variable to our analysis (X_{12}). We aim to capture the effect of time on the evolution of our dependent variable. We expect to find variations in the behavior of local government expenditures, especially with the advent of the financial crisis of 2009.

Table 2 displays descriptive statistics for all of the variables included in our analyses.

[Insert Table 2 here]

We estimate our models using panel data with fixed effects, assuming unobserved heterogeneity, constant for each city, but varying across them, correlated with the independent variables. Hence, we assume that:

$$\mathrm{cov}(\mu_i, X) \neq 0$$

and

$$Y_{it} = \beta X_{it} + i\alpha_i + \varepsilon_i$$

The element $i\alpha_i$ is the specific component of each city that controls for omitted variables bias, which might be correlated with other variables in the model and the error term. Such correlation is possible for two reasons: first, the absence of theoretical support for the assumption that the variation across jurisdictions is random and uncorrelated with the predictor or independent variables included in the model and, second, that none of the Hausman tests display results suggesting the use of random effects. Additionally, in every regression using fixed effects, an F-test allows us to reject the null hypothesis that μ_i is different from zero.

6. Empirical findings

The overall results confirm the existence of a complex relationship between the density of representation and total expenditures at the local level (see Table 3). The first three specifications contain the results for the density of representation computed with all city councilors, whereas the last three specifications refer to our measurement of the density of representation computed only with district-elected councilors.

[Insert table 3 here]

In the first two sets of regressions using the density of representation for all councilors and its square, we can see that our variable of interest lacks statistical significance at conventional levels. Only in the complete model, with the quadratic and cubic terms (Table 3 column III) can we obtain statistically significant results. The results show a negative relationship between the density of representation and the size of local government expenditures. Substantively, each additional councilor per 1,000 inhabitants reduces total local government spending by 18.8%. The quadratic term, $(X_2)^2$, confirms a U-shaped relationship between the density of representation and the size of total expenditures. The cubic term, $(X_2)^3$, also is significant and confirms the complex relationship between total expenditures and the density of representation stated in our fourth hypothesis.

In the case of district-elected specifications, the results are in agreement with our hypotheses (see Table 3, models IV-VI). Again, only in the model including the quadratic and cubic terms do the coefficients achieve statistical significance. Given the similarity of the findings for both all councilors and district-based representation, we estimate an additional set of specifications employing density of representation measures for at-large elected officials only. The results indicate that none of the density of representation terms – additive, quadratic or cubic – attains statistical significance.[3]

Overall, the full set of results suggests that district-based representation is responsible for the S-shaped relationship between the density of representation and the levels of total expenditures at the local level. The results for our measures of the density of representation – whether involving all councilors or only district-elected computation – generally confirm our hypotheses. An increase in the density of representation from low levels alleviates potential monitoring problems and curbs rent-seeking, causing the level of expenditures to decline. Beyond a certain level, however, further increases in the density of representation increase local government expenditures because of budgetary commons mechanisms and principal-agent problems. This increase occurs only up to a certain point, after which decision-making costs become so severe that expenditures return to a decreasing trend.

[Insert table 4 here]

The level of total expenditures is the lowest at 3.47 councilors per 1,000 habitants and reaches its highest point at 6.47 councilors per 1,000 inhabitants. The calculations presented in Table 4 indicate that, in practice, when the density of representation is measured for all city councilors, approximately 78% of all city councils in continental Portugal appear in the first section of the polynomial, almost 21% in the second section, and 1.43% in the last section.

[3] The results are omitted owing to space constraints, but are available from the authors upon request.

For the estimated density of district-elected representation, expenditures reach their lowest level for 1.23 district-elected councilors per 1,000 inhabitants before increasing to the highest point at 3.14 district-elected councilors per 1,000 inhabitants. The distribution across the sections is similar to that shown for all councilors: 78.78% of city councils appear in the first section of the polynomial, 20.14% in the second section, and 1.08% in the last section.

Some of the results for the control variables are worth mentioning. Population size is statistically significant in all six specifications. The coefficient carries a negative sign, confirming the existence of economies of scale. Urban land also is statistically significant in all six specifications. As expected, it displays a positive sign because urbanization places pressure on infrastructure and leads to increases in expenditures. The ratio of district and at-large elected members on the council is significant only for the model estimated by entering all councilors, both district-based and at-large. Surprisingly, it displays a negative relationship with total expenditures.

Most importantly, the time trend variables are statistically significant in all of our models. They display a negative sign, indicating that local governments reduced their levels of expenditures over time. This result can be understood in the context of the austerity program implemented by the Portugal's central government. Local entities were forced to postpone investments, implement cuts in wages and to reduce their service delivery activities.[4]

Portuguese governmental institutions classify expenditures into two types: current and capital. Current expenditures include wages, water supply, electricity, fuel and other assorted expenditures. Those expenditures are common to all municipalities and typically represent the majority of total expenditures. In contrast, capital expenditures entail decisions about municipal infrastructure spending. In the case of Portuguese municipal councils, the effects of the law of 1/n are more likely to occur for current expenditures than for capital expenditures because district

[4] As an additional robustness check, Appendix B includes a table reporting models I-VI, estimated without the time trend variables. The results for our key theoretical variables of interest do not change substantively.

representatives aim to capture resources for wages, increased staff, public procurement of services, and small investments.

We replicate our empirical analysis using current expenditures as the dependent variable, and the results, with and without time trend variables, are reported in Appendix C. The complex relationship between the density of representation and current expenditures holds only for the case of district-elected councilors in the specifications without time trends. Once we introduce the time trend variables, all of the expected effects for the density of representation disappear. A closer investigation indicates that, throughout our four-year study period, the annual average change (in absolute values) is much smaller for total expenditures (2.4%) than for current and capital expenditures (3.9% and 7.1%, respectively). A similar pattern is observed in the standard deviations of these average changes: 2.9 for total expenditures, 5.3 for current expenditures and 6.8 for capital expenditures. In summary, it appears that the effect of the density of representation variables does not hold for current expenditures after the introduction of time trends because these expenditures are much more volatile than total expenditures.

7. Conclusion and policy implications

The determinants of local government spending have been a topic of relevant research in the economics and political science literatures for several decades. One of the most important bodies of empirical work has been concerned with testing and extending the law of 1/n, according to which government spending increases with the number of members of legislative bodies. In this paper, we begin by testing this basic formulation of the law of 1/n in the context of Portuguese city councils. This preliminary analysis reveals inconclusive results. Consistent with the findings of MacDonald (2008), no effect is detected for total expenditures. We extend this initial analysis by introducing the concept of density of representation, defined as the number of councilors per 1,000 constituents.

Our work contributes to this body of research by emphasizing the complex relationship that develops between the density of political representation and the level of local government expenditures. Specifically, we investigate and find a cubic relationship between density of representation and local government spending in the context of Portuguese city councils. Expenditure levels decline initially with increases in the density of representation since smaller groups of constituents are better able to organize and coordinate the monitoring of their representatives, to foster accountability and to curb rent-seeking activities. At higher levels of representation density, the relationship becomes positive, reflecting higher levels of local expenditures associated with the dynamics of budgetary commons and principal-agent problems that underlie the conventional formulation of the law of 1/n. At extremely high levels of density of representation, the relationship becomes negative again owing to the presence of the high transaction costs of legislative decision-making. The findings are consistent with the theoretical predictions even after including a set of important controls for local government spending. This fact underlines the unique contribution of our work to the literature on the effects of political institutions and electoral rules of representation on local public spending.

The findings have several normative implications for the study of local government institutions and policy-making. First, underrepresentation of constituents on city councils leads to high levels of spending that reflect constituents' inability to overcome collective action problems and to hold local officials accountable. As the number of representatives increases, the likelihood of constituents being able to organize and improve the accountability of elected officials also increases, and a reduction in wasteful spending is also more likely. As a result, an increase in the density of political representation also reduces spending.

At higher, above-average levels, our findings indicate that each additional representative per 1,000 inhabitants will attempt to capture benefits at the expense of the common tax base, which drives up local government expenditures. In addition, citizens attempting to control these actions face agency costs that prevent the containment of opportunistic spending. The implication

of this finding is that a size of representation exists that minimizes public spending. Our findings confirm the existence of effects similar to the law of 1/n but only for a minority of city councils, particularly when we focus on district-elected councilors who represent geographically defined constituencies that supply strong incentives for pork barrel. However, the problem of overspending is moderated somewhat by the fact that only one-fifth of all Portuguese municipalities exceed the public-spending minimizing level of representation.

When the density of representation is extremely high, the transaction costs associated with decision-making are likely to be so severe that it becomes difficult to reach agreements regarding spending priorities. Although the empirical results fit our theoretical expectations regarding legislative decision-making costs, only a few Portuguese local governments are characterized by extremely high densities of political representation, suggesting that, although this situation is possible in theory, practice indicates that it is uncommon, affecting only approximately 1.5% of all city councils.

The Memorandum of Understanding (MoU) signed by the International Monetary Fund, the European Commission, the European Central Bank, and the Portuguese Government outlined a solution to the problem of intra-municipal fragmentation into civil parishes, with implications for political representation on city councils. The MoU recommended the merger of civil parishes, and a territorial reform was signed into law and implemented by the Portuguese government in 2013, resulting in the amalgamation of one-third of all civil parishes. The stated goal was to improve efficiency and capture economies of scale, as well as to reduce the tendency to overspend by municipal governments. Our work provides some empirical evidence in support of the policy recommendations of the MoU, thus underlining the need for territorial reform of Portuguese civil parishes.

Future work should address this highly complex process of territorial reform, namely, the implications of the density of political representation for district-elected members. After the institutionalization of the reform, empirical work comparing data before and after spending will

be extremely valuable in determining whether the reform actually achieved the goals of its proponents.

Our research has general implications for the relationship between the sizes of legislative bodies and their policy-making options, particularly for deliberative bodies at the local level. However, our work provides support for this general theory only in a limited context – Portuguese city councils, which can be considered representative of local elections mixing district and at-large elected councilors. Future work should also extend empirical testing to other settings to provide additional evidence for the complex relationship between the density of representation in legislative bodies and local government expenditures. The empirical evidence presented here is the first step in this direction.

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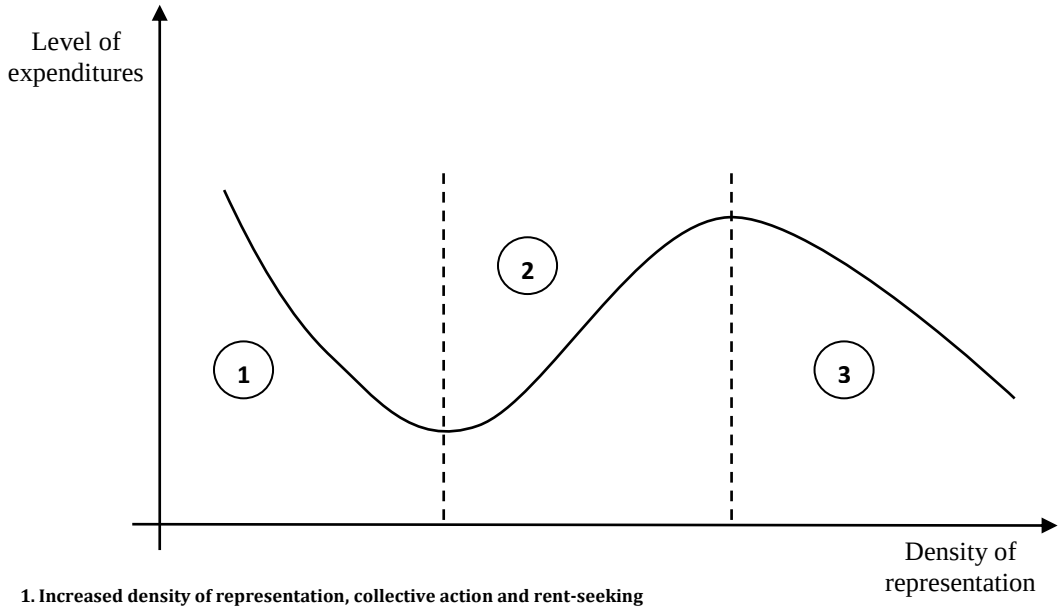
Tables and Figures

Figure 1. Theoretical relationship between the density of representation and expenditure levels as a third-degree polynomial



1. Increased density of representation, collective action and rent-seeking
- Fewer severe collective action problems faced by voters in monitoring their representatives (Olson 1965; Azfar 2001)
- Fewer opportunities for rent-seeking (Thornton and Ulrich 1999)
- An increase in the density of representation from low levels, leading to lower spending

2. Increased density of representation and monitoring costs
- Law of 1/n – geographically targeted projects (Weingast et al. 1981)
- Fiscal common pool resources (Raudla 2010)
- Higher density of representation, leading to increased spending (Bradbury and Stephenson, 2003)

3. Increased density of representation and decision-making costs
- The diversity and heterogeneity of policy positions create opportunities for conflict (Buchanan and Tullock, 1962)
- Higher transactions costs in decision-making processes offset the effects of the Law of 1/n (Raudla, 2010)
- Extremely high density of representation leads to lower spending

Table 1. Parishes per municipality

Parishes	**Number of municipalities**	**%**
> 50 parishes	9	2.92
> 40 and ≤ 50	2	0.65
> 30 and ≤ 40	18	5.84
> 20 and ≤ 30	27	8.77
> 10 and ≤ 20	88	28.57
≤ 10 parishes	164	53.25
Total of municipalities	308	100.00

Source: DGAL – *Direcção Geral das Autarquias Locais*, 2003.

Figure 2. Number of city council members and population per municipality

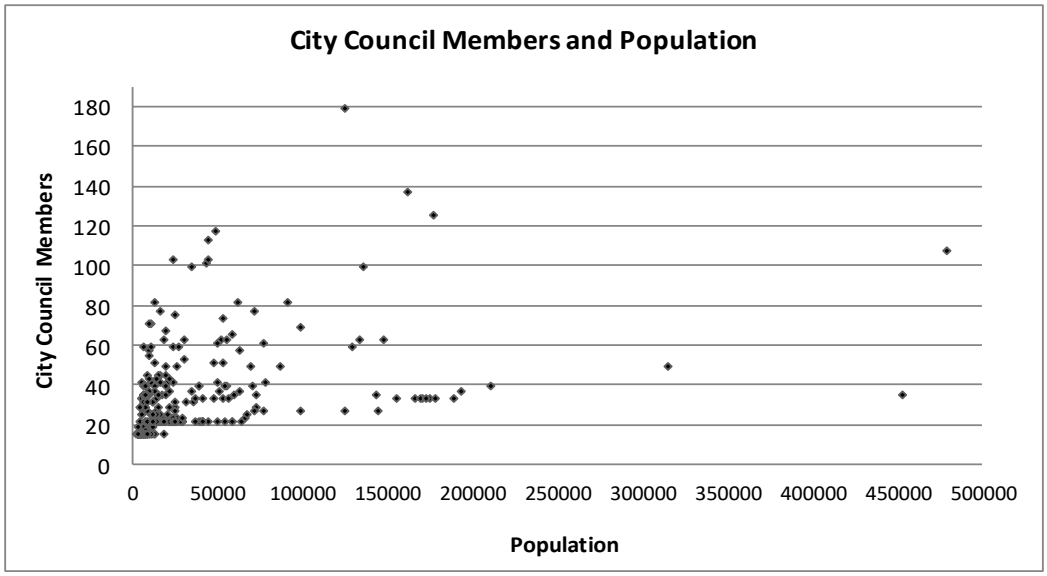


Table 2. Descriptive statistics

Variables	Mean	Std. Dev.	Minimum	Maximum
Dependent				
Total expenditures per capita (ln)	16.68	0.7953	15.08	20.54
Independent				
Density of representation	2.183	1.741	0.0758	9.180
Density of representation district members	0.868	0.800	0.0192	4.376
Density of representation (sq)	7.794	11.82	0.00574	84.27
Density of representation district (sq)	1.394	2.523	0.000368	19.15
Density of representation (cubic)	36.44	82.84	0.000435	773.6
Density of representation district (cubic)	3.103	8.385	7.06e-06	83.80
Control				
Population (ln)	9.797	1.118	7.399	13.21
Population density	310.1513	848.9389	4.568995	7379.454
Income per capita	6.727	0.162	6.368	7.541
Urban land (%)	0.102	0.122	0.00334	0.789
Intergovernmental grants (ln)	15.74	0.521	14.60	18.01
Political alignment	0.612	0.268	0	1
Council alignment	0.373	0.484	0	1
Ideology	0.635	0.482	0	1
Ratio of district/at-large elected	0.692	0.302	0.0500	0.989

Table 3. Panel data with fixed effects (dependent variable: total expenditures per capita (ln)) with time trends

	All city council members			District-elected members		
	I	II	III	I	II	III
Independent	Coefficient (RSE)	Coefficient (RSE)	Coefficient (RSE)	Coefficient (RSE)	Coefficient (RSE)	Coefficient (RSE)
Density of representation	0.00222	-0.0321	-0.188*	0.0237	0.0204	-0.387*
	(0.0208)	(0.0640)	(0.113)	(0.0422)	(0.121)	(0.214)
Density of representation (sq)		0.00313	0.0416*		0.000639	0.218**
		(0.00552)	(0.0235)		(0.0219)	(0.0968)
Density of representation (cubic)			-0.00279*			-0.0332**
			(0.00166)			(0.0144)
Control						
Population (ln)	-0.270*	-0.292*	-0.336**	-0.264*	-0.265*	-0.324**
	(0.148)	(0.153)	(0.155)	(0.145)	(0.148)	(0.150)
Population density	1.62e-05	2.00e-05	2.35e-05	1.54e-05	1.55e-05	2.42e-05
	(0.000134)	(0.000135)	(0.000135)	(0.000134)	(0.000134)	(0.000134)
Income per capita	0.0885	0.0879	0.0952	0.0917	0.0915	0.0921
	(0.151)	(0.151)	(0.151)	(0.151)	(0.151)	(0.151)
Urban land (%)	1.112*	1.110*	1.092*	1.102*	1.102*	1.056*
	(0.630)	(0.630)	(0.629)	(0.630)	(0.630)	(0.629)
Intergovernmental grants (ln)	0.113	0.113	0.114	0.113	0.113	0.119
	(0.139)	(0.139)	(0.139)	(0.139)	(0.139)	(0.139)
Political alignment	0.00397	0.00147	-0.00814	0.00576	0.00568	-0.00375
	(0.0275)	(0.0278)	(0.0284)	(0.0275)	(0.0276)	(0.0278)
Council alignment	0.00100	-8.14e-05	0.00109	0.00237	0.00231	0.00460
	(0.0195)	(0.0196)	(0.0196)	(0.0196)	(0.0197)	(0.0197)
Ideology	-0.0222	-0.0217	-0.0188	-0.0224	-0.0224	-0.0206
	(0.0229)	(0.0229)	(0.0229)	(0.0228)	(0.0228)	(0.0228)
Ratio of district/at-large elected	0.033	0.018	-0.005	0.0325	0.0331	0.0860
	(0.086)	(0.090)	(0.091)	(0.0819)	(0.0844)	(0.0873)
Constant	16.88***	17.17***	17.69***	16.78***	16.80***	17.40***
	(2.873)	(2.918)	(2.932)	(2.852)	(2.886)	(2.893)
Year 2010	-0.0470***	-0.0470***	-0.0473***	-0.0473***	-0.0473***	-0.0473***
	(0.0138)	(0.0138)	(0.0138)	(0.0138)	(0.0138)	(0.0138)
Year 2011	-0.0576***	-0.0574***	-0.0581***	-0.0582***	-0.0582***	-0.0585***
	(0.0159)	(0.0159)	(0.0159)	(0.0159)	(0.0160)	(0.0159)
Year 2012	-0.111***	-0.111***	-0.111***	-0.112***	-0.112***	-0.112***
	(0.0227)	(0.0227)	(0.0227)	(0.0227)	(0.0227)	(0.0227)
Year 2013	-0.0736**	-0.0800**	-0.0926***	-0.0689**	-0.0692**	-0.0810***
	(0.0295)	(0.0315)	(0.0324)	(0.0293)	(0.0308)	(0.0311)
Observations	1,390	1,390	1,390	1,390	1,390	1,390
F	5.50	5.15	5.01	5.52	5.15	5.18
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000
Hausman Test for random effects	0.000	0.000	0.000	0.000	0.000	0.000

*p<0.1; **p<0.05; ***p<0.01;

Two-tailed tests. Robust standard errors (RSE).

Table 4. Substantive effects of the cubic relationship between the density of representation and total expenditures

	Total expenditures	
At minimum point	All City Council Members	District-Elected Members
Density of representation	3.47	1.23
At maximum point		
Density of representation	6.47	3.14
Range		
Stage 1	78.05%	78.78%
Stage 2	20.52%	20.14%
Stage 3	1.43%	1.08%