On the determinants of local government debt: Does one size fit all?*

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Abstract

This paper analyzes the factors that directly influence levels of debt in Spanish local governments. Specifically, the main objective is to find out the extent to which indebtedness is originated by controllable factors that public managers can influence, or whether it hinges on other variables beyond managers' control. The importance of this issue has intensified since the start of the crisis in 2007, due to the abrupt decline of revenues and, simultaneously, to the stagnation (or even increase) in the levels of costs facing these institutions face. Results can be explored from multiple perspectives, given that the set of explanatory factors is also multiple. However, the most striking result relates to the varying effect of each covariate depending on each municipality's specific debt level, which suggests that economic policy recommendations should not be homogeneous across local governments.

Keywords: debt, local government, quantile regression

JEL Classification: D60, H71, H72, H74, H75

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1. Introduction

Over recent years the problems of local treasury departments have increasingly become a focus of attention and concern in several euro area countries. Among the numerous problems affecting these departments, some of the most serious are related to high debt levels. In the particular case of Spain, local councils have become responsible for a growing number of powers, with a corresponding increase in the functions they perform, and resulting into higher expenditure levels. In addition, their basic resources are often insufficient to keep pace with the rate of growth of their expenditure needs (López-Hernández et al., 2012). These circumstances have led to high levels of indebtedness in most local government administrations. Although the problem of local debt is relatively modest on a national scale, due to the lower importance of the local public sector compared to the other public administrations (central and regional),[1] it has become a threat to local government solvency and moreover, may have a negative effect on macroeconomic financial stability.

These high levels of local indebtedness are now a focus of concern for local politicians, since it is frequently the case that the only way they can fulfill their commitments is through borrowing. It also presents a problem for public administration managers, as they are aware that higher levels of debt in their local administrations will lead to increased fiscal pressure. Politicians at a national level are also concerned, since indebtedness in numerous local councils in Spain will inevitably have an impact on the national economy.

The severity of these issues has increased remarkably since the start of the financial crisis, which was followed by a *real* economic crisis that, in the case of Spain, has resulted in the burst of the housing bubble, a deep recession, and rising unemployment, which more than doubles the average rate in the European Union (EU). This new macroeconomic scenario has had a remarkable impact on the public sector, leading to very high levels of deficit across all strata of public administrations considered, i.e. central, regional or local—although the level of total debt is still lower than that of many other EU countries.

In this new economic context, local governments have not been left unscathed, and for most of them the financial difficulties affecting them practically since the Spanish constitution was approved in 1978 have been exacerbated. The crisis has led to a sharp decline in municipal revenues while, simultaneously, their costs have either stagnated or even increased, which

[1] The Spanish regions or *comunidades autónomas* (autonomous communities) correspond to level NUTS3 of the European Union (*Nomenclature of Territorial Units for Statistics*), whereas municipalities correspond to level LAU2 (*Local Administrative Units*).

impels local governments to find new tools for dealing with the new financial scenario (Brusca Alijalde et al., 2012). Therefore, it seems reasonable to design policies which take into account the major sources of debt for Spanish municipalities.

Due to the importance of the topic, several contributions have been analyzed the factors influencing past levels of local government debt, some examples of which include Inman and Fitts (1990), or Kiewiet and Szakaty (1996a). These and related studies have dealt with the general issue of monitoring local government debt. Related to this literature, other relevant contributions have dealt with more specific questions such as the need to guarantee a balanced budget in the long run (Poterba, 1997), to preserve the principle of intergenerational equity when issuing debt (Musgrave, 1989), or to minimize the use of debt as a political instrument to prevent a disproportionate rise of taxes in constituencies (Cabasés et al., 2007).

As indicated by Cropf and Wendel (1998), municipal debt policy is influenced by a number of economic, political, and social forces. Some of these forces can be controlled by local governments, but others lie beyond their influence. However, due to the increasing importance of debt for growth in many cities around the world, and also due to the general increase in indebtedness (which clashes with the austerity policies being implemented in many European countries), it is important to understand which factors are having a stronger effect on municipal debt patterns, and their likely impact on city policies.

The literature exploring the determinants of municipal debt is not especially large, although some of the contributions are relevant. Cross-country studies are virtually nonexistent, which introduces certain difficulties when reviewing the international literature. Some previous studies focusing on specific countries include, apart from the cited paper by Cropf and Wendel (1998) who focus on the UK case, others such as Ashworth et al. (2005) and Bastiaens et al. (2001), who analyze Flemish municipalities, or Baber and Gore (2008) and Bridges (2005), who focus on US local governments, among others.

The objective of this paper is to analyze whether certain economic, political or social factors influence levels of debt in Spanish local government administrations. In this particular case, Guillamón et al. (2011b) provide a recent summary of the literature focusing on different aspects of municipal debt. Our specific analysis aims to reveal the extent to which the use of debt stems from factors that can be controlled, and over which managers can have an influence, or otherwise. In this general context, the existent literature finds some relevant variables explaining the level of municipal debt. Some of the variables have an influence and some do not, as we will see in the empirical section of the article. We then go more deeply

into the discussion, indicating that the greatest weakness in previous literature is that it tries to find significant relationships at the average level, but ignores the fact that some variables can have a different impact depending on the level of debt of the unit under analysis. For instance, when relating the level of municipal debt to fiscal capacity, for local governments with a reduced level of debt we can expect that the greater the fiscal capacity (i.e. the more revenues coming from the respective municipal resources), the lower the need to raise funds from external borrowing. On the opposite side, local governments having high fiscal capacity can make major investments because they may find easier to raise money by increasing their level of debt beyond the reasonable limits for municipalities presenting a poor fiscal capacity. Summing up, in contrast to the existent literature, in this article we will determine whether or not the variables explaining the level of municipal debt can be controlled by managers. These results can be helpful when designing strategic plans to reduce the level of debt because the first decisions to be made should concern to variables that have a significant impact and, in one way or another, are easily influenced by public managers. As a second implication, we will explore to what extent the existent heterogeneity among local governments can imply the emergence of different variables—and even different impacts—for municipalities presenting different levels of debt (to our knowledge, this aspect has not been explored in the literature to date). Obviously, the combination of the two dimensions (degree of controllability and level of debts) influence the level of severity of the problems caused by the existence of high levels of debt in municipalities.

The paper is structured in six sections. This first section justifies and describes the study. Section 2 briefly outlines the legal regulations governing indebtedness in Spanish local government administrations and the reasons why restrictions are necessary, and also presents a brief review of the literature on local government debt in Spain. In section 3 we provide information on the variables what have the greatest influence on level of debt, and their likely impacts, in order to discover whether managers can exert any influence on them to reduce the local administrations' debt level. After presenting the empirical model in section 4, the results of the analysis are analyzed in section 5. Finally, section 6 reports the main conclusions of the study.

2. Legal limits to local debt in Spain

In Spain, the amount local governments can borrow is limited by a set of restrictions imposed by central government. The legal framework regulating credit operations is established under Law 39/1988, of 28 December, on Local Governments ("Ley 39/1988 Reguladora de las Haciendas Locales"). The original wording of this law has been modified substantially through the Consolidated Text of the Law on Local Governments 2/2004 ("Real Decreto Legislativo" 2/2004, of March 5) and the approval of other subsequent laws. Some of the reasons for establishing debt restrictions are described below (Arnau, 1997; Monasterio Escudero, 1996). The details of this law are carefully summarized in, for instance, Guillamón et al. (2011b).

According to Guillamón et al. (2011a), there are three main reasons for establishing restrictions to the levels of local debt: (i) because of concern to maintain intergenerational equity, in an attempt to avoid a scenario in which the present generation passes on financial burdens in the form of debts accrued in order to enjoy better services today; (ii) because of the need to guarantee long-term financial equilibrium, to prevent local governments from falling into critical financial situations, and thus preserve financial viability; if excessive growth of debt relative to revenues is not controlled, social welfare may be jeopardized since citizens will have to go without a series of social services in order to continue financing investment costs; (iii) finally, the third aspect that may lead to restrictions is the effect that sub-central debt has on monetary markets and on the total amount of liabilities in public hands. In particular circumstances, central government may require specific financial conducts of sub-central governments, by restricting debt issuing, in order to implement a policy of stabilization.

Among those studies explicitly analyzing the determinants of municipal debt, one of the earliest proposals was by Balaguer-Coll (2001), who examined the level of debt in municipalities in the Comunitat Valenciana (Spain) for the 1992–1996 period. The independent variables used in this study were total revenue, total expenditure, current expenditure, capital expenditure, financial expenditure, non-financial deficit, gross savings rate, net savings rate, treasury surplus and economic level. Of these variables, financial expenditure, capital expenditure, population, net savings rate and non-financial deficit were significant. Brusca and Labrador (1998) applied a logit model to analyze municipal debt patterns in Catalonia for financial years 1993 and 1994. The independent variables they considered were number of inhabitants, total per capita budgetary expenditure and revenue, gross savings rate, net savings rate and budgetary surplus per inhabitant. The variables annual expenditure per inhabitant and gross savings

were found to explain level of debt. Escudero (2002) analyzed debt in Catalan municipalities for 1995 and 1996. The independent variables used in his study were level of decentralization, level of tourism, number of inhabitants, per capita income, gross savings rate, proportion of own revenues over current revenues, current consolidated per capita expenditure, and non-financial fixed assets. His results showed that level of decentralization, level of tourism, per capita income, population, gross savings and percentage of own revenues over current revenues were all relevant explanatory variables for the level of local debt.

More recently, other studies such as those by Benito and Bastida (2004) and Benito and Bastida (2005) have attempted to explain the level of debt by applying panel data regressions for the 1994–2000 period, for a sample of 180 municipalities of the Comunitat Valenciana (Spain). They used four budgetary variables as independent variables (capital expenditure, capital income, independence index and non-financial surplus/deficit) and four dummy variables (tourism status, population, economic level and political ideology). Of these variables, non-financial surplus/deficit, capital expenditure and capital income were significant.

Fernández Llera et al. (2004) followed an econometric panel data approach to analyze local debt for a sample of 100 Spanish municipalities during the 1992–1999 period. The independent variables they used were available household income, real investments, gross savings, own fiscal capacity and expenditure commitment, together with four dummy variables, namely, municipality size (above or below 500,000), electoral cycle (election year and year previous to election versus other years), capital status (provincial capital or otherwise), foral[2] municipalities (municipalities in the regions of the Basque country and Navarre versus all others). Results identified real investments, gross savings, own fiscal capacity, size and electoral cycle as explanatory variables.

The studies by Vallés et al. (2003) and Cabasés et al. (2007) specified an explanatory model of debt for Spanish municipalities by analyzing panel data for the 1988–2000 period. They used the following explanatory variables: real investment expenditure, legal debt limit, net expenditure savings due to debt amortization, level of powers, tendency to debt, tax revenues and per capita income. Their results indicated that investment, legal limits, net savings, own tax revenues, tendency to debt and per capita income explain local debt.

As commented in the introduction, none of these works considered the possibility that the impact of specific variables could depend on the level of debts of the local government, because

[2]Related to the *fueros*, charters dating back to the Middle Ages that historically granted certain privileges, some of which still hold in the autonomous communities (regions) of the Basque Country and Navarre.

all of them focussed on the observable effects regarding the *average* level of debts. As a result, it may well be that a variable with a specific impact on the average could play a very different role depending on the level of debt of the municipality under scrutiny. In order to shed light on this issue. We will develop an empirical test to understand this situation in section 4.

3. Data and variables

As pointed out by Casetti's (1972) expansion method, and Casetti's followers, because studies might differ greatly in terms of their particular contexts, methods and variables chosen, it is difficult to find a *standard* choice of covariates across studies that focus on the same issue. Given the specific context we are dealing with, our choice will be partly guided by the previous literature on the topic in Spain, since some information is simply unavailable for other countries. Specifically, when we consider other studies dealing with different aspects related to the debt levels of municipalities in other countries, we find a myriad of proposals which present differences in many more dimensions therefore making it difficult to choose the variables that are expected to have an impact on the debt levels.

3.1. Sample description

The sample comprises a large set of Spanish municipalities for which budgetary information is available for year 2008.[3] It is important to note that when selecting our budgetary information, we chose actual expenditure and revenues (net recognized assets and net recognized liabilities) rather than budgetary data (final expenditure and revenue forecasts), despite the fact that these budgetary implementations are not published promptly. If final forecasts had been used instead of actual implementations, results could have been severely distorted, since forecasts tend to underestimate expenditures and overestimate revenues. After this initial explanation, we define a series of independent variables that may have a certain effect on the level of debt per capita, in order to test which of these variables actually do so. Table 1 defines each one of the independent variables in the study, whereas table 2 provides some summary statistics for them.

As indicated in previous sections, the literature that has analyzed aspects related to the determinants of debt levels of municipalities is heterogeneous in several respects. Given that differences can be quite remarkable, following Cropf and Wendel (1998) we have considered

[3]The Spanish Ministry of Economy and Finance website provides information on budgetary implementations up to and including 2008 (http://serviciosweb.meh.es/apps/EntidadesLocales/).

three general types of forces that can impact on municipal debt policies, namely, financial (or economic), political and social forces. The heterogeneity is not restricted to the covariates only, since there is some variety as well regarding the dependent.

3.2. Fiscal/financial forces

As indicated above, it is difficult to construct categories in which to classify the different contributions that we will be reviewing in this section. Therefore, our strategy to determine the set of variables to include in the model, and how they will affect municipalities' debt levels will be to take into account the various items or, more properly "headings" (*capítulos*), of the municipalities' budgets. Considering all the possible categories, and the existing literature both in Spain and other countries, the selected variables would be as follows.

The first of these financial covariates can be broadly defined as "capital expenditure". We will term it $INVEST$, since these expenditures are included in those headings of the municipal budget corresponding to physical capital investments. Specifically, we will define it as total capital expenditures (capital transfers plus acquisitions of capital goods) divided by population. However, the variable is partially ambiguous, since there is no standard definition of what it exactly represents—even in the Spanish case. For instance, some authors such as Benito and Bastida (2004, 2005) define it as a ratio of real investments and capital transfers to headings 1 to 8 of net recognized liabilities (i.e. total expenditures). However, other authors such as Vallés et al. (2003) and Cabasés et al. (2007) calculate it as the ratio of real investment to GDP, and refer to this variable as *intergenerational equity*—since future generations will also benefit from the capital investments that current generations may make. In contrast, authors such as Escudero (2002) define it as the consolidated non-financial fixed assets per capita, and others (Fernández Llera et al., 2004) confine the contents of this variable to real investments only. In general (or, more exactly, *on average*), we can expect a *positive* relationship between debt and this variable. This occurs in the particular case we are dealing with, as Spanish law[4] establishes that local governments can resort to long or short term public or private credit in any of its forms in order to finance their investment expenditure. The definition and descriptive statistics for this variable are provided in tables 1 and 2, respectively.

The second of the selected variables is net savings, which we will refer to as $NETSAV$. We can broadly describe it as the available funds municipalities can use to conduct their *own* investments. It corresponds to the difference between gross savings minus amortization ex-

[4]LRHL, *Ley Reguladora de Haciendas Locales*, Law 39/1988 December 28$^{\text{th}}$.

penses. Gross savings (which can be defined, following Fernández Llera et al. (2004), as the difference between current income minus current expenses) indicate local governments' capacity to cover financial amortization. Hence, the lower the level of gross savings, the higher will be the need to resort to borrowing. Previous contributions using this variable, although considering a slightly different definition, are Brusca and Labrador (1998), or Cabasés et al. (2007). The former authors consider a gross savings index in their use of the variables, whereas the latter define it as the ratio of net savings to GDP.

In this respect, Cabasés et al. (2007) also note how local governments that have an austere current expenditure policy, that obtain higher current income, or that plan debt amortizations appropriately, have a greater financing capacity, and are less likely to resort to borrowing to fund their investment expenses. Therefore, we may hypothesize a *negative* relationship between the levels of debt and net savings; in other words, when an institution has positive net savings, the need to resort to borrowing might be, *cæteris paribus*, lower.

Some previous contributions in the particular case of the debt levels of Spanish municipalities have considered a variable that corresponds to the ratio of non-financial surplus to deficit. We will refer to this variable as $BUDGET$ which, in accounting terms (i.e. in terms of budget headings) can be broadly defined as the difference between the sum of the net recognized assets (NRA) headings 1 to 7 and the sum of net recognized liabilities (NRL) headings 1 to 7. These are also defined in Table 1 and, as indicated, the sum of NRA headings considered would correspond to all revenues excluding capital transfers, financial assets and financial liabilities, whereas the sum of NRL headings considered would exclude only financial assets and financial liabilities. However, this variable has been defined in different ways in the literature. For example, Balaguer-Coll (2001) calculates it as the *ratio* of NRL headings 1 to 7 to NRA headings 1 to 7. Benito and Bastida (2004, 2005) calculate it in relative values, as the ratio between the sum of NRA headings 1 to 7 minus the sum of NRL headings 1 to 7 divided by the sum of NRA headings 1 to 7. Brusca and Labrador (1998) consider total budgetary revenues and expenditure, in other words, the difference between total budgetary revenues and total budgetary expenditure, what they term budgetary deficit.

Although the specific definition of this variable might be subject to various interpretations, the sign of the impact on the levels of debt are not. If non-financial expenditures are higher than non-financial revenues, there will be a non-financial deficit and, therefore, it may be expected that the local government will have to go further into debt in order to balance such a deficit. Therefore, if we consider this variable as the ratio of NRA headings 1 to 7 to NRL

headings 1 to 7, which we will refer to as $BUDGET$, its relation to debt should be *positive*, since local governments will turn to this resource more in order to balance the non-financial deficit.

Our model also includes a variable reflecting each municipality's own fiscal capacity ($FISCCAP$). We can define this variable as the ratio of NRA headings 1 to 3 (direct taxes, indirect taxes, and revenues from other taxes) to NRL headings 1 to 8 (all expenditures with the exception of financial liabilities), and it indicates the percentage of total revenues (excluding indebtedness) represented by municipalities' own resources. Vallés et al. (2003) refer to this variable as "fiscal responsibility", and calculate it as the ratio of headings 1 to 3 of the NRA to the GDP.

Vallés et al. (2003) point out that the relationship between own fiscal capacity, which we will refer to as $FISCCAP$, and the level of debt is unclear since, in principle, municipalities that have more of their own resources will be under less pressure to borrow. However, the opposite effect may occur, as municipalities with more of their own resources will face lower financial risks and will therefore be granted certain advantages when accessing loans.

Finally, amongst the financial variables we also include what we could refer to as "expenditure commitment" ($EXPCOMM$), which will correspond to the sum of personnel and financial expenditures divided by total expenditures. According to some authors such as Fernández Llera et al. (2004), the quantities in the numerator are usually very rigid (they are especially difficult to reduce), at least in the short run and, therefore, given such an inflexibility, municipalities might be impelled to issue debt. Therefore, the link we might expect between this variable and the levels of debt is *positive*.

3.3. Socioeconomic forces

The second set of variables we will consider can be broadly defined as *socioeconomic* variables. In this case, the number of available studies from which to choose the covariates is broader, as most of the variables included in this category have a more standard definition.

If our dependent variable were debt, without dividing it by population, one might consider as a key determinant the size of the municipality, measured by its population. In the literature the vast majority of authors consider that the effect of this variable on debt should be positive, since municipalities with a higher number of inhabitants are obliged to provide more services, as established by the Spanish law on local governments. Authors such as Benito and Bastida (2004, 2005), Farnham (1985), or Fernández Llera et al. (2004), among many others, have put

forward this argument.

However, Escudero (2002) considers that its effect is ambiguous and unclear, given that economies or diseconomies of scale in investments can alter the sign, depending on how the municipality's size is classified as established in the Law on Local Treasury Departments. In addition to this, considering size itself does not allow direct comparisons among municipalities of different sizes. Therefore, in both models considered we will be dividing by population and, consequently, it cannot enter the analysis as an explanatory factor.

Apart from population, some authors (Benito and Bastida, 2004, 2005) have included in the model the **level of tourism**—which we refer to as $TOURISM$. Tourist municipalities must face higher expenditure on tourism infrastructure and a higher demand for services than other towns or cities and, as a result, they will need to borrow more in order to meet this additional expenditure. The expected sign for this variable with regard to debt level should therefore be *positive*. The tourism variable has been used not only by Benito and Bastida (2005) and Benito and Bastida (2004), who introduced two dummy variables to differentiate between coastal and inland municipalities, but also by Escudero (2002), who used the tourism index from the "Anuario Económico de España" (Spanish Economic Yearbook) published by La Caixa Foundation.[5]

Previous studies have also considered per capita income. The link with the level of municipal debt is explained, among others, by Farnham (1985), who indicates that this variable would be reflecting the influence of a positive income elasticity of demand for capital goods, which would imply a positive link between this variable and debt. However, there is no total consensus on this point, and the expected sign for this variable is partly debatable; while some authors such as Clingermayer and Wood (1995), Farnham (1985), Kiewiet and Szakaty (1996b) or, more recently, Benito et al. (2010), consider its effect to be positive, others such as Adams (1977) claim a negative relationship.

This variable, also provided by La Caixa Foundation via the Spanish Economic Yearbook ("Anuario Económico de España"), is estimated on the base of available household income figures by province provided in the INE (Spanish National Statistics Institute) Regional Accounting section. In this particular Spanish case, previous studies considering this information include Balaguer-Coll (2001), Benito and Bastida (2005), Benito and Bastida (2004), Cabasés et al. (2007), Escudero (2002), Fernández Llera et al. (2004), or Vallés et al. (2003), among others, who have used per capita income level as a possible indicator of economic level.

[5]See http://www.anuarieco.lacaixa.comunicacions.com.

We will not use economic level exactly since it is no longer available but rather the level of economic *activity*, which we will refer to as $ACTIVITY$. For year 2008 onwards, only the variable measuring economic activity is available. This is the one we use and, in addition, we consider that its link with a municipality's possible debt level is stronger than when considering per capita income, as those local governments operating in environments where the general economic activity is more intense will have to provide their constituencies with more and, probably, more complex services, which generally imply higher costs.

The third socioeconomic factor we will be considering is the *density* of the municipality ($DENSITY$), measured as inhabitants per square kilometer. Several recent contributions have considered the relation of this, or related variables, with municipality debt. For instance, according to Hortas-Rico and Solé-Ollé (2010), the urban spatial structure of many Spanish cities, measured as urbanized land per person, not only has an environmental impact, but also a major impact on municipal finances. Benito et al. (2010) also consider similar issues. Specifically, they evaluate the impact of urban sprawl on municipal *expenditures*, finding that the higher the population density, the lower the total expenditures and current expenditures per capita which, in principle, would lead to lower levels of debt (*negative* relationship). This finding, in the opinion of Benito et al. (2010), would favor those voices asking for "smarter" growth in municipalities.

3.4. Political forces

Numerous studies have associated aspects of a political nature (which we will refer to as **political factors**) with debt, such as political fragmentation, ideology (progressive or conservative) or the length of time in power. Although it is a highly nuanced question, the number of contributions in the field is remarkable, and these studies have been applied to very different contexts.

As indicated in Bastida and Benito (2004), political theory has traditionally claimed that left wing governments are more *lax* regarding governmental financial discipline. Therefore, this type of government would advocate a bigger public sector, generally with more powers, than right wing governments, which would ultimately become more indebted. Although a substantial number of studies have tested and corroborated this theory (see, for instance Blais and Nadeau, 1992; Dickson and Yu, 1997; Galli and Rossi, 2002), others have found the link was not significant (see, for instance, Abizadeh and Gray, 1993). In contrast some studies, albeit fewer in number, conclude that right-wing governments accumulate more debt when

facing a higher probability of defeat; one example is Pettersson-Lidbom (2001), who examines debt accumulation among local governments in Sweden.

Other studies have also focused on related issues such as political fragmentation, or how long the governing parties remain in power. For example, Ashworth et al. (2005) analyze how greater political fragmentation leads to higher levels of debt and public deficit. However, in their study on a sample of 48 states in the USA, Clingermayer and Wood (1995) found that divided government did not lead to higher volumes of debt in the long term. For instance,Bunch (1991) found that when the same party remains in power for various years (regardless of political ideology) they create public entities to provide loans in order to get round debt restrictions. Unfortunately, our database did not contain information on these variables and, therefore, their use had to be discarded. We will refer to this variable as $POLITICAL$, which is a dummy variable taking the value of 1 for municipalities governed by left-wing parties.

We also consider the variable $FORAL$, which is also a dummy variable taking the value of 1 for those municipalities in the so-called *foral* regions. The regions of Navarre and the Basque Country are classified under this special regime which essentially gives them more independence in terms of managing transferred taxes and powers. In terms of municipalities, the minimum services that the local governments of these regions must supply is different from those that the rest of Spanish municipalities most provide. Therefore, one might hypothesize that these discrepancies turn into differences in terms of levels of municipalities' indebtedness.

The expected sign for this variable could *a priori* be undefined. However, some authors such as Fernández Llera et al. (2004) consider that *foral* regions have created a relatively higher number of public firms (compared to the rest of Spain). Therefore, some municipalities might have decided to *outsource* some services which would lead to lower levels of municipal debt, pointing to a *negative* link with this variable.

We can also consider the $FORAL$ variable to be strongly linked to the issue of decentralization. Recent contributions have explored this issue in depth, such as, for instance, Lago-Peñas et al. (2011), or Pike et al. (2012). In the particular case of Spain, some authors such as Balaguer-Coll et al. (2010a,b, 2012) have dealt with the specific issue of how the different levels of powers Spanish municipalities have might impact on the efficiency with which they provide their services. Specifically, Balaguer-Coll et al. (2012) argue that some municipalities with lower levels of powers might go *beyond* the legal minimum, providing more services than those legally required. In addition to this, some reports such as Vilalta and Mas (2006) actually corroborate that the amount of discretionary expenditures of the municipalities in the province

of Barcelona is very high. This rationale would point to higher levels of debt. Therefore, one might hypothesize a *negative* link between the level of powers and the level of municipal debt. The variable $POWERS$ takes the value of 1 for municipalities with fewer powers. Therefore, the sign one might expect is actually positive—because of how the variable is defined.

4. Methodology

4.1. OLS regressions

In order to analyze how the variables reviewed in the previous section influence levels of debt, we will first specify a linear model, in which the dependent variable is the level of municipal debt per inhabitant. Consistent with the contents of the previous section, this model will consider the three groups of explanatory variables examined earlier (financial, socioeconomic and political), whose impact on debt operates through the mechanisms described above.

Since the dependent variable is the total municipal debt per inhabitant, many of the selected covariates will also be expressed as shares of population. Therefore, our first model can be expressed as follows:

$$\begin{aligned}(DEBT/POP)_i = \beta_0 &+ \beta_1 INVEST_i + \beta_2 NETSAV_i + \beta_3 BUDGET_i + \beta_4 FISCCAP_i + \beta_5 EXPCOMM_i \\ &+ \beta_6 TOURISM_i + \beta_7 ACTIVITY_i + \beta_8 DENSITY_i \\ &+ \beta_9 ELECTION_i + \beta_{10} FORAL_i + \beta_{11} POWERS_i + \varepsilon_i\end{aligned} \tag{1}$$

Each of the lines constituting Equation (1) contains the three different types of variables considered in section 3. The first line, afar the intercept β_0, contains the financial variables referred to in subsection 3.2 ($INVEST$, $NETSAV$, $BUDGET$, $FISCCAP$ and $EXPCOMM$), the second line displays the socioeconomic variables described in subsection 3.3 ($TOURISM$, $ACTIVITY$ and $DENSITY$), and the third one includes the political variables, described in subsection 3.4 ($ELECTION$, $FORAL$ and $POWERS$). ε_i is the error term corresponding to municipality i, with $i = 1, \ldots, n$.

Our units of observation, i.e. municipalities, differ in many significant ways such as, for instance, size. This is a common source of homoskedasticity, which is a strong assumption that may not hold in applied problems such as the one we are dealing with, where the units of observation have an important spatial component. Some relatively recent contributions such

as, for instance, Anselin and Lozano-Gracia (2008), or Baltagi et al. (2008) are typical examples or empirical applications that require the use of spatial heteroskedasticity and autocorrelation consistent estimators. Therefore, Equation (1) was estimated using OLS, correcting for both autocorrelation and heteroskedasticity—an estimation we will refer to as HAC (heteroskedasticity and autocorrelation corrected).

4.2. Evaluating the determinants of local debt using regression quantiles

Quantile regression (Koenker and Bassett, 1978; Koenker, 2001, 2005) allows estimation of the conditional quantiles of a response variable distribution (in our case, the debt of each municipality) in a linear model that provides a much more detailed and comprehensive view of likely causal relationships between our variables of interest. Specifically, the estimation of models such as those presented in the previous section are relevant, but they confine the analysis to providing information on *average* impacts, which in our case would be the *average* impact for the *average* municipality. Using this instrument, the analyst will only be able to determine whether the *mean* effect of a covariate on a response variable is significant or not. These ideas may be relevant in many contexts such as, for instance, the determinants of growth, which might differ sharply for developed or developing countries, i.e. for the tails of the distribution of the response variable (Cunningham, 2003).

The conditional-mean framework has other shortcomings. For instance, the model assumptions are not always met in the real world, especially when dealing with social science data. In this regard, meeting the homoscedasticity assumption is often problematic, and focusing only on central tendencies can fail to uncover relevant trends in the response distribution. In addition to this, fat-tailed distributions, very frequent in social science phenomena, lead to a preponderance of outliers which are handled with difficulties by the conditional-mean framework.

Quantile regression is an alternative to conditional-mean modeling, in which conditional quantiles are modeled as functions or predictors. It is a natural extension of the linear-regression model. The novelty is that, whereas the linear-regression framework specifies the change in the conditional mean of the dependent variable, the quantile regression model specifies changes in the conditional quantile. Therefore, it enables the problems referred to above to be tackled with more precision. Applications are growing in a variety of fields (see, for instance, the survey by Buchinsky, 1998), but they are still largely outnumbered by those using linear models which focus exclusively on average behavior, although this is, of course, a

relevant approach. Therefore, as its name suggests, quantile regression does not confine the analysis to regression against averages (and hence it is not limited in its explanatory values) but rather also uses information obtained from the underlying distribution of the dependent variable.

In our case, the great advantage of quantile regression is that it enables us to consider the entire distribution of local debt. As indicated by Coad and Hölzl (2009), quantile regression is able to provide a more *complete* story of the relationship between variables—in our case, between local debt and the relevant covariates. We can therefore specifically investigate whether, for municipalities whose debt is low (corresponding to the lower tail of the distribution, or to the lower quantiles), the sign and significance of the determinants is the same as for other municipalities whose debt is high (those lying in the higher tails of the distribution, and corresponding to the highest quantiles). Under such circumstances, we would be able to design specific policies depending on each particular financial situation. Therefore, in the present study we think that both low- and highly-indebted municipalities (especially the latter) are of interest in their own right—we do not want to consider them as outliers—and quantile regression allows us to analyze them in greater detail.

In addition to this, as indicated by Buchinsky (1998), the quantile regression estimator is characteristically robust to outliers on the dependent variable, and it also relaxes the restrictive assumption that error terms are identically distributed at all points of the conditional distribution and, avoiding this assumption will enable analysis of differences in the relationship between the endogenous and exogenous variables at different points of the conditional distribution of the dependent variable.

In some fields these instruments can be particularly important. For instance, they are related to the issue of parameter variability and the expansion method developed by Casetti (1972) and his followers (Foster, 1991; Eldridge and Jones, 1991; Jones, 1992; Jones and Bullen, 1994), a modeling strategy which takes into account contextual variation of parameters and functional forms. Casetti (1972) *expanded* the traditional econometric model to include a set of equations that would relate the parameters of the regression equation to cross-sectional spatial characteristics (Kochanowski, 1990). Although the discussion of this issue has evolved significantly and the state of the art now centers on geographically weighted regression (Fotheringham et al., 2002), the underlying ideas are still valid and strongly related to our research questions. Indeed, some recent papers such as Basile and Girardi (2010) test (and reject) the assumption of parameter homogeneity across geographic units in the particular context of risk

sharing measurement. Likewise, quantile regression allows one to test whether the differences in both the magnitude and sign of the estimated coefficients for the different quantiles are significant or not.

Compared with the basic ordinary-least-squares model specified in equation (1), the regression quantiles we use in this section specify the τ^{th} quantile of the conditional distribution of y_i given $\boldsymbol{x}$ as a linear function of the covariates. As described by Koenker and Bassett (1978), and in much greater detail in Koenker (2005), the estimation is carried out by minimizing the following equation:

$$\underset{\boldsymbol{\beta}\in\mathbb{R}^k}{\text{Min}} \sum_{i\in\{i:y_i\geq \boldsymbol{x}'\boldsymbol{\beta}\}} \tau|y_i - \boldsymbol{x}'\boldsymbol{\beta}| + \sum_{i\in\{i:y_i< \boldsymbol{x}'\boldsymbol{\beta}\}} (1-\tau)|y_i - \boldsymbol{x}'\boldsymbol{\beta}| \tag{2}$$

where y_i is the same dependent variable as in equation (1) for municipality i, $\boldsymbol{x}$ is the vector of explanatory variables, k is the number of explanatory variables, and τ represents the vector containing each quantile. The vector of coefficients $\boldsymbol{\beta}$ to be estimated will differ depending on the particular quantile.

Using regression quantiles has certain analogies with approaches such as that of Basile and Girardi (2010), who test the assumption of parameter homogeneity across geographic units in measuring risk sharing. In our case, running the regressions for different quantiles (τ's) is equivalent, since the different values of τ refer to different values of the endogenous variable (number of bank branches), which varies between municipalities.

In the particular field of local government finances, these ideas have been barely explored, although there are some exceptions. For instance, Benito et al. (2010) find that the impact of population on municipal expenditures is not linear. Specifically, they find that population yields economies of scale up to a limit, since the functions present a U-shape, as from the point of the minimum per capita spending, if the population keeps on growing, per capita spending rises.

5. Results

5.1. OLS regressions

Results from OLS regressions are reported in Table 3. Since they correspond to cross-sectional data, the standard errors (in parentheses) were estimated using the White's correction for both autocorrelation and heteroskedasticity. The results reported in this table are presented se-

quentially, in three different models (A), (B) and (C), the third one (column three in Table 3) containing the most complete one, with all regressors included. We consider this sequentiality in order to isolate the effect of the financial (Model (A)), socioeconomic (Model (B)) and political (Model (C)) factors.

In the first group, not all the the variables (financial) are significant in all three models (A), (B) and (C). For instance, all variables, with the exception of $EXPCOMM$, are significant either at the 1% or 5% level, with the expected signs. However, once the model becomes more complex (i.e. either socioeconomic or political variables are included), the impact of $FISCCAP$ vanishes—not only losing significance but, in addition the magnitude of the coefficient becomes substantially lower. Although this decreasing magnitude is also found for $NETSAV$, in other cases ($BUDGET$) it actually increases, holding the significance. Therefore, one may conclude that, *on average*, $INVEST$, $NETSAV$ and $BUDGET$ have the expected impact, and the result is significant at the 1% level. The effect of both $FISCCAP$ and $EXPCOMM$ also corroborates what one might expect according to the ideas presented in Section 3, but in these two cases significance is entirely lost at the usual levels. However, this is an *average* effect which might not be the same for different parts of the distribution of debt.

The socioeconomic variables, which are first introduced in the the second column of Table 3, corresponding to Model (B), partly show the expected sign. This is the case of both $TOURISM$ and $ACTIVITY$, whose impact is positive, as expected, and significant at the 1% significance level. In addition, this result holds both for Model (B) and Model (C). In contrast, the $DENSITY$ variable shows a negative sign, as expected, but only for Model (B), whereas the most complete model (Model (C)) shows a positive *average* effect on the levels of debt; however, none of these effects is significant at the usual levels.

Finally, the three political variables considered also display heterogeneous results. Of the three variables, the one most frequently considered in the literature, i.e. the political *color* of the governing party ($POLITICAL$), shows the expected sign, and it is significant at the more demanding level (1%). This corroborates the ideas exposed in Section 3, since $POLITICAL$ is a dummy variable taking the value of 1 for municipalities governed by left-wing parties.

The variable $POWERS$ also has the expected sign, and the effect is also significant at the highest level. Although we had hypothesized a *negative* link between the level of powers and the level of municipal debt, we must take into account that this is a dummy variable taking the value of 1 for those municipalities with the lowest level of powers and, therefore, a positive sign (which is precisely the result that we obtain) would corroborate our hypothesis. The

variable $FORAL$, which was assumed to be strongly linked with $POWERS$, takes the value of 1 for municipalities from Navarre and the Basque Country, with different levels of powers from the rest. However, the effect, although negative, is low and not significant—on average.

Concerning the level of controllability of the independent variables, Model (C) provides we take the overall picture. Level of debts depends on socio-economic and political variables, both with a positive sign and characterized as non-controllable from the short term perspective. In these circumstances, left wing governments in municipalities with developed tourism and/or industrial sectors, should carefully monitor the development of fiscal and financial variables, as a way to keep debt levels under control.

5.2. Results from regression quantiles

Many of the results commented on in the previous section corroborate the results postulated in Section 3. However, this is not the case in all instances, as the effect for all variables is not always significant at the usual levels and, in addition, these are *average* results, which might not hold for the lower and upper tails of the distribution of debt.

We report the results corresponding to the estimation of Model (2) in both Table 4 and Figures 1, 2 and 3. For space reasons we restrict the analysis to Model (C) in Table 3, i.e. we will only be considering the most complete specification with all regressors included.

The results offer various subtleties compared to those we obtained via OLS regressions and are, up to a certain point, *striking*. Amongst the financial covariates, those which were found to be significant throughout, and showed the expected signs were $INVEST$, $NETSAV$ and $BUDGET$. However, as reported in Table 4, these are *average* effects which hide very disparate behaviors for the different parts of the conditional distribution of the dependent variable ($DEBT/POP$). For instance, the positive, and significant (average) effect found for $INVEST$ is actually *negative* for the lowest tails of $DEBT/POP$, i.e. for those municipalities with the lowest levels of debt. However, as shown by the standard errors in parentheses, the effect is not significant for quantiles $\tau = .05$, $\tau = .10$ and $\tau = .25$. In contrast, the effect is not only positive and significant for quantiles $\tau \geq .50$ but, in addition, the magnitude of the effect increases with the level of debt. In the case of $NETSAV$ results are also much richer than the OLS results. In this case, the *average* negative, and significant, effect found is negative for all quantiles, as shown in Table 4, but the magnitude of the effect is much higher for the upper tail of the distribution of debt. In this case, however, the effect is also significant for all considered quantiles—with the sole exception of $\tau = .05$. The third financial variable which was found

to be significant throughout via OLS, i.e. $BUDGET$, also shows remarkable differences for the quantile regression analysis. In this case, results are partly similar to those found for $INVEST$, although in this case the lowest quantiles do not show a negative effect. In this case, the effect is positive throughout, although significance holds only for the upper quantiles, and not for all of them. Analogously to what we found for $INVEST$ and $NETSAV$, the magnitude is also much higher for the most indebted municipalities.

Those financial variables whose effect was not found to be significant *on average*, i.e. $FISCCAP$ and $EXPCOMM$, share with the rest of the financial variables the *increasing* magnitude of the effect with the quantiles—i.e. the effect is always much stronger for the highest quantiles. For both $FISCCAP$ and $EXPCOMM$ the sign of the effect changes depending on the part of the distribution being analyzed—with a negative effect for the lower tail. In addition, some of the upper quantiles show a *significant* effect. Again, this behavior was completely overlooked by OLS regressions.

These results are corroborated in Figure 1, which displays the graphical counterpart to the results in Table 3 for the financial variables. As indicated in the figure, each sub-figure displays the slopes corresponding to the financial variables of the estimated linear quantile regression of Equation (2), which are plotted as functions of τ, i.e. the different quantiles, which are represented on the horizontal axis, whereas the vertical axis represents the values of the slope coefficients for each quantile (τ).

Interestingly, the solid horizontal red line in each sub-figure represents the OLS estimates, and the dashed horizontal red lines represent 95% confidence bands. Comparing them with the slopes of the estimated quantiles, it is easy to understand how misleading it can be to confine the analysis to OLS only. For instance, in the case of $INVEST$, we can observe that the variable is significant for $\tau > .5$ (approximately), since for values below this threshold the (gray) confidence bands contain the 0. In the case of $NETSAV$, significance is only lost for the very upper and lower tails of the distribution, whereas for $BUDGET$ we find that for $\tau < .3$ approximately the effect is not significant—at the 5% significance level. We can also notice how the effect varies with the quantiles. In the case of $FISCCAP$ and $EXPCOMM$ the confidence bands for OLS coefficients (dashed horizontal red lines) contain the zero, indicating that, *on average*, these variables are not significant, as stated earlier. However, the confidence bands for the estimated quantiles do not contain the zero for many of the quantiles (dashed black lines inside the gray bands), especially in the case of $FISCCAP$, indicating the effect of this variable is mostly positive.

In the case of the socioeconomic variables, one might *a priori* consider that the contribution of quantile regression would be minimal since, at least in the case of $TOURISM$ and $ACTIVITY$, the effect is positive for both Model (B) and Model (C) in Table 3. However, paralleling the findings for the financial variables, the magnitude of the effect is much stronger for the most indebted municipalities, whereas the impact vanishes for the lower quantiles and, in addition, significance is partly lost—especially in the case of $TOURISM$, which is only significant for $\tau \geq .50$. In contrast, $DENSITY$ is never significant and, in addition, the effect presents an erratic pattern throughout quantiles, which naturally leads to the conclusion that this variable is not significant at all.

Figures 2a, 2b and 2c provide graphical counterparts for the coefficients estimated for the socioeconomic variables in Table 4. For both $TOURISM$ and $ACTIVITY$ the OLS results are corroborated, with effects of increasing magnitude which, in the case of $TOURISM$, are not significant for $\tau < .30$. In contrast the effect of $DENSITY$ is both low (very close to zero), not significant, and without a clear sign.

Finally, the effect for the political variables also shows some nuances with respect to OLS. The variable $ELECTION$, which takes the value of 1 for those municipalities governed by left-wing governments, shows a positive effect throughout, corroborating what was found *on average* (Table 3). This would imply that, on average, these municipalities have higher levels of debt. However, as shown in Table 4, the effect is not significant for the highest quantiles—i.e. the most indebted municipalities have these high levels of debt regardless of their political stance. Again, this result would be completely hidden by OLS.

In the case of $FORAL$ and $POWERS$, the nuances with respect to OLS are more marked. Whereas the variable $FORAL$ shows no particular pattern for OLS (the effect was low, and not significant), for quantile regression (Table 4) the negative effect becomes positive, and non-negligible) for the highest quantiles ($\tau = .90$, $\tau = .95$). However, in this case the effect is not significant. Yet significance actually exists for some quantiles, in this case the lowest ones ($\tau = .05$ and $\tau = .25$). Taking into account that $FORAL$ is a dummy variable taking the value of 1 for the foral regions (Navarre and the Basque Country), it would indicate that those municipalities with the lowest levels of debt are located in these regions. In the case of the municipalities with the highest levels, the effect is not significant.

Finally, the behavior of the decentralization variable ($POWERS$) is partly similar to that found for $FORAL$, since the sign of the effect varies with the conditional distribution of debt. In this case, however, there are more quantiles with a positive sign, and with significant effects.

Since *POWERS* takes the value of 1 for the municipalities with fewer powers, a positive effect indicates that the municipalities with fewer powers have higher levels of debt. Results in Table 4 indicate this is actually the case for those municipalities with more debt, corresponding to the highest quantiles, and this effect is very strong. In contrast, for those municipalities with lower levels of debt, corresponding to the lowest quantiles, the effect is the opposite, and more modest in magnitude.

The effects of the three political variables considered are visually corroborated in Figure 3, which clearly shows clearly noticed how the effect of *POLITICAL* is present for most of the selected quantiles, whereas in the case of *FORAL* it only holds for few of them. In the case of *POWERS*, this effect is of the opposite sign (albeit significant) for both tails of the distribution of debt.

The results from the OLS and quantile estimation help us to detect the asymmetric situation of debts in Spanish local governments. On the one hand, municipalities having a low level of debts seem to be affected by the overall economic activity, but not by the tourism activity. The requirements concerning the level of investments do not appear to 'drive' increased level of debts. In other terms, the allocation of infrastructures seem to be financed without requiring funds from financial institutions, which helps these municipalities to avoid financial pressures. Cases with such characteristics can be taken as a 'best practice' model on how to manage the requirement of the external environment with an adequate structure of controllable budget variables (as the regressors concerning net savings indicate).

Confronting the previous case, local governments having a high level of debts appear to be influenced both by tourism and economic activities, and by operating with more powers in a decentralized environment, which can imply the requirement to offer a mixture of more sophisticated services to their citizens. For these municipalities, the investments increase the level of debts because control of the budgetary variables (i.e. the level of net savings) does not seem to reduce the requirement to raise financial debts. The obvious implication from this is that investments should be carefully monitored for municipalities offering complex services and maintaining important levels of economic activities once a certain level of debts is surpassed. In other words, to find an analogy from the private sector, a kind of 'debt covenant' should be introduced as a way to regulate the financial management of local governments. This regulation should only affect those municipalities having a level of debts beyond a determined point. The results of the quantile regression are extremely useful to determine the upper limit of the debts to regulate the level of municipal investments.

6. Concluding remarks

In Spanish public administration, all layers of government—central, regional and local—contribute to public spending, and have varying levels of powers. Although municipalities are clearly the level of government with the fewest less powers (the second decentralization, from the central and regional governments to local governments actually never took place), they are allowed to both raise local taxes and charge tariffs for the services they provide. These and other revenues they obtain from different sources allow them to, depending on the size of their populations, provide services such as day-care nurseries, public transport, waste disposal, sewage, construction, management of sports centers and public green areas, etc.

The current economic and financial crisis has seriously affected (and is affecting) European public administrations. In the Spanish case, all layers are heavily affected. However, there are many differences, since out of 17 regions ("comunidades autónomas") some of them are facing much higher deficits than others, especially those where the housing bubble was largest—and, therefore, when it burst the effects were more devastating. In those regions, the amount of revenues raised by regional governments has plummeted, whereas that of costs has either remained constant or even risen. Stepping down to the local government level, one finds a similar scenario, with the added problem that the number of municipalities is much higher (8,112 municipalities vs. 17 regions) and, therefore, the levels of heterogeneity are also much higher, with many municipalities facing extremely stringent financial needs, to which the responses have differed remarkably.

Under these circumstances, this paper has analyzed the main determinants of local government debt in Spain. This question has been partly approached in previous contributions, which found relevant results. However, the previous literature implicitly assumed that the impact of the different variables was *homogeneous* across the 8,112 municipalities, disregarding the possibility that effects could vary for different quantiles of the distribution of municipal debt. In other words, most of the subtleties that might exist were hidden by the fact that results were summarized into an *average* effect. We consider that this might be an over-simplification, since based only on this summary, economic policy recommendations would not be tuned to match the intrinsic characteristics of each municipality.

Our results indicate that for most of the variables considered to have an impact on municipalities' debt, which were in line with those used by previous literature, the effects vary considerably depending on the quantile of the conditional distribution of local government

debt. This implies that the explanations one might have previously found (explanations that did not take into account these differing effects by quantile) should state that the impacts found corresponded to *average* impacts. According to the analysis performed in this study, where we considered three types of variables, namely, financial, socioeconomic, and political, the effects are strong, and significant, for most of them. Interestingly, the effects differ greatly depending on how indebted municipalities are, and in some cases the impacts were even opposite for the lower and upper tails of the municipalities' debt distribution—such as, for instance, the variable reflecting devolution. In other cases, the effects were not significant for some parts of the distribution, but for others these effects were positive and significant, and this happened in a non-negligible, and relevant, number of instances. This is the case of, for instance, capital expenditures, non-financial surplus (as a share of deficit), own fiscal capacity, or tourism.

These results indicate that the design of public policies that attempt to control local governments' costs, strongly encouraged by European Union institutions, and contemplated by the recent update of the Stability and Growth Pact (2011), should take into account this *varying* reality, which is very present in the case of Spanish local governments. Failing to do so would lead to an design of public policies which, ultimately, could be ineffective in achieving the objectives pursued.

References

Abizadeh, S. and Gray, J. A. (1993). Provincial government expenditures in Canada: An empirical analysis. *International Review of Applied Economics*, 7(1):69–90.

Adams, R. D. (1977). Individual preferences as supply determinants in the municipal and federal bond markets. *Public Finance Quarterly*, 5(2):175–202.

Anselin, L. and Lozano-Gracia, N. (2008). Errors in variables and spatial effects in hedonic house price models of ambient air quality. *Empirical Economics*, 34:5–34.

Arnau, V. (1997). Las operaciones de crédito de las entidades locales. *Revista de Hacienda Local*, (81):631–731.

Ashworth, J., Geys, B., and Heyndels, B. (2005). Government weakness and local public debt development in Flemish municipalities. *International Tax and Public Finance*, 12(4):395–422.

Baber, W. R. and Gore, A. K. (2008). Consequences of GAAP disclosure regulation: Evidence from municipal debt issues. *Accounting Review*, 83(3):565–591.

Balaguer-Coll, M. T. (2001). *Análisis de la situación económico financiera en la Administración Local. Una aplicación a los ayuntamientos de la Comunidad Valenciana*. PhD thesis, Universitat Jaume I, Castelló de la Plana.

Balaguer-Coll, M. T., Prior, D., and Tortosa-Ausina, E. (2010a). Decentralization and efficiency of local government. *The Annals of Regional Science*, 45:571–601.

Balaguer-Coll, M. T., Prior, D., and Tortosa-Ausina, E. (2010b). Devolution dynamics of Spanish local government. *Environment and Planning A*, 42(6):1476–1495.

Balaguer-Coll, M. T., Prior, D., and Tortosa-Ausina, E. (2012). Output complexity, environmental conditions, and the efficiency of municipalities. *Journal of Productivity Analysis*, forthcoming.

Baltagi, B. H., Egger, P., and Pfaffermayr, M. (2008). Estimating Regional Trade Agreement effects on FDI in an interdependent world. *Journal of Econometrics*, 145:194–208.

Basile, R. and Girardi, A. (2010). Specialization and risk sharing in European regions. *Journal of Economic Geography*, 10(5):645–659.

Bastiaens, E., De Borger, B., and Vanneste, J. (2001). Expenditure and taxation effects of local public debt and unconditional grants: evidence from flemish municipalities. *Brussels Economic Review*, 17(171):71–89.

Bastida, F. and Benito, B. (2004). The determinants of the municipal debt policy in Spain. *Journal of Public Budgeting, Accounting & Financial Management*, 16(4):492–525.

Benito, B., Bastida, F., and Guillamón, M. D. (2010). Urban sprawl and the cost of public services: an evaluation of Spanish local governments. *Lex localis-Journal of Local Self-Government*, 8(3):245–264.

Benito, B. and Bastida, F. J. (2004). The determinants of the municipal debt policy in Spain. *Journal of Public Budgeting, Accounting and Financial Management*, 16(4):525–558.

Benito, B. and Bastida, F. J. (2005). Análisis del endeudamiento en los Ayuntamientos: un Estudio Empírico. *Revista Española de Financiación y Contabilidad*, 126:613–635.

Blais, A. and Nadeau, R. (1992). The electoral budget cycle. *Public Choice*, 74(4):389–403.

Bridges, D. (2005). Public authorities and determinants of aggregate debt: Kentucky's municipal governments. *Unpublished*, pages 1–65.

Brusca, I. and Labrador, M. (1998). Análisis del endeudamiento en las Corporaciones Locales. Un estudio empírico. *Revista de Hacienda Local*, (84):581–597.

Brusca Alijalde, I., Mora Agudo, L., and Montesinos Julve, V. (2012). La descentralización de servicios en el sector local: factores explicativos e implicaciones contables. *Revista Española de Financiación y Contabilidad*, forthcoming.

Buchinsky, M. (1998). Recent advances in quantile regression models: a practical guideline for empirical research. *Journal of Human Resources*, 33(1):88–126.

Bunch, B. S. (1991). The effect of constitutional debt limits on state governments' use of public authorities. *Public Choice*, 68(1):57–69.

Cabasés, F., Pascual, P., and Vallés, J. (2007). The effectiveness of institutional borrowing restrictions: Empirical evidence from Spanish municipalities. *Public Choice*, 131(3):293–313.

Casetti, E. (1972). Generating models by the expansion method: applications to geographical research. *Geographical Analysis*, 4(1):81–91.

Clingermayer, J. C. and Wood, B. D. (1995). Disentangling patterns of state debt financing. *American Political Science Review*, 89(1):108–120.

Coad, A. and Hölzl, W. (2009). On the autocorrelation of growth rates. *Journal of Industry, Competition and Trade*, 9(2):139–166.

Cropf, R. A. and Wendel, G. D. (1998). The determinants of municipal debt policy: a pooled time-series analysis. *Environment and Planning C*, 16:211–224.

Cunningham, B. M. (2003). The distributional heterogeneity of growth effects: some evidence. *The Manchester School*, 71(4):417–447.

Dickson, V. A. and Yu, W. (1997). Spending by Canadian provincial governments: An empirical analysis. *Public Finance/Finances publiques*, 52(2):145–60.

Eldridge, J. D. and Jones, J. P. (1991). Warped space: A geography of distance decay. *The Professional Geographer*, 43(4):500–511.

Escudero, P. (2002). *Endeudamiento, descentralización de los servicios y ciclos políticos presupuestarios: el caso de los ayuntamientos catalanes*. PhD thesis, Universitat Autònoma de Barcelona, Barcelona.

Farnham, P. G. (1985). Re-examining local debt limits: A disaggregated analysis. *Southern Economic Journal*, 51(4):1186–1201.

Fernández Llera, R., García Valiñas, M. A., Cantarero Prieto, D., and Pascual Sáez, M. (2004). El endeudamiento de los gobiernos locales en España: Aspectos generales y resultados empíricos. In Caramés, L., editor, *Situación actual de la hacienda local en España*, pages 171–187. Asociación Galega de Estudios de Economía do Sector Público (AGEESP), Santiago de Compostela.

Foster, S. A. (1991). The expansion method: implications for geographic research. *The Professional Geographer*, 43(2):131–142.

Fotheringham, A. S., Brunsdon, C., and Charlton, M. (2002). *Geographically Weighted Regression: The Analysis of Spatially Varying Relationships*. John Wiley & Sons Inc, Chichester.

Galli, E. and Rossi, S. P. S. (2002). Political budget cycles: the case of the Western German Länder. *Public Choice*, 110(3):283–303.

Guillamón, M. D., Bastida, F., and Benito, B. (2011a). The determinants of local government's financial transparency. *Local Government Studies*, 37(4):391–406.

Guillamón, M. D., Benito, B., and Bastida, F. (2011b). Evaluación de la deuda pública local en España. *Revista Española de Financiación y Contabilidad*, 150(150):251–285.

Hortas-Rico, M. and Solé-Ollé, A. (2010). Does urban sprawl increase the costs of providing local public services? Evidence from Spanish municipalities. *Urban Studies*, 47(7):1513.

Inman, R. P. and Fitts, M. A. (1990). Political institutions and fiscal policy: Evidence from the US historical record. *Journal of Law, Economics, and Organization*, 6:79–132.

Jones, J. P. (1992). Paradigmatic dimensions of the expansion method. In Jones, J. P. and Casetti, E., editors, *Applications of the Expansion Method*, pages 32–46. Routledge, London.

Jones, K. and Bullen, N. (1994). Contextual models of urban house prices: a comparison of fixed-and random-coefficient models developed by expansion. *Economic Geography*, 70(3):252–272.

Kiewiet, D. R. and Szakaty, K. (1996a). Constitutional limitations on borrowing: An analysis of state bonded indebtedness. *Journal of Law, Economics, and Organization*, 12(1):62–97.

Kiewiet, D. R. and Szakaty, K. (1996b). Constitutional limitations on borrowing: An analysis of state bonded indebtedness. *Journal of Law, Economics, and Organization*, 12(1):62–97.

Kochanowski, P. (1990). The expansion method as a tool of regional analysis. *Regional Science Perspectives*, 20(2):52–66.

Koenker, R. (2001). Quantile regression. *Journal of Economic Perspectives*, 15(4):143–156.

Koenker, R. (2005). *Quantile Regression*. Cambridge University Press.

Koenker, R. and Bassett, G. (1978). Regression quantiles. *Econometrica*, 46(1):33–50.

Lago-Peñas, I., Lago-Peñas, S., and Martínez-Vázquez, J. (2011). The political and economic consequences of decentralization. *Environment and Planning C: Government and Policy*, 29:197–203.

López-Hernández, A. M., Zafra-Gómez, J. L., and Ortiz-Rodríguez, D. (2012). Effects of the crisis in Spanish municipalities' financial condition: an empirical evidence (2005–2008). *International Journal of Critical Accounting*, forthcoming.

Monasterio Escudero, C. (1996). Los límites al endeudamiento de los gobiernos subcentrales. Teoría y evidencia para el caso español. *Papeles de Economía Española*, (67):275–285.

Musgrave, R. A. (1989). *Public Finance in Theory and Practice*. McGraw-Hill, New York.

Pettersson-Lidbom, P. (2001). An empirical investigation of the strategic use of debt. *Journal of Political Economy*, 109(3):570–583.

Pike, A., Rodríguez-Pose, Tomaney, J., Torrisi, G., and Tselios, V. (2012). In search of the "economic dividend" of devolution: spatial disparities, spatial economic policy, and decentralisation in the UK. *Environment and Planning C: Government and Policy*, 30(1):10–28.

Poterba, J. M. (1997). Do budget rules work? In Auerbach, A., editor, *Fiscal Policy: Lessons from Empirical Research*, pages 53–86. MIT Press, Cambridge.

Vallés, J., Pascual, P., and Cabasés, F. (2003). Endeudamiento municipal y efectividad de las restricciones institucionales de disciplina crediticia. *Hacienda Pública Española*, 166(3):9–47.

Vilalta, M. and Mas, D. (2006). El gasto de carácter discrecional de los ayuntamientos y su financiación. Ejercicios 2002 y 2003. Elementos de debate territorial 23, Diputació de Barcelona (Xarxa de Municipis), Barcelona.

Table 1: Definition of the relevant variables

Type of variable	Variable name	Description	Definition/Calculation	Controllable/non-controllable (short-term basis)
Dependent variable				
	DEBT/POP	Debt level per inhabitant	(Total debt)/population	
Independent variables				
Financial/fiscal	*INVEST*	Capital expenditures	(capital transfers plus acquisitions of capital goods)/population	Controllable
	NETSAV	Net savings (available funds to conduct investments)	(gross savings – amortization expenses)/population	Controllable/non-controllable
	BUDGET	Non-financial surplus as a share of deficit	(sum of net recognized assets (NRA), headings 1 to 7)/(sum of net recognized liabilities (NRL), headings 1 to 7)	Controllable
	FISCCAP	Own fiscal capacity (revenues represented by municipalities' own resources)	(NRA headings 1 to 3)/(Total revenues)	Controllable
	EXPCOMM	Expenditure commitment	(personnel and financial expenditures)/(total expenditures)	Controllable
Socioeconomic	*TOURISM*	Level of tourism	Index based on the (local) tax on economic activity (or *Impuesto de Actividades Económicas*, IAE) with respect to tourism-oriented activities	Non-controllable
	ACTIVITY	Level of economic activity	((Local tax on economic activity (IAE) corresponding to the municipality's economic activities)/(total IAE revenues for all Spanish municipalities))$\times 100,000$	Non-controllable
	DENSITY	Population density	Inhabitants per km^2	Non-controllable
Political	*POLITICAL*	Color of municipality's governing party	Dummy variable taking the value of 1 for municipalities governed by left-wing parties, 0 otherwise	Non-controllable
	FORAL	Foral regions (Navarre and the Basque Country)	Dummy variable taking the value of 1 for municipalities in the *foral* regions	Non-controllable
	POWERS	Decentralization	Dummy variable taking the value of 1 for municipalities with less powers	Non-controllable

Table 2: Descriptive statistics of the relevant variables

Type of variable	Variable name	# of observations	Mean	Std. Dev.	1st quartile	Median	3rd quartile
Dependent variable							
	DEBT/POP	1,381	0.2851	0.2873	0.0686	0.2134	0.4151
Financial/fiscal	*INVEST*	1,381	1.0355	0.1827	0.9336	1.0120	1.1090
	NETSAV	1,381	87.8060	422.6137	–8.4856	51.7434	119.0209
	BUDGET	1,381	1.0353	0.1827	0.9336	1.0118	1.1088
	BUDGET	1,381	1.0355	0.1827	0.9336	1.0120	1.1090
	FISCCAP	1,381	0.4357	0.1528	0.3212	0.4407	0.5425
	EXPCOMM	1,381	0.6517	0.1268	0.5770	0.6635	0.7438
Independent variables							
Socioeconomic	*TOURISM*	1,381	52.8704	349.2460	0.0000	2.0000	10.0000
	ACTIVITY	1,381	56.4461	361.9620	2.0000	7.0000	23.0000
	DENSITY	1,381	0.0246	0.0355	0.0031	0.0119	0.0310

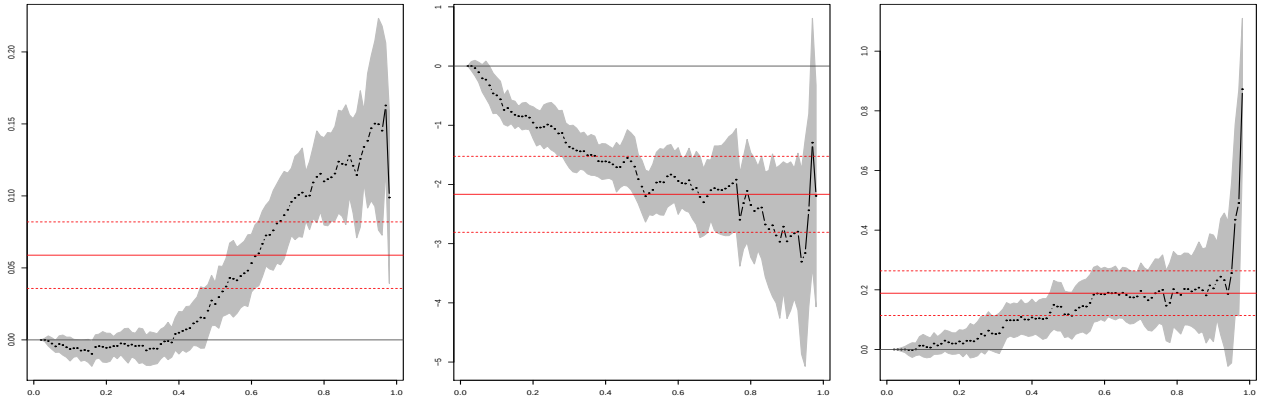
Table 3: Model 1, estimated using OLS (HA corrected)

Covariates		Dependent variable: $DEBT/POP$		
		(A)	(B)	(C)
	(Intercept)	-0.417^{**}	-0.458^{**}	-0.558^{***}
		(0.196)	(0.178)	(0.186)
Fiscal/financial variables	$INVEST$	0.074^{***}	0.066^{***}	0.059^{***}
		(0.020)	(0.019)	(0.019)
	$NETSAV$	-3.636^{***}	-2.289^{***}	-2.166^{***}
		(0.456)	(0.416)	(0.417)
	$BUDGET$	0.106	0.169^{**}	0.189^{***}
		(0.070)	(0.066)	(0.066)
	$FISCCAP$	0.457^{***}	0.102^{*}	0.085
		(0.052)	(0.056)	(0.059)
	$EXPCOMM$	0.040	0.036	0.020
		(0.124)	(0.111)	(0.111)
Socioeconomic variables	$TOURISM$		0.033^{***}	0.036^{***}
			(0.008)	(0.008)
	$ACTIVITY$		0.047^{***}	0.056^{***}
			(0.008)	(0.014)
	$DENSITY$		-0.043	0.034
			(0.213)	(0.212)
Political variables	$ELECTION$			0.046^{***}
				(0.013)
	$FORAL$			-0.004
				(0.052)
	$POWERS$			0.090
				(0.058)
R^2		0.149	0.278	0.292
$\bar{R}^2$		0.146	0.274	0.286
σ		0.266	0.245	0.243
F		48.191	66.180	43.440
p		0.000	0.000	0.000
Log-likelihood		-125.313	-11.470	1.961
Deviance		96.947	82.212	80.628
AIC		264.625	42.940	26.078
BIC		301.239	95.246	104.536
N		1,381	1,381	1,381

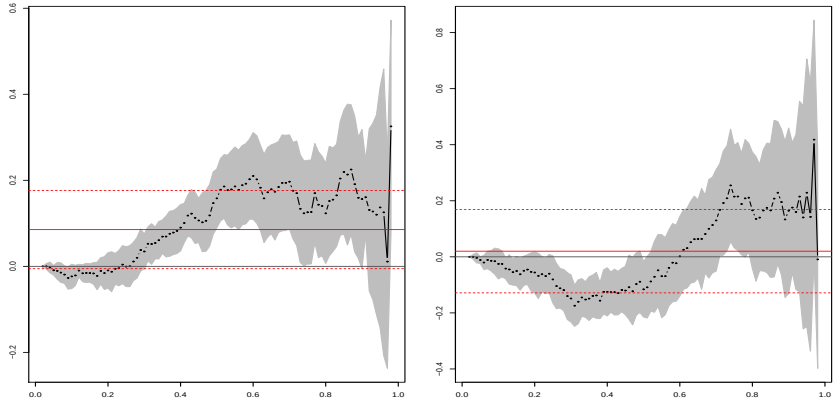
Table 4: Model 1, quantile regression

Covariates		Dependent variable: $DEBT/POP$						
		Quantile (τ)						
		0.05	0.10	0.25	0.50	0.75	0.90	0.95
	(Intercept)	0.146	0.220	0.123	−0.189	−1.012	−1.027	−1.243
		(0.046)	(0.066)	(0.079)	(0.086)	(0.165)	(0.264)	(0.430)
Fiscal/financial variables	*INVEST*	−0.003	−0.006	−0.003	0.025	0.100	0.126	0.150
		(0.002)	(0.005)	(0.006)	(0.009)	(0.010)	(0.029)	(0.045)
	NETSAV	−0.104	−0.495	−1.016	−2.037	−1.981	−2.961	−3.159
		(0.103)	(0.185)	(0.244)	(0.272)	(0.508)	(0.793)	(1.163)
	BUDGET	0.000	0.013	0.036	0.118	0.195	0.205	0.256
		(0.006)	(0.023)	(0.035)	(0.045)	(0.065)	(0.109)	(0.183)
	FISCCAP	−0.009	−0.023	−0.001	0.158	0.126	0.157	0.137
		(0.007)	(0.017)	(0.028)	(0.042)	(0.074)	(0.098)	(0.170)
	EXPCOMM	−0.011	−0.025	−0.081	−0.116	0.215	0.164	0.229
		(0.007)	(0.033)	(0.051)	(0.060)	(0.111)	(0.180)	(0.290)
Socioeconomic variables	*TOURISM*	0.001	0.004	0.003	0.023	0.032	0.059	0.069
		(0.001)	(0.003)	(0.004)	(0.006)	(0.009)	(0.013)	(0.026)
	ACTIVITY	0.003	0.012	0.041	0.049	0.103	0.088	0.097
		(0.002)	(0.005)	(0.007)	(0.009)	(0.016)	(0.022)	(0.036)
	DENSITY	0.000	−0.017	−0.046	−0.091	0.185	0.136	−0.142
		(0.007)	(0.050)	(0.116)	(0.193)	(0.233)	(0.198)	(0.867)
Political variables	*ELECTION*	0.005	0.014	0.020	0.031	0.045	0.033	0.139
		(0.003)	(0.006)	(0.007)	(0.009)	(0.017)	(0.028)	(0.048)
	FORAL	−0.039	−0.032	−0.083	−0.006	−0.008	0.161	0.151
		(0.016)	(0.036)	(0.012)	(0.076)	(0.037)	(0.124)	(0.503)
	POWERS	−0.128	−0.183	−0.091	0.018	0.201	0.259	0.304
		(0.045)	(0.048)	(0.034)	(0.036)	(0.071)	(0.086)	(0.161)

Figure 1: Regression quantiles, Model 1, financial/fiscal variables



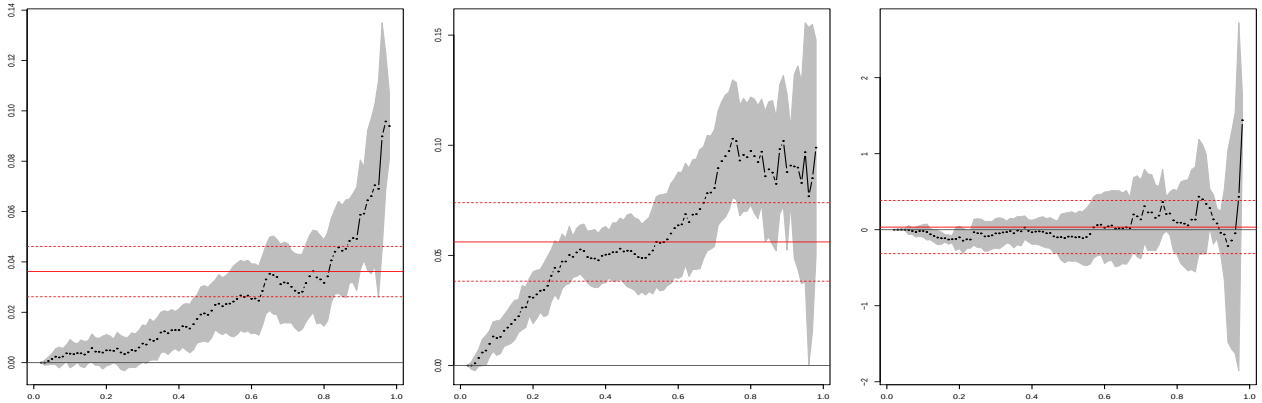
(a) *INVEST* **(b)** *NETSAV* **(c)** *BUDGET*



(d) *FISCCAP* **(e)** *EXPCOMM*

Notes: the slopes corresponding to the financial/fiscal covariates of the estimated linear quantile regression for model 1(C) are plotted as a function of τ (i.e., the different quantiles), represented on the horizontal axis. The vertical axis represents the values of the slope coefficients for each quantile (τ).

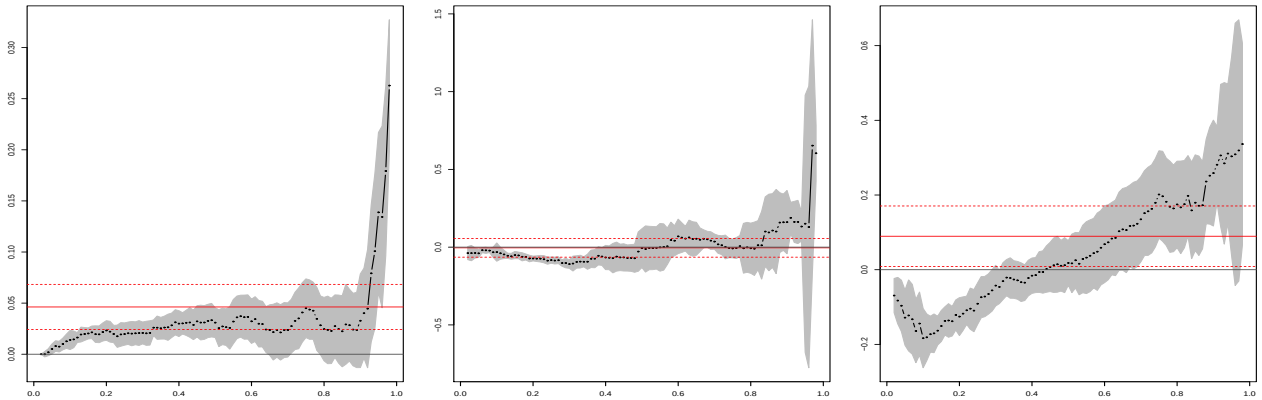
Figure 2: Regression quantiles, Model 1, socioeconomic variables



(a) *TOURISM* **(b)** *ACTIVITY* **(c)** *DENSITY*

Notes: the slopes corresponding to the financial/fiscal covariates of the estimated linear quantile regression for model 1(C) are plotted as a function of τ (i.e., the different quantiles), represented on the horizontal axis. The vertical axis represents the values of the slope coefficients for each quantile (τ).

Figure 3: Regression quantiles, Model 1, political variables



(a) *ELECTION* **(b)** *FORAL* **(c)** *POWERS*

Notes: the slopes corresponding to the financial/fiscal covariates of the estimated linear quantile regression for model 1(C) are plotted as a function of τ (i.e., the different quantiles), represented on the horizontal axis. The vertical axis represents the values of the slope coefficients for each quantile (τ).