Title: The Importance of Spatial Effects in Municipal Debt

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Abstract:

This article analyses the debt of local governments taking into account the presence of spatial interactions among neighbouring municipalities. To this end, the S2SLS and Spatial lag spatial models were applied to a sample of 527 municipalities located in the Valencian Community (Spain). The main results reveal a spatial correlation in outstanding debt among municipalities. The gender of the mayor, the subsidy ratio and the average payment period have direct effects on outstanding debt. In turn, the net savings index, inactive population, local income and the strength of the ruling political party have indirect effects on the municipal debt and indirect spatial effects on the debt of the neighbouring municipality.

Keywords: debt, councils, spatial interactions.

JEL codes: C21, H71, H72

1. Introduction

Public debt is an indicator for measuring a country's financial health. In Spain, the volume of debt has steadily increased, notably after the start of the global economic crisis in 2007. Given its volume and importance, European and national legislation has had to adapt to the situation, imposing strict limits that must be met at central, regional and local levels.

Numerous studies in the literature have analysed debt and its determinants in local governments (Balaguer, et al., 2016; Benito & Bastida, 2004, 2005; Benito, et al., 2015 a; Cabases, et al., 2003, 2007; Pascual et al., 2003; and Guillamón et al., 2011). The present study aims to extend this literature by analysing whether neighbouring interdependencies exist in municipal debt decisions, that is, whether an increase in the debt level of one municipality might affect that of the neighbouring municipality. The variables in the study include the average payment period to suppliers and the gender of the local government's ruling party,[1] among others, to analyse their effects on municipalities' current debt levels.

In today's globalised world, the effect of interconnectivity and technological development seems to be that nothing happens randomly. This has motivated some authors to hypothesise that local governments do not make decisions in isolation, but take into account the decisions adopted by their neighbours. Spatial interactions among municipalities and their influence on fiscal policy are increasingly attracting research attention. Authors such as López et al. (2017), Bastida et al. (2012), Foucault et al. (2008) and Ermini and Santolini (2010) highlight the existence of similar spatial behaviours in localities in spending, that is, spending levels in one municipality are influenced by the spending decisions adopted by neighbouring municipalities.

[1] This is an interesting question due to the changes in gender balance of local government composition brought in by changes to Spanish electoral legislation (Ferraz & Tejedo-Romero, 2016).

The literature on spatial patterns in local taxes shows that municipalities determine their taxes according to those of their neighbouring councils (Delgado & Mayor, 2011; Allers & Elhorst, 2005 and Cassette et al., 2012). The work of Álvarez and Barbero (2016) highlights the importance of spatial effects of tax income on growth in Spanish regional economies, analysing at the same time competition among regions for public resources.

In line with the previous research, Kopczewska at al. (2016) carried out a broad study on the existence and magnitude of the spatial effects of debt in EU countries. These authors observe that taxes have a considerable spatial repercussion on debt at the European level, confirming the existence of global effects that influence the fiscal policy of the Eurozone. Pan et al. (2017) find a pattern of constant debt accumulation in Chinese municipalities due to their increased income from taxes, which represents greater capacity to return the debt they owe. Their main conclusions identify spatial patterns in municipal debt, that is, the issue of bonds as a local financing instrument in one city is related to the amount of bonds issued by neighbouring cities. Borck at al. (2015) study spatial patterns in German municipal debt and uncover a robust spatial correlation. These authors confirm that if one local authority increases its debt level, this has repercussions for its closest neighbour, which in turn increases its own debt.

Finally, Zhang and Gibson (2017) observe spatial dependency in the outsourcing of local services, indicating that decisions to subcontract services to third parties is influenced by the outsourcing decisions taken by their nearest neighbouring local authorities.

This study is structured in five sections. Following this introduction, the second section outlines and justifies the sample and the variables. The methodology and the empirical models are then described; finally the main results and conclusions of the analysis are presented.

2. Sample and variables

2.1. Description of the sample

This study was carried out using a sample of town councils from the Valencian Community (Spain) for which information was available for the year 2015. The sample thus comprised 527 municipalities, representing 97% of all the municipalities in the region. Budget data for the local authorities were taken from the Spanish Ministry of Finance and Public Administration; specifically, we used the recognised net assets and liabilities, rather than budget provisions, despite the fact that the available information is less recent.

In what follows we analyse a set of budget, socio-economic and political variables for which the literature has found empirical evidence of spatial behaviour.

(Insert table 1)

2.2. Budget variables

Grants and transfers received (GRANTS)

Lago-Penas (2008) finds that local authorities with higher grants increase their expenditure level, and refers to this effect as "*fiscal replacement form of asymmetry.*" The author notes that, depending on the ruling political ideology, grants are either used to reduce the debt or not. Specifically, grants are partially used by conservative governments to reduce their deficit because their income from taxes is lower. Bastida et al.'s (2012) study shows that grants received have a positive and direct impact on expenditure and, therefore, indirectly affect the debt level. Guillamón et al. (2011) and Levaggi et al. (2003) find a positive relationship between grants received and debt level. However, Benito and Bastida (2005), Balaguer (2002) and Pérez et al. (2013) report that higher volumes of grants received coincide with debt reduction.

Net savings rate (NSR)

According to Cabases et al. (2003), local authorities that implement austerity policies in their current expenditure and have an appropriate plan for debt reduction have greater financing capacity; in other words they do not need excessive debt to finance their capital investments. Similarly, Vila i Vila (2010) analyses the evolution of net savings as a determinant of compliance with legal debt limits, finding a negative evolution. Pérez et al. (2013), Benito and Bastida (2005), Cabases et al. (2003), Balaguer (2002) and Brusca and Labrador (1998) find a negative relation between net savings and municipal debt. Fernández et al. (2004) confirm that gross savings imply a reduced need for financing through debt due to increased self-financing capacity. Local administrations that require financing consolidate their greatest financial capacity through net savings; that is, net savings is an advantage when accessing credit.

Capital expenditure (CE)

Capital expenditure is financed by capital transfers received, current savings, income from urban development taxes, or long-term loans, which increase municipal debt. In this line, Benito et al. (2015b) find a significant and positive relationship between capital spending and local debt. The studies by Pérez et al. (2013), Balaguer et al. (2016), Cabases et al. (2007), Cabases et al. (2003) and Benito and Bastida (2004, 2005) conclude that capital investment positively influences local debt, and that local debt is one of its determinants. Zehms (1991) highlights the need to update capital assets and their financing through opportune budgetary allocations in the budgets. According to this study, investment spending, contained in budget reports, informs users about the proportion of expenditure allocated to financing municipal investment.

Average payment period (APP)

Organic Law 2/2012 on Budget Stability and Financial Sustainability establishes a set of fiscal regulations that affect local administrations through the principles of financial stability and sustainability, the expenditure rule, and the use of budget surplus to pay off

debt. To control commercial late payments, the regulation stipulates the average period of payment to local suppliers, setting a final payment date at 30 days of receiving the invoice. If the local administration does not make the payment, it incurs interest on arrears that increases the total debt. In this line, Pons (2017) runs an analysis of variance on the average payment period, as an indicator of debt, of different types of local organisations, finding that a large proportion of the municipalities analysed do not comply with the regulation.

2.3. Socio-economic variables

Income level (INCOME)

This variable is used by Cabases et al. (2003, 2007), Escudero and Prior (2001), Bastida et al. (2013) and Allers et al. (2015), among others, in their studies on debt. According to the literature, income has a positive influence on local debt; that is, higher per capita income levels lead to higher accumulated public debt due to higher demand from citizens for goods and services, who pay higher taxes in relation to their higher income levels (Vallés, 2005; Guillamón et al., 2011; Benito & Bastida, 2005; Kiewiet & Szalaky, 1996; Escudero & Prior, 2002; Cabases et al., 2003a,b; and Pascual et al., 2008). However, Benito et al.'s (2015a) study on compliance with legal limits of local debt finds a positive relationship between per capita income and compliance with legal public debt limits. Similarly, in their study on the housing bubble and its consequences at local government level, Benito et al. (2015b) confirm that income level does not affect local debt level.

Population density (DENS)

In the literature on debt, the relationship between population density and local debt growth is unclear, and has led to many diverse conclusions. Benito et al. (2015a) state that population density is negatively correlated with debt growth; that is, the need for

financing declines as population density increases. This conclusion is explained by the fact that expenditure on street cleaning and lighting in the town or city centre, among other factors, does not vary according to number of inhabitants. These authors find that municipalities with higher population densities have lower current debt levels. However, Andrews (2015) analyses vertical consolidation and financial sustainability in English local authorities, finding that population density is not a factor that determines an authority's "fiscal health". Bastida et al. (2012) conclude that the impact of population density on different types of functional expenditure is very small or practically non-existent.

Retired people (RET)

Social services, resulting from local policies, lead to increased public spending, which in turn affects debt level. Social policies are associated with population segments, in that the existence of vulnerable groups motivates social policies with resulting increased service costs. In this vein, Hagen and Vabo (2005) find evidence that older people have negative effects on public finance surplus; similarly, Borck at al. (2015) uncover negative effects of the inactive population on accumulated municipal debt. However, Ríos et al. (2017) conclude that older people do not have significant effects on municipal spending and therefore, we might deduce, on debt. Taking these results into account, we consider the effect of inactive population on the amount of municipal debt an interesting question to examine.

2.4. Political variables

Election data from 2011 were used to define the political variables (political strength, political inclination and gender of the mayor), since current debt[2] is an accumulated amount and its volume is a result of past decisions.

[2] The Ministry of Finance and Public Administration defines current debt as the total nominal value of gross liabilities in the public administration sector, pending at the end of the year, with the exception of

Gender of the mayor (GEN)

Massolo (1996) and Guillamón et al. (2011) highlight the importance of the mayor's gender to local debt. According to Hernández-Nicolás et al. (2018), "councils with women mayors have fewer annual interest and debt repayment obligations and have higher expenditure on security, protection, and social promotion". Madinah et al. (2015) point out that not only do men and women have different values of equity, long-term perspective, sense of community and representation, but also differ in their values of efficiency, effectiveness and experience. For their part, Carozzi and Gago (2017) analyse gender and social policies related to support for families, preschool education and work, finding no empirical evidence that women mayors are more likely to introduce such policies. Clots-Figueras (2011) observes that when women are responsible for political management, a positive impact is seen in educational performance in urban areas of India.

Ferraz and Tejedo-Romero (2016) find that women's role in local Spanish politics was greater in the 2011 elections than in the previous 2007 local elections. Ilcan et al. (2007) studied the restructuring of the Canadian public sector and women's new political and economic role. Green and Homroy (2018) evidence the positive and economically significant effects of women directors' involvement on company boards and committees. Bagues and Campa (2017) identify increased gender quotas in local authorities, but find no statistically significant evidence of change in the composition of public finance.

Herfindahl Index (HI)

Research analysing political strength and its consequences for local debt has reached varying conclusions. Ashworth et al. (2005) find that more politically fragmented local

financial asset liabilities in the hands of the public administration. Public debt refers to public administration liabilities in the following categories: cash and deposits, debt securities and loans, in accordance with the definitions from the SEC 2010.

governments have higher public deficits and debt, due to the strategic use of debt by political coalitions. Their analysis of strategic debt shows that local governments probably prefer to take on higher debt as a legacy for future governments, concluding that the effects of political fragmentation have a long-term influence on municipal debt. Guillamón et al. (2011) show that the concentration of local government power influences debt level. Tovmo (2001) and Rattsø and Tovmo (2002) conclude that political fragmentation does not affect public deficit, and therefore debt. Borge (2003) finds robust effects of political fragmentation on municipal debt, although politically strong governments are not confirmed to have lower debt levels. Hagen and Vabo (2005) conclude that stronger political leadership leads to higher fiscal performance and, therefore, improved – that is, higher – budget balance. This lack of consensus motivates our objective to test the effects of political strength on local debt.

To measure the degree of political competition in the municipalities analysed, we use the Herfindahl index, which takes values between 0 and 1, depending on the number of councillors from each party represented in the council, with higher values indicating a lower degree of political fragmentation and, therefore, a lower degree of competition or higher degree of political strength.

$$\sum_{i=1}^{n} c_i^2 \Big/ \left(\sum_{i=1}^{n} c_i\right)^2$$

where c_i is the number of councillors of party i in the local government; and n is the number of parties in the local government.

Political sign (SIGN)

The study by Rattsø and Tovmo (2002) shows that liberal parties are more likely to increase spending, without raising income through taxes, as a result of their social policies; this positively contributes to the public deficit, which increases local debt. Guillamón et al. (2011) and Kiewiet and Szalaky (1996) find that conservative-run

councils have lower levels of debt. In contrast, authors such as Cabaleiro et al. (2014) note that ideology has a significant influence on debt level, confirming that councils governed by political parties with no clear ideological identity have lower debt levels. However, these authors are unable to confirm significant differences between conservative and liberal parties in terms of debt levels. For their part, Benito and Bastida (2004), Benito and Bastida (2005) and Pérez et al. (2013) conclude that political inclination does not have a significant influence on municipal debt level.

3. Model specification

Following the basic modelling strategy in the work of Elhorst (2010), we apply the ordinary least squares (OLS) model to test for spatial dependence. Standard econometric estimation methods are not suitable when spatial autocorrelation is present, due to bias and inconsistency in the estimates (Chasco, 2003 and Hall et al., 2016). This is due to the existence of endogeneity that characterises spatial models, which can be defined as linear models that represent spatial effects of dependency or spatial autocorrelation. When tests are applied to detect autocorrelation, namely Moran's I, Lagrange multiplier lag, Lagrange multiplier error and Lagrange multiplier SARMA, they are shown to be significant: that is, substantive and residual autocorrelation is observed. Table 2 reports the results of these tests. Both the LM (lag) test and the robust LM (lag) test show that spatial dependence is substantive and is adapted to the SAR model, as specified by Anselin (2005). The test performed on the residual model shows spatial dependence, but its robust version rejects this hypothesis. These results were confirmed by the robust SARMA test.

(Insert Table 2)

The non-normal distribution of the residuals precludes the application of the strategy to estimate the model with the maximum likelihood (ML) method, presented in the spatial literature by Elhorst (2010), LeSage and Pase (2009, 2014). We therefore use spatial lag and two-stage least-squares (2SLS) models as proposed in Bastida et al. (2012). To

estimate the spatial lag model, we include the spatially lagged dependent variable W_y as a further explanatory variable, in line with Chasco (2013). The spatial lag is included in the analysis in order to achieve the consistency that is not yielded by the OLS model and, at the same time, incorporate in the model the influence of the variables omitted in the OLS model. We take into account the presence of endogeneity in the model by constructing the spatial lag, since this functions in the same way as including the endogenous variable in the simultaneous equations framework, according to Chasco (2013). In accordance with the above, in the spatial literature this model is referred to as the simultaneous autoregressive spatial model.

We use the Anselin-Kelejian test to check the existence of spatial autocorrelation in the residuals. The results show no spatial autocorrelation in the error term. Therefore, the most suitable model, once again, is the mixed autoregressive model of spatial regression, known as the lag model, which is expressed as follows:

$$y = \rho W_y + X\beta + u \qquad (1)$$

where:

y: vector of observations of the dependent variable.

ρ: spatial autoregressive coefficient corresponding to the spatially lagged variable.

W_y: vector of spatial lags of the dependent variable (spatial lag of the variable y).

W: matrix of spatial weights.

X: matrix of observations of the independent variables.

β: vector of the independent variable parameters.

u: vector of random disturbances.

For our case we define the following model:

$$\log(DV_i) = \rho W_{\log(DV)} + \beta_1 IS_i + \beta_2 IAN_i + \beta_3 GK_i + \beta_4 PMP_i + \\ + \beta_5 PIB_i \beta_6 + DENS_i + \beta_7 POBNOA_i + \beta_8 GEN_i + \beta_9 IH_i + \beta_{10} SIG_i + u_i$$

(2)

As there is no theoretical model that specifies the most suitable matrix for each case, in the spatial autocorrelation test we used four types of weight funtions for spatial contiguity matrix: queen contiguity, *k*-nearest-neighbour, minimum distance and inverse distance. The results of the log likelihood ratio (LR) test led us to select the 5 nearest-neighbour matrix, which best adapted to the spatial model, in line with Elhorst (2010). The *k*- nearest-neighbour criterion considers the geometric distance between regions taking into account the k nearest neighbours of each observation. To construct the matrix selected, we used information on the centroids and identified the nearest centroid as the neighbour until the established number of neighbours is obtained, following Herrera (2015). This criterion ensures that all the municipalities have the same number of neighbours and also avoids the problem of isolation of neighbours or municipalities with too many neighbours. Having chosen the nearest neighbour criterion, the municipalities were represented with the binary technique that assigns values of $W_{ij} = 1$ when i and j are neighbours and $W_{ij} = 0$ otherwise. Econometric treatment of the data requires matrix standardisation by rows. The distances based on the spatial weight matrix are used to interpret the interactions of the neighbours, calculated with UTM coordinates (latitude and longitude). Euclidean distance was used to construct the matrix; that is, distance based on a straight line and not kilometres.

Kelejian and Prucha (1998, 1999, 2010), Arraiz et al. (2010) and Drukker et al. (2013), the most prominent scholars in the spatial literature, have developed the two-stage least-squares estimation technique with instrumental variables and the spatial lag model. In their work, Anselin (1988) and Bastida et al. (2012) propose using spatial two-stage least-squares (2SLS) by constructing an instrument fitted to the variable W_y. Kelejian and Robinson (1993) and Chasco (2003) argue that the spatially lagged exogenous variables are the appropriate instrumental variables for spatial analysis, which requires

the use of first-order contiguous matrices. For these reasons, we use the logarithm of the current debt as the instrumentalised variable, and the lagged independent variables are the instruments.

Finally, we analyse the existence of spatial effects in the dichotomous variables: budget stability compliance (BSC) or otherwise. Given the limited significance and absence of spatial autocorrelation of this variable, we noted that it was not significant in the model and removed it from the analysis.

4. Results

Table 2 presents the results of the LM tests, Moran's I and the SARMA test that initially identified the existence of spatial autocorrelation. The LM tests, developed by Anselin (1988), show that a priori the spatial lag model is the most suitable, as it is confirmed by the robust LM test (Anselin et al., 1996). Although in our case the LM test for the residuals is significant, the robust LM test rejects the spatial error model as the most suitable model. These results were confirmed by the Anselin-Kelejian test, the results of which show no spatial autocorrelation in the residuals. We therefore adopt the spatial lag model as the most suitable option for this study.

We also take into account the possible problem of endogeneity by following the instrumental variables (IV) or spatially lagged variables approach. Table 2 displays the main results. The effects of the spatial iteration of current municipal debt, represented by $\rho = 0.32$, are significant and positive. We can therefore confirm that if current debt rises in one municipality, its five nearest neighbours will also experience an increase in their debt levels. Our results are in line with the findings of Borck et al. (2015).

In addition, the interpretation of the results of the spatial models does not directly depend on the matrix units, since their interpretation is not based on the β coefficients, due to the feedback effects from the ρ coefficients, according to Hall et al. (2016). That is, if an explanatory variable in one municipality undergoes changes, these changes will affect the dependent variables in the other municipalities. We therefore obtained the

direct, indirect and total effects according to LeSage and Pace (2009) and Elhorst (2014 a, b). The direct effect reflects how a change in a variable in municipality *i* affects its current debt, and vice versa. The indirect effect represents the effect of the change in an independent variable in municipality *i* on the current debt of its neighbours *j* and vice versa (López et al., 2017).

Continuing with the analysis of Table 2, the variable index of grants and transfers received (GRANTS) presents a direct spatial effect; that is, an increase in the GRANTS in one municipality has a negative effect on its current debt, as confirmed by Benito et al. (2015a). However, this increase does not affect the current debt of neighbouring municipalities. Local governments' involvement in local taxation systems (personal income tax, VAT, property tax, etc.) and grants received from other government bodies to finance services, investment in assets and public works are alternative sources of funding to taking on debt.

Our results reveal that the coefficient of the variable net savings rate (NSR) is significant and negative, in line with Cabases et al. (2003). That is, if a municipality's net savings rate increases, its current debt will fall, and to a lesser extent, its neighbours' current debt will also decrease. Net savings represents local government sustainability in that if a municipality can meet its current expenses with its current income, it will not need to get into debt.

However, we find no significant results of spatial autocorrelation for per capita capital expenditure (CE) or population density (DENS), although when we analyse the linear model with OLS budget variables, these are statistically significant in line with the literature on local debt.

One of the main contributions of this study is the introduction of the variable average payment period to suppliers (APP) into the analysis. The results show that this variable is highly representative and significant for the reduction of local debt, although it does not affect the debt of neighbouring municipalities. To date, given that the payment period for local government suppliers has been introduced very recently, the only other

contribution we are aware of is the article by Pons (2017). This author studied APP as an indicator of commercial debt, and his findings point to significant variations of APP among the different local government groups analysed, highlighting the high levels of non-compliance with the payment limits established in current legislation, and municipalities' failure to report their information.

The variable per capita income (INCOME) is significant and has positive direct and indirect effects on accumulated debt. Municipalities with higher per capita income have higher levels of current debt, coinciding with studies by Guillamón et al. (2011), Kiewiety and Szalaky (1996), Escudero and Prior (2002), Cabases et al. (2003a, 2003b) and Pascual et al. (2008). In addition, higher income levels in one municipality positively affect its neighbours' debt levels. This is due to the demand from citizens for more public services in relation to the higher taxes they pay.

The retired people (RET), comprising people over the age of 65, has negative effects on local and neighbouring debt due to the indirect and direct effects of spatial spillover. Our results are in line with Borck et al. (2015), who include older citizens as a measure of the labour force. This stakeholder group can be analysed from the perspective that they do not pressurise municipalities to provide a greater number of services.

The variable gender of the mayor (GEN) presents positive spatial autocorrelation and direct effects, confirming that gender affects debt level. These results seem to suggest that when councils are managed by women, expenditure policies are different, and this can affect municipal debt levels.

Political strength (HI) shows negative spatial effects, both direct and indirect, on local debt. Our results coincide with those of Hagen and Vabo (2005) and Bastida et al. (2013). According to the literature, party political majorities enable local governments to resist pressure on debt from different stakeholder groups. This is because political decisions taken by majority governments on expenditure and investment budgets are not dependent on coalitions with other political parties.

Finally, the political ideology of the party, whether conservative or liberal, does not influence the evolution of local debt, since this variable (SIGN) has no significant effects at either local or neighbourhood level. Our results coincide with those of Benito and Bastida (2004), Benito and Bastida (2005) and Pérez et al. (2013) in that political ideology does not influence local debt level.

5. Concluding remaks

The aim of the present study was to analyse the spatial relationships in public debt among municipalities in the Valencian Community (Spain). Using spatial techniques, we observe the existence of spatial dependency of neighbouring councils for current debt. Specifically, the index of grants and transfers received, the average payment period, and the gender of the mayor have direct significant effects. However, the net savings rate, per capita income, population over the age of 65 and political strength present direct and indirect effects on municipal debt.

The empirical results show that the grants and transfers received (GRANTS) has effects at a local level; in other words, it only contributes to reducing local debt. Benito et al. (2015a), Benito and Bastida (2005), Pérez et al. (2013) and Balaguer (2002) find the same results. We find a similar pattern for the variable average payment period (APP). Pons (2017) concludes that a considerable proportion of municipalities do not comply with the legally established average payment period. Our study extends his analysis, confirming that this variable negatively affects debt level since compliance with APP is very relevant to public finance. In turn, the variable gender of the mayor (GEN) has positive effects on the level of current debt, since the social policies adopted by women mayors call for greater recourse to debt.

A higher net savings rate (NSR) has a negative influence on a municipality's accumulated debt, and in turn, reduces the debt of its neighbours. Our results are in line with those of Pérez et al. (2013), Benito and Bastida (2005), Cabases et al. (2003),

Balaguer (2002) and Brusca and Labrador (1998), studies that analyse this variable as a determinant of municipal debt, but without considering its potential spatial effects.

Guillamón et al. (2011), Kiewiety and Szalaky (1996), Escudero and Prior (2002), Cabases et al. (2003a, 2003b) and Pascual et al. (2008) find that municipalities with higher per capita income levels (INCOME) have a corresponding higher level of debt. The results of the present study are in the same line and extend their findings. Per capita income has direct and indirect effects; that is, it affects current municipal debt and at the same time, affects debt levels in neighbouring municipalities due to higher demands for the provision of public services.

Finally, we find that the variables population over the age of 65 (RET) and political strength (HI) have direct and indirect effects on debt; that is, they have negative effects on a municipality's local debt and that of its neighbours. In the same line, Hagen and Vabo (2005) find that stakeholder groups comprised of older citizens and political strength have negative effects on public finances in Norwegian municipalities.

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Table 1. Definition of the variables and descriptive statistics

	Variables	Definition of the variables	Expected sign	Sources	Mean	S.d
Budget variables	Grants and transfers (GRANTS)	Grants and transfers received / total population	+/-	Ministry of Finance and Public Administration	0.41	0.15
	Net savings rate (NSR)	Gross savings-amortization expenses/ current revenues (net recognized revenue)	-		0.10	0.17
	Capital expenditure (CE)	Capital expenditure / total population	+		300.85	455.37
	Average payment period (APP)	Dummy variable: 0: payment in excess of 30 days, 1: payment within 30 days	-		0.65	0.40
Socio-economic variables	Population density (DENS)	Number of inhabitants/total extension (in squared kilometres)	-	National Statistics Institute	541.98	20965.16
	Income (INCOME)	Disposable income per capita	+/-	Klein Institute	13666	1965.97
	Retired people (RET)	% Population 65 years and adove/total population	+/-	National Statistics Institute	0.24	0.08
Political variables	Gender of mayor (GEN)	Dummy variable: 0: male mayors, 1: female mayors	+/-	Spanish Government's Transparency Portal	0.19	0.40
	Herfindalh index (HI)	Values between 0 and 1 depending on the number of councillors for each party in the council. High values denote a lower level of political fragmentation or higher political strength	+/-	Ministry of the Presidency and for the Territorial Administrations	0.45	0.13
	Political sign (SIGN)	Dummy variable: 0: municipalities governed by left-wing parties, 1: municipalities governed by right-wing parties	+/-	Ministry of the Presidency and for the Territorial Administrations	0.68	0.47

Table 2. Determinants of debt. Spatial effects

	Models				Spatial effects		
Variables	2SLS		Spatial lag		Direct effects	Indirect effects	Total effect
GRANTS	-1.5647*	(0.9468)	-1.5694*	(0.8354)	-1.6014e+00*	-7.1154e-01	-2.3130e+00*
NSR	-3.0823***	(0.6249)	-3.0889***	(0.5791)	-3.1521e+00***	-1.4005e+00*	-4.5525e+00***
CE	-0.0003	(0.0002)	-0.0003	(0.0003)	-3.1425e -04	-1.3963e- 04	-4.5388e-04
APP	-1.6068***	(0.2572)	-1.6101***	(0.2436)	-1.6430e+00***	-7.3001e-01	-2.3730e+00***
INCOME	0.0000	(0.0000)	0.0000***	(0.0000)	6.1071e- 06***	2.7185e-06**	8.8255e-06***
DENS	-0.0000	(0.0001)	-0.0000	(0.0001)	-3.3600e- 05	-1.4929e-05	-4.8529e-05
RET	-5.0533***	(1.6823)	-4.9078***	(1.7132)	-5.0053e+00***	-2.2280e+00*	-7.2333e+00***
GEN	0.4083	(0.2609)	0.4005*	(0.2346)	4.0841e - 01*	1.8180e-01	5.9021e-01
HI	-4.1699***	(1.0236)	-4.1175***	(1.0504)	-4.2016e+00***	-1.8668e+00*	-6.0684e+00***
SIGN	0.2178	(0.2214)	0.2229	(0.2144)	2.2731e- 01	1.0118e-01	3.2849e-01
P	0.3028***	(0.1201)	0.3215***	(0.1207)			
CONSTANT	7.8154***	(0.9468)	7.6971***	(0.9501)			
Anselin-Kelejian Test	0.1577		0.1618				
R^2	0.3093		0.3122				
Moran's I (error)	2.6170***						
LM (lag)	8.9340***						
Robust LM (lag)	3.6460**						
LM (error)	5.6020***						
Robust LM (error)	0.3150						
LM (SARMA)	9.248***						

* p < 0.1 ** p < 0.05; ***p < 0.01
Standard error in parenthesis.