Determinants of local governments' re-election: new evidence based on a Bayesian approach*

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Abstract

This paper analyzes the effect of public spending on the probability of municipal re-election of Spanish local governments during the 2000–2007 period, using Bayesian techniques. The results indicate that, in general, increases in local government spending positively impact on the chances of re-election of local governments. Moreover, the capital expenditure over the whole term affects positively to the re-election probability, although the pre-electoral one is preferred, and the electorate rewards increases in current expenditures only in the period before elections. The use of Bayesian techniques is particularly interesting because, in contrast to most previous literature, results are not boiled down to a summary effect such as the average. On the contrary, our results show exactly how a given covariate affects the probability of being re-elected.

Keywords: Bayesian, election, local government, opportunistic policies

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

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1. Introduction

The existence of political budget cycles (PBC) has been largely analyzed by the literature, obtaining a general result pointing out that opportunistic pre-election manipulations on fiscal instruments do exist, with the clear objective to increase the likelihood of a government to be re-elected (Shi and Svensson, 2003). The result of this opportunism on reelection is not always desired by governments and policy-makers, and it is possible to find in the literature evidence on both of a reward or a penalty in constituencies' vote due to this behavior. For instance, according to Akhmedov and Zhuravskaya (2004), Veiga and Veiga (2007a), Sakurai and Menezes-Filho (2008) and Aidt et al. (2011), voters reward opportunistic fiscal actions. However, these behaviors are penalized according to other authors such as Peltzman (1992), Kraemer (1997), Brender (2003) and Brender and Drazen (2008). This literature is vast and still expanding, as shown by research on the *conditional* political budget cycle (Persson and Tabellini, 2003; Brender and Drazen, 2005; Shi and Svensson, 2006; Alt and Lassen, 2006), recently surveyed by de Haan and Klomp (2013), or how differently the PBC may operate under different types of suffrage (Aidt and Mooney, 2014).

In the particular case of Spanish local government, on which we focus, despite the importance of the topic, little empirical evidence can be found addressing the specific issue as to which factors affect the probability of re-election. Whereas previous literature has analyzed the impact of budgetary variables and socio-economic policies on the probability of re-election in other countries, in the Spanish case the evidence is scarce. However, this context is particularly relevant for a number of reasons, two of which are worth mentioning. First, although decentralization stopped at the regional level (*Comunidades Autónomas*), and the number and importance of powers in hands of local governments is far less important than those in hands of regions, their degree of autonomy in terms of budget planning is remarkable (García Sánchez et al., 2011), implying a high degree of flexibility when it comes to implement it (De Haan et al., 1999). Second, the analysis of PBC in Spain has been mainly focused on their existence and composition, but their effect on political re-election remains almost unexplored (Vila i Vila, 2010; Sánchez Mier, 2011; Vicente et al., 2013).

The main objective of this study is to explore the impact of public spending on the probability of local governments' re-election for a large sample of Spanish municipalities. Specifically, we study the effect of total expenditure, and current and capital expenditure, over the whole term, and the expenditure divided by periods, establishing a distinction between the

expenditure in the first years of each electoral cycle and the expenditure corresponding to the pre-electoral period. In addition, we also analyze the effect of other budgetary, political and socioeconomic variables.

As opposed to previous approaches in this literature, most of which were frequentist, we consider Bayesian (inference) methodologies. Bayesian inference allows for a pure mathematical interpretation of the problem (in terms of probability) combining likelihood and prior believes (if any) through the Bayes theorem. In this sense, from a Bayesian point of view, there is no longer a need for *ad hoc* tests such as heterogeneity or normality tests, making the analysis simpler. Using Markov Chain Monte Carlo (MCMC) methods we obtain posterior distributions for the parameters in the analysis which contains much more information that a simple estimation of their values. However, despite their advantages, Bayesian methods have barely been used in the specific context of political budget cycles, and their consideration may shed some light on the links between several covariates considered in the literature and the probability of a given local government to be re-elected.

Our results can be analyzed from a variety of perspectives. They show that, in general, citizens reward local governments for increases in total spending during the entire electoral cycle. More specifically, current expenditure in the pre-electoral period affects positively the possibilities of re-election—probably due to the immediate visibility of these expenditures. On the revenue side, we find a positive relationship between taxes and grants and the probability of mayors' re-election—probably due to the increase in the availability of resources for the local government which could be used to finance the expenditures. On the contrary, we also find that citizens penalize high levels of debt. Regarding the political variables, we find that right-wing parties have more possibilities of being re-elected, probably for the conservatism which makes it difficult to change between parties, even within the same political wing. Results also show the persistence of vote in the period analyzed. The ideological alignment between local and central government affects negatively to mayors, a result that could be explained because people tend to avoid the concentration of power in a single party, or to show the dissatisfaction with national government. As for the socio-economic variables, we find a positive relationship between unemployment and re-election. Although the opposite relationship was expected, this could be explained because citizens could not consider local governments as the main responsible for this economic outcome.

The paper is divided into six sections. After this first introduction, Section 2 involves a literature review of previous studies on the effect of opportunism on the re-election of gov-

ernments and changes in pre-election composition of public spending. Section 3 describes the sample and variables used as possible determinants of re-election. In Section 4 we present the model and methodology used in the empirical analysis. Finally, Section 5 describes the main results obtained in the paper, whereas Section 6 is devoted to outline some of the conclusions drawn from the study.

2. Political business cycle and the determinants of local governments' re-election: theory

Numerous studies (Block, 2002; Galli and Rossi, 2002; González, 2002; Khemani, 2004; Efthyvoulou, 2012; Foremny and Riedel, 2012; Klomp and De Haan, 2013) have found evidence of a cyclical pattern in public revenue or expenditure that follows the electoral cycle. In their bid for re-election, incumbent governments may reduce taxes or increase public expenditure in the run-up to elections—frequently causing an increase in the budget deficit—in an attempt to gain favour with the electorate and thus secure their votes in the ballot box.

In more comprehensive analyses of political budget cycles, some studies have analyzed the effect of opportunistic behavior on the re-election possibilities of incumbent governments, finding evidence of both penalization and reward effects in the polls. Studies by Peltzman (1992), Kraemer (1997), Meloni (2001), Brender (2003) and Brender and Drazen (2008) reveal that opportunistic behaviors are penalized by the electorate. Specifically, Peltzman (1992) found that the US electorate penalizes governments that increased public expenditure in the run-up to elections, whereas Kraemer (1997), for a set of Latin American and Caribbean countries, found that pre-election deficits do not benefit the incumbent parties. Brender (2003) obtained similar results for the case of local elections in Israel, where a larger deficit in the year prior to elections reduces the probability of the incumbent party's re-election. In a similar vein, Brender and Drazen (2008) observed that in the more developed countries and advanced democracies, governments in a situation of deficit and that introduce tax cuts in an election year have lower chances of re-election. Meloni's (2001) analysis of Argentine electoral districts shed additional evidence on this regard, revealing that an increase in public expenditure negatively affects the percentage of votes obtained by the governing party.

However, other predominant studies in the literature have found opposite effects, namely, that the electorate actually rewards opportunistic behavior. Akhmedov and Zhuravskaya (2004) in the case of regional elections in Russia, or Veiga and Veiga (2007a) and Aidt et al.

(2011) for Portuguese municipalities, found that an increase in public expenditure prior to elections increases the probability of governments being re-elected. Sakurai and Menezes-Filho (2008) observed that higher expenditure throughout the legislature increases the probability of re-election for Brazilian local governments. In the case of Colombian town councils, Eslava (2005) concluded that although pre-election deficits are penalized in the polls, increased capital expenditure leads to an increase in the percentage of votes for the incumbent party. Similar results were obtained by Jones et al. (2012), who analyzed the effect of public expenditure in the case of the Argentine provinces, finding that the electorate rewards increases in public expenditure at the polls. Specifically, higher expenditure throughout the entire term was rewarded, while no extra gains result from expenditure increases in the election period. In the case of Brazilian municipalities, Litschig and Morrison (2012) analyzed the effect of additional expenditure on the probability of re-election of incumbent parties, finding that a 20% rise in per capita expenditure throughout the whole electoral cycle led to a 10% increase in the probability of re-election of the local incumbent party. Some studies have broadened the analysis, extending the sample to several countries. It is the case of Mourão and Veiga (2010) who, for a sample of 68 countries, found that opportunistic behavior in public expenditure during election periods has a positive effect on votes for the ruling party.

Although governments' opportunistic behaviors are generally reflected in pre-election expenditure increases and tax cuts, often causing a situation of fiscal deficit, governments can opt to change the composition of expenditure without having to raise total expenditure or increase the overall budget deficit (Vergne, 2009), known as the composition effect. Local governments can thereby increase expenditure on more visible budget components or those favored by the electorate, while offsetting through reductions in other budget items, with the clear aim of increasing their popularity and the probability of re-election.

In this regard, the literature reports mixed results as to the expenditure components that are manipulated prior to elections. Immediate visibility is usually the main explanation in studies that find increases in current expenditure in the run-up to elections. For instance, Vergne's (2009) results indicate a pre-election shift towards more visible current expenditure budget items, along with a decrease in capital expenditure. Similar results are obtained by Sakurai and Menezes-Filho (2011) for the case of Brazilian municipalities, or Katsimi and Sarantides (2012) for a group of OECD countries, where pre-election expenditure increases correspond to current expenditure, while public investments fall. An opposite finding is reported by Schuknecht (2000), Binet and Pentecôte (2004) and Khemani (2004), who find pre-election

increases in capital expenditure, partly due to the ease with which they can be addressed directly to groups of citizens and specific places.

Other studies that can be classified within this specific category focusing on the expenditure components that can be manipulated are those by Veiga and Veiga (2007b), who reported an increase in capital expenditure in election year, or Drazen and Eslava (2010), who demonstrated that infrastructure expenditure increases before municipal elections in Colombia, or Sedmihradská et al. (2011), who observed an increase in capital expenditure in pre-election years.

This diversity of findings may be the result of the circumstances, or context, specific to each analysis. As Aidt and Mooney (2014) referred, the context is essential for the capacity of incumbent governments to manage spending in order to have benefit in the electoral results. In this regard, as indicated by Block (2002), "political business cycle (PBC), theory, since the seminal papers of Nordhaus (1975), Lindbeck (1976), and Tufte (1978), has been debated by economists and political scientists almost exclusively in the context of industrialized democracies." Although, as it is apparent through the citations in this section, several studies exist focusing in South American countries, many of which can still be regarded as developing, in other contexts such as Africa the evidence is much scarcer, with few exceptions (Block, 2002).

In the specific case of the literature analyzing the determinants of local governments' re-election, the number of contexts on which the empirical evidence is almost entirely yet to come is higher, including several developed countries. This is the case of the particular setting of our study—i.e., Spanish local governments. In this context some studies have centered the analysis of specific groups of municipalities (from a given region). For instance, Lago-Peñas and Lago-Peñas (2008) have observed deficit increases in election years for a number of municipalities in Asturias, whereas Vila i Vila (2010) finds that capital expenditure rises in pre-election and election years for the municipalities of the Valencian Community. Considering municipalities from several regions, Benito et al. (2010) has observed a tax decrease in the electoral year and, for the case of the largest Spanish municipalities, Vicente et al. (2013) identifies increases in total expenditure during election years—yet only for the least transparent municipalities. None of these contributions, however, deals *explicitly* with the determinants of re-election.

3. Data, variables and data sources

The empirical analysis in the present research focused on Spanish municipalities with a population of over 1,000 inhabitants that reported information for the period 2000–2007, during which two local elections were held (in 2003 and 2007). The sample comprises 2,188 municipalities.

The data used were taken from several sources. The election results were provided by the Ministry of the Interior. Budget balances came from the Ministry of Finance and Public Administration. And socio-economic variables were taken from La Caixa Economic Yearbook and the National Institute of Statistics.

The variable this study aims to explain is the probability of re-election of the incumbent party in local governments based on a series of budgetary, political and socio-economic variables. To define this variable, the party of the incumbent mayor in each municipality following the municipal elections of 1999 and 2003 was compared with the party that obtained the most votes in the 2003 and 2007 elections, respectively.[1]

Once the dependent variable (*reel*) has been defined, we explain the variables analysed as determinants of local governments re-election, classified into four groups: expenditure, revenue, political and socio-economic. The definition of variables is presented in Table 1, whereas the summary statistics are reported in Table 2.

3.1. Expenditure variables

Total public expenditure (*totalex*): One of the main objectives of this paper is to study the effect of total public expenditure on the probability of re-election of the incumbent party. Although some studies report penalisation for increases in public expenditure or fiscal deficit (Peltzman, 1992; Brender and Drazen, 2008), the general pattern shows that voters reward increased public expenditure, either during the entire election cycle or in the run-up to the election, at national, regional and local levels (Akhmedov and Zhuravskaya, 2004; Veiga and Veiga, 2007a; Sakurai and Menezes-Filho, 2008; Mourão and Veiga, 2010; Aidt et al., 2011; Jones et al., 2012; Litschig and Morrison, 2012).

Therefore, in line with the literature, we expect a positive effect showing a reward for

[1]The party with the highest percentage of votes was selected, rather than the party that eventually governed, because in some cases the incumbent party governed in coalition with other political groups, and a party with a small percentage of the votes could actually hold the office of mayor. This was considered to be the best option, since it is the variable on which the electorate have the power to decide.

increases made by the local government during its term in office.

Current and capital expenditure (*currex* and *capex*): The literature on PBC has attempted to determine which expenditure components increase most in pre-election periods. Following the economic classification for expenditure budgets, we distinguished between current and capital expenditure.

Studies by Vergne (2009), Sakurai and Menezes-Filho (2011) and Katsimi and Sarantides (2012) found an increase in current expenditure before elections, accompanied by a fall in public investment. In contrast, pre-election increases in capital expenditure together with a decrease in current expenditure have been reported by authors such as Drazen and Eslava (2010) or Sedmihradská et al. (2011).

Hence, we aim to analyse whether the expenditure component has different effects on citizens' levels of satisfaction and, therefore, on re-election; in other words, whether the electorate evaluates increases in certain areas of public expenditure differently from others.

Furthermore, we also include both components of expenditure divided by periods in order to analyze if the impact on re-election changes depending on the moment when the spending is made. Therefore we distinguish between expenditure in the first years of each electoral cycle and the farthest to the electoral moment ($currex1per$ and $capex1per$) and the expenditure in the pre-electoral period ($currex2per$ and $capex2per$). For instance, Sakurai and Menezes-Filho (2008) observed that higher capital expenditures in the three years previous to an election and rises in current spending in the election year, growth the probability of re-election of Brazilian mayors. Results by the study of Eslava (2005), show that pre-electoral increases in capital expenditure, benefit the incumbent party. Or Veiga and Veiga (2007a) found a positive relationship between the percentage of vote for the incumbent local government and increases in investment expenditures in election years.

3.2. Revenue variables

Although the main variable to be analysed as a determinant of re-election probability is public expenditure, we also examine another set of budgetary variables that the literature has identified as determinants of incumbent party re-election.

The budgetary variables, related to public revenues, are tax revenues per capita (*tax*), transfer revenues per capita (*grants*) and debt per capita (*debt*). Tax revenues are the total of direct and indirect taxes, while the transfer revenues variable includes the sum of the current and capital transfers received for each of the years in the cycles analysed. The final budgetary variable included in the analysis is the level of debt generated by each municipality, expressed in per capita terms, corresponding to financial liabilities generated in each of the years analysed.

These variables are used to analyse the impact of public revenues on the probability of re-election.

Tax revenues (*tax*): Studies by Khemani (2004), Veiga and Veiga (2007b), Dahlberg and Mörk (2011) and Foremny and Riedel (2012), amongst others, have shown that local governments reduce taxes before elections with the clear objective of gaining favour with the electorate and securing their votes at the polls.

The literature reports mixed results on the impact of local taxes on voting patterns. These results may be classified into three groups: studies that find penalisation for tax increases (Revelli, 2002; Bosch and Solé-Ollé, 2007; Dubois and Paty, 2010); studies that find a positive relation between taxes and votes (Sakurai and Menezes-Filho, 2008; Arvate et al., 2010); and cases in which the relation between local taxes and the percentage of votes is small or insignificant (Boyne et al., 2009; Balaguer and Brun, 2013).

Thus, by introducing the tax revenues variable, we explore the relation between tax revenue and local government re-election for the study sample during the analysed period.

Grants (*grants*): The probability of the incumbent party's re-election may be positively affected by the level of public revenues, as a balanced budget implies that the budget expenditures are financed by budget revenues.

Several studies have found a positive relation between the level of transfers and public expenditure. Veiga and Veiga (2007b), Sedmihradská et al. (2011) and Litschig and Morrison (2012) reported that the transfers a municipality receives positively affect the level of local public expenditure.

Therefore, if the expected effect of public expenditure on re-election holds, an increase in the level of transfer revenues could become a positive determinant of re-election. Solé-Ollé and Sorribas-Navarro (2008) showed, for a sample of Spanish municipalities during the period 1993–2003, that transfer revenues positively affects the election results of the

local governing party. Veiga and Veiga (2013) results indicated that an increase in the transfer revenues that municipalities receive from central government in election years improves its results in the legislative elections.

Debt (*debt*): The introduction of the variable debt, reflecting the financial liabilities generated in the years analysed, allows us to verify whether the electorate punishes high levels of local debt or whether, on the contrary, it supports certain levels of debt that may derive from higher municipal expenditure.

Brender (2003) examined the effect of fiscal performance on local government election results in Israeli municipalities, finding that the greater the volume of debt generated by the local government, the lower its chances of re-election. Cassette and Farvaque (2013) studied the impact of debt accumulation on the re-election possibilities of French local governments. Their results indicate that the accumulation of debt during the whole term adversely affects their re-election, but in contrast, pre-election debt accumulation favours the election results of the incumbents.

3.3. Political variables

Ideology (*ideol*): Turning to political variables, a large number of studies included a variable that classifies parties according to their political ideology in order to study its effect on the probability of re-election, PBC or opportunism by incumbents governments.

Our study includes the variable of the ideology of the incumbent party in the electoral moment. With this variable we could study the incidence of the ideology in the probability of local governments to be reelected.

To define the ideology variable, we distinguished between right-wing parties and left-wing parties (Kneebone and McKenzie, 2001; Galli and Rossi, 2002; Veiga and Veiga, 2007b; Vila i Vila, 2010; Aidt et al., 2011). The former are characteristically more conservative, while the latter typically follow the progressive ideological objectives of the left. This variable takes the value 1 when the incumbent party in a given municipality can be associated with right-wing ideology, and 0 when it is associated with a leftist party. This left-right classification is the most commonly used in the literature.

Alignment (*align*): The next political variable included as a possible determinant of re-election is the ideological alignment of the local government in each municipality with the central

government (Sakurai and Menezes-Filho, 2008, 2011; Aidt et al., 2011).

Political alignment can have advantages for municipalities governed by parties of the same ideology as those in higher levels of government. In the case of Argentina, for example, presidents favour the provinces governed by members of their own party in the geographical distribution of the national budget (Bercoff and Meloni, 2009).

Moreover, when the mayor's political ideology coincides with that of the president of the government, his or her chances of remaining in power may be influenced by issues other than purely budgetary questions (Sakurai and Menezes-Filho, 2008). According to Boyne et al. (2009), the electorate's opinion of the central government can have a significant effect on support for municipal governments.

Sakurai and Menezes-Filho (2008) reported a negative relation between the mayor's political alignment with the president and the possibilities of the local incumbent's re-election, based on Brazilian voters' penalisation of the national government due to a succession of economic crises during the period analysed. The negative relation between political alignment and the win-margin obtained by Portuguese mayors, revealed by Aidt et al. (2011), is explained as one way in which the electorate can prevent a concentration of power in the same party at both national and local level, or as a way of showing dissatisfaction with the national government. Cassette and Farvaque (2013) also find a negative relation between ideological alignment and the probability of re-election.

Coalition (*coal*): The final political variable included in the analysis refers to the support obtained by the incumbent party in the previous polls. A large number of studies have included a variable measuring the past support of the incumbent governments with the aim of studying the persistence of political support and the possible existence of inertia in the polls, since some of the electorate usually votes in the same way from one election to another. The generalised result in the literature indicates that parties with better results in an election, will continue to have more support in the next election (Brender, 2003; Bosch and Solé-Ollé, 2007; Veiga and Veiga, 2007a; Drazen and Eslava, 2010; Dubois and Paty, 2010; Aidt et al., 2011; Cassette et al., 2013).

In order to study how affects the electoral results in the past to the present election and the existence of this persistence in voting behaviour and political support, we include a dummy variable which indicates if the incumbent party governed as part of a coalition with other political groups due to it did not obtain the enough votes to govern alone or,

on the contrary, won an absolute majority. The effect of this variable is expected to be negative, indicating that parties governing in coalition and, therefore, not elected by an absolute majority, are less likely to be re-elected than those who governed as a result of broad support from the electorate.

3.4. Socio-economic variables

Unemployment rate (*unemp*): The purpose of introducing the municipal unemployment rate into the analysis of the determinants of re-election is to explore the effect of the municipality's economic situation on the re-election chances of their governments, in line with the literature on "economic voting". According to what is known as the responsibility hypothesis, the electorate considers the government to be responsible for economic performance (Lewis-Beck and Paldam, 2000; Paldam, 2004).

The literature reports mixed results on the effect of employment outcomes in the elections at different levels of government. At the central level, the generalised result points to a penalisation to the government for increases in the unemployment rate (Cerda and Vergara, 2007, 2008; Veiga and Veiga, 2004a,b; Mourão and Veiga, 2010). However, at the local level, although there is evidence of such penalty (Martinussen, 2004), a large number of studies find a weak or insignificant relationship between local unemployment and support for local governments, including research by Veiga and Veiga (2007a), Boyne et al. (2009) and Aidt et al. (2011).

Population (log(*pop*)): Studies analysing the re-election possibilities or election results of governments usually include demographic variables to identify patterns of behaviour.

Hence, following in the line of similar research (Sakurai and Menezes-Filho, 2008; Arvate et al., 2010; Veiga and Veiga, 2013), we use population size as a control variable to allow us to observe the relation between the size of a municipality and governments' re-election possibilities.

Furthermore, the literature finds that municipality population size significantly affects level of public expenditure, taxation or debt (Ashworth et al., 2005; Veiga and Veiga, 2007b; Sakurai and Menezes-Filho, 2011).

4. Methods and models

The main goal of this paper is to model the probability of a local government of being re-elected. For this purpose we use multivariate regression models (McCulloch and Searle, 2001) from a Bayesian point of view. In particular, our response variable *reel* is a dummy variable with 1 value if the re-election has happened and 0 otherwise, therefore a logistic regression was used to analyze the effect of the covariates in the re-election process. These type of models also allow for an easy introduction of a municipality effect. In particular we introduce an independent random effect intending to assume any unknown information of the specific municipality .

We consider that each outcome $reel_{ij}$ for municipality i with $i = 1, \ldots, 2188$ at year j with $j = 2003, 2007$, follows a Bernoulli distribution with probability is:

$$\text{logit}(p_{ij}) = \boldsymbol{X}_1\boldsymbol{\beta} + \boldsymbol{X}_2\boldsymbol{\alpha} + b_i \tag{1}$$

where b_i is a random effect for each municipality with $b_i \sim \text{N}(0, \sigma)$ for $i = 1, \ldots, 2188$ and $\boldsymbol{X}_1$ is a fixed design matrix including intercept:

$$\begin{aligned} \boldsymbol{X}_1\boldsymbol{\beta} &= \beta_0 + \beta_1\, tax_{ij} + \beta_2\, grants_{ij} + \beta_3\, debt_{ij} + \beta_4\, unemp_{ij} + \beta_5 \log(pop)_{ij} \\ &+ \beta_6\, ideol_{ij} + \beta_7\, align_{ij} + \beta_8\, coal_{ij} \end{aligned} \tag{2}$$

The remaining part of the desing matrix, $\boldsymbol{X}_2$, considers variables related to the expenditure. Depending on how these covariates are decomposed we consider three different models:

Model 1: total expenditures for each period of four years is considered as a single covariate, $\boldsymbol{X}_2\boldsymbol{\alpha} = \alpha\, totalex_{ij}$.

Model 2: total expenditure in each four year period is divided in current and capita expenditures, $\boldsymbol{X}_2\boldsymbol{\alpha} = \alpha_1\, currex_{ij} + \alpha_2\, capex_{ij}$.

Model 3: Both, current and capital expenditures for each term of office is divided in two periods, $\boldsymbol{X}_2\boldsymbol{\alpha} = \alpha_1\, currex1per_{ij} + \alpha_2\, currex2per_{ij} + \alpha_3\, capex1per_{ij} + \alpha_4\, capex2per_{ij}$.

As mentioned in the introduction, using a Bayesian point of view allow us to obtain much richer results in terms of a posterior distribution for each of the unknown parameters avoiding for the ad hoc test of classical methodology. In this work we use Markov Chain Monte Carlo

(MCMC) methods (Green, 2001) via the WinBUGS software (Lunn et al., 2000), to simulate posterior distributions of all the final model parameters.

But, for adopting a Bayesian approach we need to establish prior distributions for the parameters in the model. In particular, we use uninformative prior distributions for all the values in the parametric space. Using non informative priors allow us for an objective Bayesian analysis when there is not clear prior believes. In particular we use here normal priors with large variance for the regression parameters and an uniform prior with support (0,3) for the variance of the municipality random effect.

5. Results

Table 3 show deviance information criterion (DIC) for the three models considered. DIC is a Bayesian measure which weighs up the goodness-of-fit and complexity of the estimated models (Spiegelhalter et al., 2002) (the smaller the DIC, the better the fit). Using this criterion the best model among the compared is model 3. Anyway, the results for the three models are shown because we think that understanding the efect of all the expenditure measurements is particularly interesting.

Results are shown in Tables 4, 5 and 6 for the posterior distributions of models 1, 2 and 3. The continuous counterpart to these tables is partly reported in Figures 1 and 2.

If we first consider the results concerning municipal spending (*totalex*), we should highlight the generally positive effect on the probability of re-election of local governments. This result confirms the widespread effect existing in the literature on support for the ruling party. Thus, in line with other local studies (Veiga and Veiga, 2007a; Sakurai and Menezes-Filho, 2008; Aidt et al., 2011; Litschig and Morrison, 2012) demonstrates the reward for increases in total spending over the whole term. This effect is shown by the positive sign for the mean of the *totalex* variable in Table 4. The graphical counterpart to this result, displayed in Figure 1a, provides strong support for this finding, since most of the probability mass lies beyond 0—i.e. this indicates a strong posterior probability for the effect being positive. This is a relevant results since, in previous literature, the focus is generally placed on the *average* effect, whereas we provide here much more compelling evidence.

When distinguishing the expenditures between current spending (*currex*) and capital spending (*capex*) we notice that voters have a preference for the latter (investment spending), compared with the former. This is shown in Table 5, whose mean value for *currex* is negative

(-0.00055), whereas that for *capex* is positive (0.00129). Therefore, on average, the probability of re-election of local governments increases when rises in capital expenditures are observed. The densities in Figure 1b strongly support this finding; in the case of current expenditures (*currex*), the probability mass is almost entirely concentrated below zero; in the case of the capital expenditures (*capex*) is not only that the effect is positive but also that all the probability mass is entirely concentrated above 0.

If we distinguish by periods, we observe that the capital expenditure in both periods affects positively the probability of re-elecction. These effects are shown by the positive signs for the mean values for *capex*1*per* (0.00014) and *capex*2*per* (0.00116) in Table 6. But in a more detailed way, if we observe the corresponding figures (Figure 1c), we perceive that pre-electoral capital spending affects more significantly the probability of re-election, since the probability mass is entirely concentrated above 0.

With regard to current expenditure (*currex*1*per* and *currex*2*per*), results also show that the electorate rewards current pre-election spending increases, probably due to their immediate visibility. On the contrary, the expenditure in the first period of each term (the farthest to the election) could be seen as overspending since it does not have a positive effect on re-election. This evidence is shown in Table 6, in which it is shown that the mean effect for *currex*1*per* is, on average, negative (-0.00234), whereas that of *currex*2*per* is positive (0.00184). The graphical counterpart, shown in Figure 1c, indicates that the probability of having a negative effect of the current expenditures in the first period (*currex*1*per*) is virtually 100%, since the probability mass is almost entirely concentrated below zero; in contrast, the opposite holds for *currex*2*per*, for which the posterior density mass is almost entirely concentrated above 0.

Regarding the variables related to budget revenues, taxes (*tax*) and transfers received (*grants*) have little relevance on the probability of re-election. On the other hand, the level of indebtedness (*debt*) has a quite clear negative effect. This is shown both on the tables corresponding to the results for the three models (Tables 4, 5 and 6) as well as the corresponding figures (Figures 2.a, 2.b and 2.c).

Despite its little relevance the variable related to income taxes (*tax*) has a positive mean effect (0.00011, 0.00041, 0.00030 for model 1, 2 and 3 respectively) which is consistent with the studies by Sakurai and Menezes-Filho (2008) and Arvate et al. (2010). According to Boyne et al. (2009), the fact that the local government is not penalized might be due to the fact that voters do not perceive local rulers as the primary responsibles. In addition, if public local management is good enough, a certain level of taxing may be accepted. Furthermore, we

analyze a period prior to the start of the current economic crisis and, therefore, the effect of this variable could change substantially if we analysed posterior election cycles. Still it is important to keep in mind that the literature has demonstrated that taxes are not usually a key factor in local elections (Gibson, 1988).

In the case of *grants*, the sign of the effect depends on the model considered. In this case, the level of transfers received is greatly influenced by how we consider the expenditures' variable, i.e only when considering total expenditures (Model 1) we obtain that the effect of transfers received on the probability of re-election is positive; even though, there is a non-negligible amount of probability mass lying below zero (see Figure 2.b).

The last variable in the budget group, the level of municipal debt (*debt*), shows a negative impact on local government election which is robust across the different models. This is quite apparent in Tables 4, 5 and 6, where the mean impact is -0.00098, -0.00147 and -0.00142, respectively. These results agree with those obtained by Brender (2003) or Cassette and Farvaque (2013), demonstrating in this way that the electorate penalizes high debt levels throughout the term of office. Figure 2.c is particularly illustrative regarding the effect of this variable, since the posterior probability mass is almost entirely on the l.h.s. [2] of the OY axis.

Political variables included in the study are the ideology (*ideol*), the ideological alignment (*align*) of local government with the incumbent party at the central government, and the fact of governing in coalition (*coal*). Regarding the first variable (*ideol*), we observed that the probability of right-wing parties to be re-elected is higher. This is shown by the positive sign for the mean of *ideol* in Table 4 (0.31893), 5 (0.34006) and 6 (0.37021). The corresponding density (see Figure 2.f) is particularly illustrative, since posterior probability mass is entirely concentrated on the r.h.s[3]. of the OY axis. The explanation may be due to the essence of the right-wing ideology, characterized by a more conservative electorate and marked by a greater loyalty to the party, away from certain proposals for change even within the same branch of ideology, compared with the more progressive ideas of leftist parties, which may result in changes in voting among other parties with similar ideologies.

The alignment with the central government (*align*) shows a negative relationship with the probability of re-election of local governments. Similar results are obtained in the studies by Aidt et al. (2011), Cassette and Farvaque (2013) and Sakurai and Menezes-Filho (2008). This negative relationship could be explained, as pointed out by Aidt et al. (2011), as a way for

[2] left hand side. i.e. below 0

[3] right hand side i.e. above 0

the electorate to avoid a concentration of power in a single party in the national and local levels, or as a way of showing dissatisfaction with the national government. This negative effect is reported for the three models (-0.12785, -0.13557 and -0.16043 for Tables 4, 5 and 6, respectively). Again, it is particularly evident via the posterior densities; in particular, in Figure 2.g most of the probability mass is below zero.

The variable coalition (*coal*) has a negative effect, indicating that mayors who ruled through a coalition with other political forces, because they did not obtain enough votes to govern alone, are less likely to be re-elected. This result reinforces the idea that parties with better results in elections, will continue to have more support in the next election, in line with the contributions of Brender (2003), Veiga and Veiga (2007a), Dubois and Paty (2010), Drazen and Eslava (2010) or Aidt et al. (2011) and demonstrating the existence of such persistence in the vote. This result is quite strong as shown not only by the negative signs for the mean in Tables 4, 5 and 6 (-1.45182, -1.43951 and -1.42261) but also by the probability mass entirely concentrated on the l.h.s. of the OY axis in Figure 2.h.

As socio-economic variables we have studied the effect of the level of unemployment ($unemp$) and the size of the population ($\log(pop)$) on the probability of re-election of the incumbent party.

In most studies that have analysed the influence of local unemployment on the probability of re-election it has obtained either a limited or insignificant effect. This accords with our results where the effect of unemployment, while positive, is quite reduced. In fact, although the mean effect, as shown in Tables 4, 5 and 6 is positive throughout (0.00021, 0.01895 and 0.02006 for models 1, 2 and 3), the corresponding density (Figure 2.d) shows these are only *mean* effects, but the probability of a negative effect is high, especially for model 1—as shown by the density depicted with a solid line in Figure 2.d.

Finally, the variable population ($\log(pop)$) shows a positive relationship with the probability of re-election of local governments. This result suggests that small municipalities are more critical of government actions that large municipalities. In this case, as indicated in Tables 4, 5 and 6 the effect is positive throughout (mean effects of 0.20164, 0.25925 and 0.25775, respectively). The density corresponding to Figure 2.e strongly corroborates this finding, since the posterior probability mass is entirely concentrated above 0.

6. Concluding remarks

In this study we have analyzed the effect of the level of public spending on the probability of re-election of Spanish municipalities in the municipal elections of 2003 and 2007. We have also analyzed the effect that other budgetary, political and socioeconomic variables may have on the probability of re-election. On the methodological side, the article employed Bayesian techniques to conduct the analysis, instead of the most extended frequentist approaches one may find in the literature. These methods have been particularly interesting, since results indicated not only how a given covariate might affect *on average* the probability of being re-elected. Complementarily, we obtain information on the entire *a posteriori* distributions, i.e. we may ascertain which is the exact probability of a given covariate to have either a positive or negative impact on the dependent variable.

Results show that an increased municipal spending throughout the term in office benefits local governments. In a more concise analysis of the effect of public spending, in which we distinguish between current expenditure and capital expenditure, we find that constituencies tend to reward pre-election increases in the budget categories corresponding to current spending, probably due to its immediate visibility. Otherwise, increases in capital expenditure over the whole term benefit local governments, although the positive effect for the pre-electoral spending is larger than the expenditure made during the first period of each term.

On the revenue budget side, results show that the level of municipal debt has a quite clear negative effect on the probability of re-election. The citizens penalize high levels of municipal debt, as Brender (2003) and Cassette et al. (2013) find. Regarding the analysis of political variables, we find that right-wing parties have more possibilities of being re-elected, probably due to conservatism, which makes it difficult to swing between parties—even within the same political wing. The results also show the persistence of vote in the period analyzed, similar as Brender (2003) and Veiga and Veiga (2007a). The ideological alignment between local and central government affects negatively to mayors. This could be explained because people tend to avoid the concentration of power in a single party or to show the dissatisfaction with national government. Similar results were obtained in Aidt et al. (2011) and Cassette et al. (2013).

As for the socio-economic variables, we find a slightly positive relationship between unemployment and re-election. Although the opposite relationship was expected, this could be explained because citizens could not consider local governments as the main responsible for

this economic issue. Finally, the probability of re-election is higher for the largest municipalities. This result suggests that small municipalities are more critical of government actions that large municipalities.

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Table 1: Definition of variables

Variables		Variable name	Definition
Budget variables	Expenditures	*totalex*	Average total expenditure per capita
		currex	Average total current expenditure[a] per capita
		*currex*1*per*	Average current expenditure[a] per capita in the first period
		*currex*2*per*	Average current expenditure[a] per capita in the second period
		capex	Average total capital expenditure[b] per capita
		*capex*1*per*	Average capital expenditure[b] per capita in the first period
		*capex*2*per*	Average capital expenditure[b] per capita in the second period
	Revenues	*tax*	Average tax revenues per capita
		grants	Average transfer revenues per capita
		debt	Average debt per capita
Political variables		*ideol*	Political ideology of the local government (1: right-wing party; 0: left-wing party)
		align	Ideological alignment of local government with central government (1: the ideology of the local government coincides with that of the central government; 0: otherwise)
		coal	Coalition in the local government (1: the local government is formed by coalition; 0: otherwise)
Socioeconomic variables		*unemp*	Average municipal unemployment rate
		$\log(pop)$	Average of the logarithm of the municipal population

[a] Current expenditure is the sum of these budget items: personal expenditures, current goods and services expenditures, financial expenditures and current transfers.
[b] Capital expenditure is the sum of these budget items: investments and capital transfers.

Table 2: Covariates (budget and socioeconomic variables), summary statistics

	Budget variables										Socioeconomic variables	
	Expenditures							Revenues				
	totalex	*currex*	*capex*	*currex*1*per*	*currex*2*per*	*capex*1*per*	*capex*2*per*	*tax*	*grants*	*debt*	*unemp*	log(*pop*)
Min.	271.50	179.20	5.85	164.10	172.70	5.75	0.02	46.38	135.90	0.00	0.60	6.91
1st Qu.	729.50	479.60	179.40	454.90	494.10	152.90	178.80	164.90	303.80	6.69	2.48	7.62
Median	907.80	593.40	259.60	569.10	617.70	234.20	272.40	242.10	387.90	35.95	3.33	8.36
Mean	1006.00	640.50	324.60	616.00	665.00	304.40	344.80	285.70	444.50	56.95	3.64	8.58
3rd Qu.	1156.00	743.20	385.50	714.80	773.20	358.70	412.50	344.90	518.60	81.68	4.45	9.31
Max.	5432.00	3226.00	2585.00	3113.00	3654.00	3776.00	3418.00	4879.00	2554.00	1514.00	13.43	14.96

Table 3: DIC values for considered models

Model	DIC
1	4506.21
2	4481.49
3	4453.50

Table 4: Summary of posterior distributions in Model 1

	Mean	sd	2.5%	25%	50%	75%	97.5%
Intercept	–0.18757	0.35476	–0.91177	–0.42458	–0.17765	0.05146	0.47402
totalex	0.00022	0.00020	–0.00017	0.00009	0.00022	0.00036	0.00060
tax	0.00011	0.00032	-0.00049	-0.00010	0.00009	0.00032	0.00078
grants	0.00017	0.00029	–0.00041	–0.00002	0.00017	0.00037	0.00075
debt	–0.00098	0.00062	–0.00223	–0.00141	–0.00096	–0.00058	0.00021
unemp	0.00021	0.02524	–0.04830	–0.01670	0.00015	0.01765	0.04652
log(*pop*)	0.20164	0.03902	0.12870	0.17490	0.20010	0.22805	0.27688
ideol	0.31893	0.07849	0.17182	0.26235	0.31750	0.37270	0.47051
align	–0.12785	0.07539	–0.27408	–0.18027	–0.13010	–0.07729	0.02437
coal	–1.45182	0.08588	–1.61987	–1.51100	–1.45200	–1.39425	–1.27602
σ_b	0.38841	0.15152	0.08470	0.28617	0.40050	0.50327	0.65287

Table 5: Summary of posterior distributions in Model 2

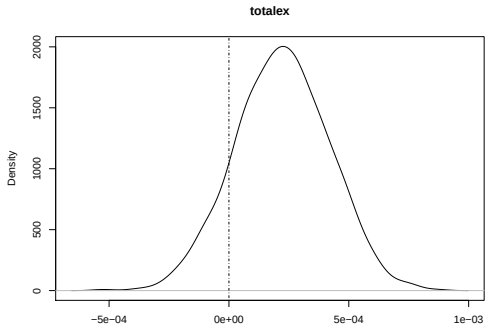
	Mean	sd	2.5%	25%	50%	75%	97.5%
Intercept	-0.54641	0.34760	-1.21690	-0.79365	-0.54970	-0.31415	0.11577
currex	–0.00055	0.00029	–0.00112	–0.00075	–0.00055	–0.00035	0.00005
capex	0.00129	0.00030	0.00071	0.00109	0.00130	0.00150	0.00187
tax	0.00041	0.00038	–0.00033	0.00015	0.00041	0.00067	0.00112
grants	–0.00008	0.00031	–0.00069	–0.00028	–0.00008	0.00013	0.00053
debt	–0.00147	0.00064	–0.00267	–0.00194	–0.00148	–0.00105	–0.00022
unemp	0.01895	0.02576	–0.03186	0.00255	0.01812	0.03599	0.06934
$\log(pop)$	0.25925	0.04060	0.18085	0.23100	0.25880	0.28547	0.33978
ideol	0.34006	0.07763	0.19231	0.28817	0.33850	0.39405	0.49016
align	–0.13557	0.07298	–0.27466	–0.18477	–0.13215	–0.08676	0.00785
coal	–1.43951	0.08674	–1.61692	–1.49900	–1.43700	–1.37925	–1.27702
σ_b	0.37578	0.17113	0.05667	0.24702	0.39215	0.50190	0.68127

Table 6: Summary of posterior distributions in Model 3

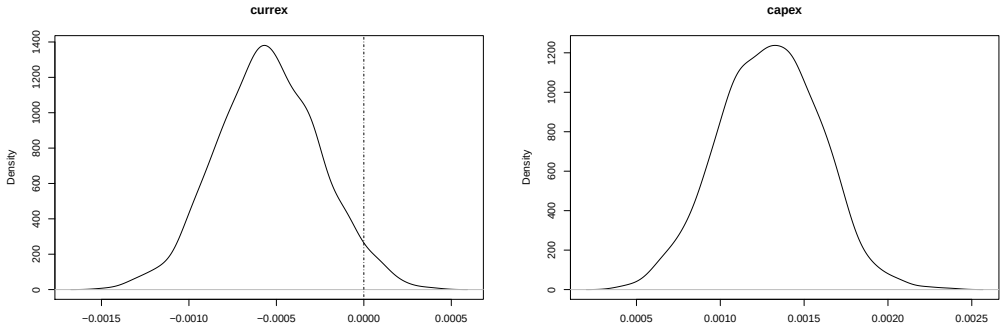
	Mean	sd	2.5%	25%	50%	75%	97.5%
Intercept	–0.58605	0.34922	–1.28380	–0.82322	–0.58805	–0.35430	0.08169
$currex1per$	–0.00234	0.00049	–0.00333	–0.00268	–0.00234	–0.00201	–0.00139
$currex2per$	0.00184	0.00051	0.00092	0.00149	0.00183	0.00216	0.00284
$capex1per$	0.00014	0.00023	–0.00030	–0.00001	0.00014	0.00029	0.00059
$capex2per$	0.00116	0.00024	0.00070	0.00100	0.00116	0.00133	0.00166
tax	0.00030	0.00039	–0.00043	0.00003	0.00028	0.00055	0.00112
$grants$	–0.00027	0.00032	–0.00088	–0.00048	–0.00028	–0.00007	0.00035
$debt$	–0.00142	0.00066	–0.00265	–0.00189	–0.00145	–0.00098	–0.00005
$unemp$	0.02006	0.02491	–0.02921	0.00305	0.02098	0.03772	0.06885
$\log(pop)$	0.25775	0.03990	0.18081	0.23310	0.25585	0.28315	0.33824
$ideol$	0.37021	0.07673	0.21644	0.31930	0.36935	0.42097	0.52458
$align$	–0.16043	0.07253	–0.30650	–0.20963	–0.16005	–0.11032	–0.02351
$coal$	–1.42261	0.08845	–1.60897	–1.47800	–1.42200	–1.36725	–1.25202
σ_b	0.22683	0.21449	0.00040	0.01955	0.19155	0.40137	0.65605

Figure 1: Posterior densities for expense related covariates

(a) Model 1



(b) Model 2



(c) Model 3

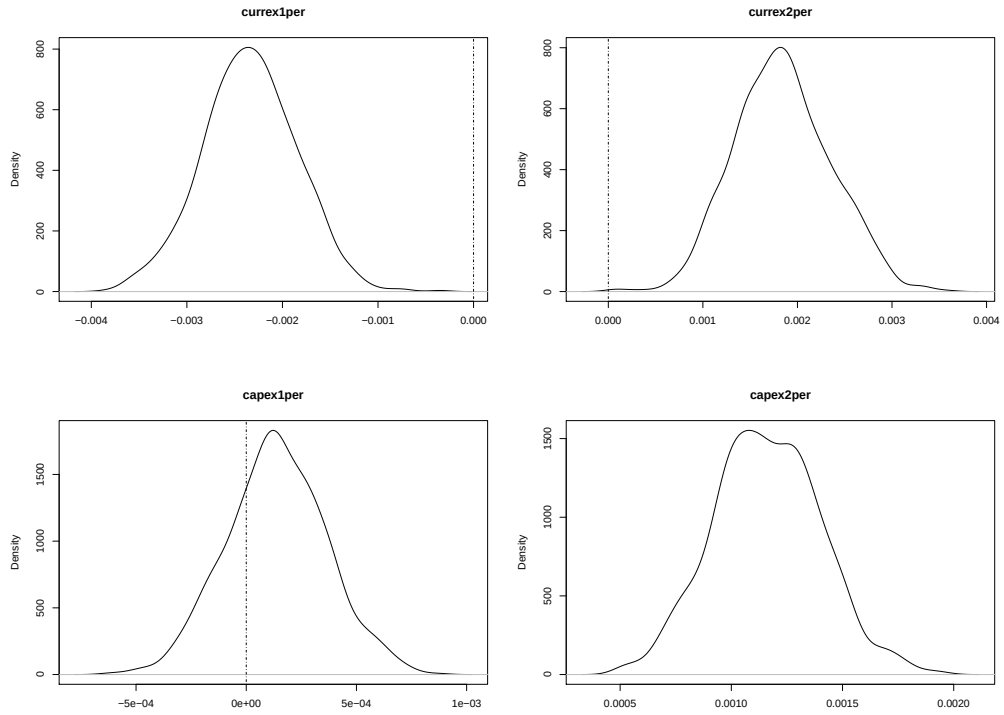


Figure 2: Posterior densities for covariates within each model