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Municipal cost behavior during financial crisis and financial sustainability periods: Evidence from Spain

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ABSTRACT

This study explores municipal cost behavior during periods of financial crisis and strict financial sustainability legislation. The study employees Anderson, Banker, and Janakiraman approach on a data sample of 48,096 observations from Spanish municipalities for the period 2008-2018. The results suggest that during this period municipality total, service provision and investment expenses exhibit anti-sticky behavior; that is the cost response to an activity level decrease is greater than its response in the case of an activity increase. After the adoption of the financial sustainability legislation this behavior is more intense for all expense categories. Moreover, in periods preceding elections the anti-stickiness trend is mitigated, while size appears to play a role as well, with larger municipalities showing greater anti-stickiness. Eventually, it appears that resource adjustment motivations during crisis periods, under law enforcement and before elections, play a key role in municipal asymmetric cost behavior.

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Introduction

While the traditional cost approach suggests that cost behavior¹ is not affected by managers' decisions and the relationship between sales and costs is mechanistic and symmetrical (Noreen 1991), asymmetric cost behavior has been recorded in various cases of private and public sector entities (e.g., Anderson, Banker, and Janakiraman 2003; Cohen, Karatzimas, and Naoum 2017). Managerial deliberate resource commitment decisions appear to be the key to cost asymmetry theory according to which costs are sticky (or anti-sticky) if they increase more (or less) with an increase in revenues than they decrease when sales revenues decline (Anderson et al. 2003).

This article aims at enhancing the understanding of cost behavior within local governments by studying it under different financial conditions. Exploring how cost behaves in local administrations is essential for public administration and management theory and practice. As this sector is characterized by a not-for-profit nature and is dominated by strong political influence, cost behavior could offer valuable insights to the role of political incentives in local finances under different financial conditions (Cohen et al. 2017; Bradbury and Scott 2018; Habib and Huang 2019). At the same time, understanding cost behavior could offer useful guidance to local governors on rationally deciding their spending and expenses when revenues increase or decrease (Bradbury and Scott 2018).

In this article we examine the behavior of Spanish municipal costs during the 2008 euro debt financial crisis emphasizing on the impact of the Spanish financial sustainability legislation imposed on municipalities in 2013. This legislation (Law 27/2013) aimed at safeguarding local

governments' stability, imposing important limitations on municipal spending for services and investments with requirements related to budgetary stability, financial sustainability and efficiency in the use of public resources.

Spain constitutes an interesting setting to study this topic due to the strong impact of the 2008 sovereign debt crisis on the country (Martí and Pérez 2015; Navarro-Galera et al. 2017) and the subsequent drastic and strict measures taken for the protection of public sector entities (Almendral 2013; Karatzimas and Griful Miquela 2019). Spanish municipalities within a short period went through different economic situations: diving from a prosperity period into the crisis, before finally stabilizing after the sustainability legislation adoption where the municipal finances were settled by imposing important limitations. In this realm, while during the crisis period Spanish public sector witnessed the reduction of public services (Navarro-Galera et al. 2017), with the financial sustainability legislation of 2013, expenses had to be maintained at specific levels and deficits were unacceptable under the threat of penalties for non-compliers. Due to the unique conditions shaped during this period, municipal governors' reactions in terms of investments and spending are expected to be rather interesting, affecting the behavior of municipal costs. Placing limits to public sector entities on how to use their resources is a rather sensitive topic, where political incentives are involved and citizens' welfare can be put at stake (Slembeck, Jans, and Leu 2014; Balaguer-Coll et al. 2015; Allers and De Greef 2018). In the same realm, the concept of budget incrementalism highlights how fiscal discipline is undermined by increasing spending instead of reviewing 'base' expenditures which could reduce government deficits (Schick 2003).

While cost behavior has been widely explored in the private sector, the interest in studying this phenomenon in the public sector is relatively recent. The paper thus contributes to the literature on cost stickiness in the public sector (e.g., Cohen et al. 2017; Bradbury and Scott 2018), by providing empirical evidence on cost asymmetry in Spanish municipalities under different, 'extreme', economic and financial conditions; i.e., periods of financial crisis and strict legislation. The paper develops a theoretical framework based on neo-institutional theory (DiMaggio and Powell 1983) and the public choice theory (Buchanan 1984) in an attempt to capture municipal governors' reactions related to costs within a period of coercive institutional pressures. The theoretical framework is informed by the results from the analysis of 48,096 observations from Spanish municipalities for the period 2008-2018, adopting the Anderson et al. (2003) approach, which estimates the magnitude of variation on expenses with respect to contemporaneous variations in sales volume. Due to the character of the public sector, sales are replaced by total revenues. As regards the expenses, the paper mainly focuses on investment² and service provision expenses, to reflect the services and facilities provided to citizens.

The results indicate cost anti-stickiness throughout the examined period for both service provision expenses and investment expenses; that is the cost response to an activity level decrease is greater than its response in the case of an activity increase. This situation is more pronounced after the adoption of the financial sustainability legislation. Moreover, in periods before elections anti-sticky behavior of investment expenses is mitigated, while municipalities' size plays a role as well. Eventually, it appears that local governors' resource adjustment motivations during crisis periods, under law enforcement and before elections, play a key role in public sector's asymmetric cost behavior.

The paper proceeds as follows: Section 2 presents the relevant literature review on the cost stickiness phenomenon. Section 3 presents the institutional framework. Section 4 is dedicated to the theoretical framework and the hypotheses development, while Section 5 discusses the sample selection and the methodology. Section 6 presents the empirical results, and Section 7 concludes with a discussion and concluding remarks.

Literature review

The sticky cost phenomenon

The traditional cost accounting model assumes that variable costs change proportionally and symmetrically with changes in the activity driver. That is, the magnitude of the increase in expenses (i.e., 6%) associated with an increase in revenues (i.e., 10%) equals to the magnitude of the decrease in expenses (6%) associated with an equivalent decrease in revenues (10%). The traditional theory of cost behavior implies a mechanistic, contemporaneous and linear symmetric relation between sales and concurrent costs (Noreen 1991). According to this traditional view of cost behavior, managers' decisions do not influence the behavior of activity costs.

However, contrarily to the traditional model, the sticky or asymmetric cost theory implies that the magnitude of the increase in expenses (i.e., 6%) associated with an increase in revenues (i.e., 10%) is greater than the magnitude of the decrease in expenses (i.e., 4%) associated with an equivalent decrease in revenues (10%). That is, when sales volume falls, managers decide to maintain idle resources (i.e., 2%) and not to cut them because there are adjustment costs of replacing these resources when sales volume will be restored. Noreen and Soderstrom (1997) were the first to empirically find asymmetric cost behavior using a sample of 11 overhead cost categories from a Washington Hospital. Based on these findings and focusing on the behavior of selling, general and administrative expenses (SG&A), Anderson et al. (2003) document the existence of cost stickiness. Specifically, they found that costs appear to increase more with sales increase than they decrease with sales volume decrease. Accordingly, managerial deliberate resource commitment decisions are the key to cost asymmetry theory according to which costs are sticky/anti-sticky if they increase more/less with an increase in revenues than they decrease when sales revenues decline.

Sticky cost literature has identified several factors that explain the variation in the degree of cost asymmetry: the magnitude of adjustment costs, the managerial expectations for the anticipated level of sales, the magnitude of economic activity change, earnings management incentives, the intensity of intangible investments, the effect of firm's strategic orientation (Anderson et al. 2003; Calleja, Stelios, and Thomas 2006; Bunker, Byzalov, and Chen 2013; Venieris, Naoum, and Vlismas 2015; Balios et al. 2020; Ballas, Naoum, and Vlismas 2020; Li et al. 2020). According to Bunker and Byzalov (2014) explanatory framework for the sticky cost theory, managerial deliberate resource commitment decisions, depend on three factors, which affect the level of adjustment costs: (a) prior resource levels, (b) expected future sales, (c) agency and behavioral factors. Adjustment costs are a function of both monetary (severance pay to fired workers, legal battle cost with a labor union, hiring and training costs of new workers, etc.) and psychological costs (loss of productivity, decrease in morale for the remaining employees after firing their colleagues, etc.).

Based on the findings of Anderson et al. (2003) many papers have examined the sticky cost phenomenon from different points of view and contexts. These studies find that the level of stickiness varies across different cost accounts (Anderson and Lanen 2009; Subramaniam and Weidenmeir 2003; Balakrishnan and Gruca 2008; Dierynck, Landsman, and Renders 2012; Dalla Via and Perego 2014), different industries (Subramaniam and Weidenmeir 2003; Balakrishnan, Petersen, and Soderstrom 2004; Balakrishnan and Gruca 2008; Anderson and Lanen 2009; Balakrishnan, Labro, and Soderstrom 2014) and different countries (Medeiros and Souza Costa 2004; Calleja et al. 2006; Dierynck et al. 2012; Bunker et al. 2013).

The sticky cost phenomenon in the public sector

Despite the obvious interest in exploring the sticky cost phenomenon in the public sector as well, only recently the interest is starting to grow. The scarce number of papers to date considerably

varies in terms of context and countries analyzed. Holzhacker, Krishnan, and Mahlendorf (2015) compared the public with private hospitals and found that sticky costs are more intense in the public ones due to the lighter institutional restrictions public entities face. Marudas, Petherbridge, and Ciokiewicz (2016) find that the fundraising and administrative expenses of a nonprofit organization in the U.S. are much stickier compared to the SG&A expenses of private firms. Mätö et al. (2017) show that sticky cost behavior prevents the achievement of desired outcomes for certain prevention and appraisal costs in the accounting department of a Finnish city. Cohen et al. (2017) study a sample of 1,852 observations of Greek municipalities for the period 2002-2008 and record cost anti-stickiness behavior related to administrative services and public relation expenses when revenues decrease, and cost stickiness behavior when it comes to service provision expenses. Bradbury and Scott (2018) examine municipalities in New Zealand and conclude that cost stickiness is understood by municipal managers and this is supported by findings that show the incorporation of asymmetric relation between costs and revenues in managerial forecasts. Habib and Huang (2019) studied the phenomenon in New Zealand charities and concluded that charity managers are reluctant to reduce resources following revenue decreases, in fear of losing trust and confidence due to the accountability implications of charities. Moreover, they find that during economic crisis periods charities evidence greater cost stickiness compared to non-crisis periods, which indicates the significance of accountability in this sector even when facing economic shocks. Finally, Wu et al. (2019) study on public schools shows that in cases where school principals are facing higher enrollment pressures operating expenditures' level of stickiness increases. The present study contributes to the above literature by analyzing municipal cost behavior under different economic and financial conditions.

Institutional framework

Spanish territorial and organizational structure

Spanish municipalities are characterized by their heterogeneity in terms of population and territorial organization. Data from the National Statistical Institute shows that more than 80% of the municipalities has less than 5,000 inhabitants. Despite their diversity, they are in charge of providing the most basic services since they are the level of government closer to the citizen (Narbón-Perpiñá, Balaguer-Coll, and Tortosa-Ausina 2019). The basic competences of municipalities vary according to their size with limits for the population under 5,000 inhabitants, between 5,000 to 20,000 inhabitants, between 20,000 inhabitants and 50,000, and over 50,000³. Accordingly, all municipalities are responsible for the provision of some minimum compulsory services and facilities such as waste collection, water supply, public lighting, road maintenance and municipal police. Larger municipalities must provide additional services, such as public parks, public libraries, markets, sports facilities, social services, environmental protection, public transport, fire-fighting services, etc. However, the law does not prevent a particular municipality from going beyond the mandatory minimum responsibilities (Balaguer-Coll, Prior, and Tortosa-Ausina 2013). Their revenues derive from local taxes, fees and public prices coming from the provision of basic services and the use of public facilities, government transfers (mainly from central government), and capital and financial revenues. Despite local municipal autonomy, the share of self-generated revenues coming from direct taxes, fees, and sale of fixed assets represent less than 60% of their total revenues, while around 30% comes from transfers from higher levels of government (Narbón-Perpiñá et al. 2019).

Financial crisis and the financial sustainability legislation in Spain

Over the last decade, Spanish public finances have been highly affected by the financial crisis (Martí and Pérez 2015). Before its outbreak in 2007, Spain presented fiscal surpluses and low

levels of public debt compared to other Eurozone countries. The depth of the financial crisis impact revealed the weakness of the Spanish economy on structural imbalances built up during the pre-crisis period, such as excessive indebtedness in the public sector and the important weight of the construction sector on the total economy. This situation led Spain into a deep recession during the period 2008-2013, and under close supervision from the European Union. To heal the macroeconomic situation, the Spanish government implemented a significant number of austerity measures to reduce public debt and reach a balanced budget. The framework for budgetary stability in Spain was therefore enacted in the Law on Budgetary Stability and Financial Sustainability of Public Administrations in 2012 (Law 2/2012)⁴. The law, which incorporates EU regulation requirements, aimed at introducing greater control over public debt and public spending to achieve a balanced budget in all public administration. As regards local governments, in 2013 the Law on Rationalization and Sustainability of the Local Administration (Law 27/2013) adapted the basic regulations on local administration to the requirements derived from the application of the principles of budgetary stability, financial sustainability and efficiency in the use of public resources.

Specifically, Law 27/2013 introduced significant amendments in three rules: (1) the deficit rule, (2) the debt rule, and (3) the expenses rule:

- i. The deficit rule asks for compliance with the principle of budgetary stability, i.e., local governments cannot run a structural deficit.
- ii. The debt rule sets the maximum level of outstanding debt at 110% of their current revenues (Chapters 1 to 5 of the municipal budget revenues)⁵.
- iii. The expenses rule forbids the annual expenses to exceed the reference growth of the Spanish Medium-term Gross Domestic Product (GDP) as annually defined by the Spanish government.

Moreover, according to Law 27/2013, municipalities have to first meet the acceptable debt level, and then work on achieving surpluses. As long as the municipality records higher revenues compared to the expected ones, then the difference is used to decrease debt rather than to increase expenses. Other provisions of this legislation ask for the use of the budget surplus for the payment of previous years' expenses, debt reduction and the conduction of financially sustainable investments. The law also includes financially sustainable investments and additional services that municipalities are allowed to provide in case financial sustainability is guaranteed.

It is important to note that the expense rule is an instrument of budgetary discipline that aims to guarantee the sustainability of local finance over time. However, not all Spanish municipalities have the same financial situation and the reality is that the effective application of this rule affects, on a direct way, municipalities with a healthy financial position and accumulated surpluses, which find strict limitations on increasing local public spending and investments (Karatzimas and Griful Miquela 2019).

Finally, for those local governments that do not comply with these limits, the law provides preventing measures, correction procedures and corrective mechanisms. In case a municipality fails to comply with at least one of the three rules, the municipality is required to present a financial plan to correct deviation in one year. Moreover, all long-term financing operations will require authorization from higher levels of government, which can be central or regional government, depending on the case.

Theoretical framework and hypothesis development

An interesting research setting is formed when local governments receive external pressures to limit their spending levels. In such cases, a combination of the neo-institutional theory with the

public choice theory could offer useful insights. The combination of the two theories was deemed necessary as they appear to complementarily help explain the context of the study. Therefore, while the coercive pressures can be explained in light of the neo-institutional theory, the reaction of mayors to these pressures can be interpreted through the lens of the public choice theory. Neo-institutional theory posits that organizations are sensitive to isomorphic pressures coming from their environment, which lead them to act in what would be socially accepted as the appropriate way, and thus to homogeneity (Meyer and Rowan 1977; DiMaggio and Powell 1983). In particular coercive isomorphism pressures are witnessed when specific rules, practices or procedures are imposed to an organization by another organization (DiMaggio and Powell 1983), including the pressures exercised from the central to local governments to adopt specific rules (Pina, Torres, and Yetano 2009). Several studies evidence how central government legislation is enforced on local governments. The impact of new policies stemming from the central government is depending on the power imbalance between the central and the local government level (Hong 2020). This power and control relationship appears to be mainly related to issues of performance, funding, and service provision (Goldsmith 2002; Ferry and Murphy 2018). In this context, Spanish local governments received significant pressures from the limitations imposed on them by the central government, through the financial sustainability legislation, with noncompliance being punished with sanctions (Karatzimas and Griful Miquela 2019).

The impact of these pressures on municipalities is undeniable, given the fact that their spending and expenses are put at stake, especially if one takes into account how close to citizens municipalities are. As such, municipalities will always be blamed by citizens even for the quality of services they are not responsible to provide (Hong 2017). Within such a context the reaction of municipal governors cannot be easily predictable, as self-interest could contrast with their sense of accountability. According to the public choice theory, politicians are driven by self-interest motives⁶ (Buchanan 1984; Allers and De Greef 2018) that urge them to keep on spending to provide services and investments to keep citizens satisfied. Politicians hope that this attitude would lead to reelection (Alesina and Tabellini 2007), without taking into account that in the long-term horizon this behavior could harm the financial sustainability of the public administration (Slembeck, Jans, and Leu 2014). Such opportunistic behaviors are evident before election periods (García-Sánchez, Mordán, and Prado-Lorenzo 2012). This effect has been widely recorded in the 'political budget cycles' literature (e.g., Rogoff and Sibert 1988; Rogoff 1990).

Negativity bias is another factor that could affect municipal governors' attitude. As relevant literature shows, punishment for a public entity's low performance can be greater compared to the rewards for high performance (Hood 2011; James and Moseley 2014; Hong and Kim 2019; Hong 2020). Consequently, low performance could attract more the public's attention, and this could damage politicians' reelection concerns (Soroka 2006; George et al. 2020). Therefore, mayors would be more interested on the effect of positivity bias, attracting public's interest on good performance (George et al. 2020). The impact of institutional pressures is expected to be stronger when the relevant information signals low performance (George et al. 2020).

Of course, politicians can be also motivated by their sense of accountability toward citizens (Arnold and Carnes 2012). It goes without saying that citizens' welfare and quality of living are closely related to this attitude. Municipal governors need to balance between maintaining acceptable –by citizens– levels of service provision and investments, and complying with such external pressures.

Hypotheses development

The public choice theory posits that politicians could be motivated by short-term goals (Garri 2010), neglecting long-term planning related to future generations (Hong 2017) and financial sustainability (Slembeck, Jans, and Leu 2014), adopting a positivity bias perspective (George et al.

2020). Accordingly, municipal governors would seek to have satisfied constituents by maintaining current levels of spending or even by increasing them (Buchanan 1984; Allers and De Greef 2018). Cohen et al. (2017) study in Greek municipalities on the period before the euro debt crisis (2002-2008) finds that municipal governors are less willing to decrease expenditures related to service provision (core activities) even during periods of revenue decrease due to the importance of these services for citizens. Therefore, under normal conditions, service provision expenses are expected to present sticky cost behavior (Cohen et al. 2017). Nevertheless, with the outbreak of the financial crisis in 2008, European municipalities received significant external pressures leading them to cut-backs, austerity policies and reduction of services (Bordogna and Neri 2014; Leisink and Bach 2014; Bröthaler, Getzner, and Haber 2015). Spanish municipalities are among them (Navarro-Galera et al. 2017). During this period sources of revenues are significantly reduced, and expenses are subsequently affected. However, in line with Habib and Huang (2019), municipal governors could also be reluctant in following this downward trend with spending reduction, and instead try to mitigate it. To conclude, during periods of 'extreme' financial conditions, such as the period of the sovereign debt financial crisis or that of the strict regulation resulting from the crisis, it is expected that even service provision expenses could be affected. The same is expected for investment expenses, however since these are not basic public services, it would be easier to postpone investments during periods of abnormal financial conditions. Traditionally, grant transfers and debt constitute the major financing sources used by municipalities for investments. While current spending is mainly related to public services, investment expenses (i.e., capital expenditure) are usually financed by debt, sustaining borrowing cost and even negatively affecting financial health (Cuadrado-Ballesteros and Bisogno 2019). Grant transfers were strongly affected by the financial crisis, while the debt level was subsequently regulated by legislation. Summarizing the above analysis, we investigate the empirical validity of the following hypothesis:

H1: *During the financial crisis period municipal service provision and investment expenses exhibit anti-sticky behavior, that is, the cost response to total revenues decrease is greater than in the case of an increase in total revenues.*

Furthermore, following the implementation of Law 27/2013 (starting being observable from 2014) important limitations are placed on service provision and investment expenses. Coercive isomorphic pressures coming from the central government dictate specific rules, punishing non-complying municipalities. Law 27/2013 allows specific 'financially sustainable' investments and services to be provided. Within such an environment, with declining municipal revenues, due to the financial crisis, and stricter budget constraints (Narbón-Perpiñá et al. 2019), municipal governors' room to maneuver is significantly limited leaving no other option but to follow the rules. According to Holzhacker et al. (2015) study, the board-members of public hospitals were more likely to oppose affecting cost elasticity to avoid sanctions. In line with the above, municipal governors are expected to comply with the legislation avoiding sanctions. That is, they are more likely to reduce service provision and investment expenses as a response to demand decreases. Based on the above, our second hypothesis would be as follows:

H2: *The period following the adoption of the financial sustainability legislation, anti-sticky behavior of municipality service provision and investment expenses is more pronounced.*

Methodological approach

Data and descriptive statistics

The study uses a sample of Spanish municipalities for the period 2008-2018. Specifically, the time span of the analysis corresponds to the years of the crisis period (2008-2013) and the period after the adoption of the Law 27/13 (2014-2018). The panel of data is an unbalanced one, in which the

Table 1. Data descriptive statistics.

	Mean	Median	1 st Quantile	3 rd Quantile
Rev ¹	7,017,635.89	771,312.07	248,303.28	2,857,334.01
TotExp ¹	6,619,833.44	727,378.07	231,536.73	2,700,053.69
InvExp ¹	955,533.39	162,001.97	53,789.86	528,647.63
ServExp ¹	4,338,829.47	442,452.82	130,128.52	1,761,322.74
Pop ²	6,107.16	611.00	179.00	2,664.00
Debt ¹	3,690,929.11	44,103.30	0.00	560,717.37

Notes:

¹In euro.²In thousand of inhabitants.

number of yearly observations (i.e., municipalities) varies from year to year depending on the availability of data for the variables included in the different models⁷.

In analyzing the sticky cost phenomenon for this particular case, information for municipal revenues and expenditures was collected from the budget execution documents⁸. Municipal budgets are annually published by the Spanish Ministry of Treasury (*Ministerio de Hacienda*). On the revenues side, the variable ‘Total municipal revenues’ (Rev) is used. The selection of this variable is consistent with previous literature focusing on municipalities (Cohen et al. 2017), and equates to the variable ‘Sales revenues’ commonly used when analyzing the sticky cost phenomenon for private firms. On the expenditures side, different expenditure categories are included, coming from the classification of the budget expenditures from an economic nature, in particular, ‘investment’ and ‘service provision expenses’. The latter refers to municipal current expenses, which include both personnel expenses and current expenses in goods and services. To capture the effect of the debt intensity, the variable ‘debt’, which measures the total financial liabilities’ pending payment at the end of the year in a specific municipality, is included. Data for this variable was retrieved from the Spanish Ministry of Treasury, which publishes annual data about the outstanding debt from municipalities to monitor the limits set by the Law on Budgetary Stability. Moreover, the variable ‘Population’ captures municipalities’ size. Original annual data comes from the Spanish Statistical Institute (*Instituto Nacional de Estadística, INE*).

Table 1 presents the descriptive statistics for the variables used in the analysis, including the mean, as well as additional statistics which provide deeper insights into the distributions of the main.

Sticky cost methodology

The study applies Anderson et al. (2003) methodology in order to capture the presence of the sticky cost asymmetry. This methodology estimates the magnitude of variation on expenses with respect to contemporaneous variations in revenues:

$$\Delta \text{Exp}_{i,t} = b_0 + b_1 \Delta \text{Rev}_{i,t} + b_2 d_{i,t} \Delta \text{Rev}_{i,t} + \varepsilon_{i,t}$$

where:

 $\Delta \text{Exp}_{i,t}$: annual log change in total expenses of municipality i $\Delta \text{Rev}_{i,t}$: annual log change in total revenues of municipality i $d_{i,t}$: indicator for the direction of total revenues of municipality i in year t.

The annual log change in expenses ($\Delta \text{Exp}_{i,t}$) and the annual log change in total revenue ($\Delta \text{Rev}_{i,t}$) are the main variables used in the above model. In the analysis, the aforementioned methodology is adapted to three types of expenses: Total Expenses, Investments and Service provision expenses. The coefficient b_1 shows the increase in expenses following a 1% increase in total revenue. The dummy variable $d_{i,t}$ takes the value of 1 if revenues decrease from last year and zero otherwise. The coefficient b_2 measures the degree of asymmetry in cost response to revenues decreases, i.e., it captures cost-stickiness. Therefore, the sum of the coefficients $b_1 + b_2$ measures

the extent of the decrease in expenses with 1% decrease in total revenue. Cost-stickiness implies that the increase in expenses given a 1% increase in revenues should be greater than the decrease in expenses given a 1% decrease in revenues, so b_2 should be negative.

We extend model (1) to control for possible cost stickiness moderating variables (Anderson et al. 2003; Subramaniam and Weidenmeir 2003; Balakrishnan and Gruca 2008; Dierynck et al. 2012). Specifically, we include four variables that capture municipality size, municipality outstanding debt, the financial sustainability legislation period, and preelection periods. These determinants are included in the model as main terms (b_7 to b_{10}) and as three-way interaction variables (b_3 to b_6) to model their moderating behavior with regard to volume decreases. Hence, extended version of equation (1) is as follows:

$$\begin{aligned}\Delta \text{Exp}_{i,t} = & b_0 + b_1 \Delta \text{Rev}_{i,t} + b_2 d_{i,t} \Delta \text{Rev}_{i,t} + b_3 d_{i,t} \Delta \text{Rev}_{i,t} \left(\frac{\text{Pop}_{i,t}}{\text{Rev}_{i,t}} \right) + b_4 d_{i,t} \Delta \text{Rev}_{i,t} \left(\frac{\text{Debt}_{i,t}}{\text{Rev}_{i,t}} \right) \\ & + b_5 d_{i,t} \Delta \text{Rev}_{i,t} d_{sustain} \\ & + b_6 d_{i,t} \Delta \text{Rev}_{i,t} d_{elect} + b_7 \left(\frac{\text{Pop}_{i,t}}{\text{Rev}_{i,t}} \right) + b_8 \left(\frac{\text{Debt}_{i,t}}{\text{Rev}_{i,t}} \right) + b_9 d_{sustain} + b_{10} d_{elect} + \varepsilon_{i,t}\end{aligned}$$

where:

$\text{Pop}_{i,t}/\text{Rev}_{i,t}$: log ratio of inhabitants to revenue of municipality i in year t

$\text{Debt}_{i,t}/\text{Rev}_{i,t}$: log ratio of debt level to revenue of municipality i in year t

$d_{sustain}$: dummy variable for the adoption of the financial sustainability legislation

d_{elect} : dummy variable for elections

The dummy variable $d_{sustain}$ equals 1 if it is a year after the adoption of the legislation (i.e., from 2014 to 2018) and 0 otherwise, while the dummy variable d_{elect} equals to 1 if it is a year before the elections (i.e., in 2010, 2014 and 2018), and 0 otherwise. As in basic model (1), the sticky cost behavior implies that b_2 is negative.

Results

The models of Eq. (1) and Eq. (2) are estimated with the annual log change in expenses as the dependent variable using Petersen's (2009) methodology, in order to choose the most appropriate econometric estimation procedure for regression models on the current study's panel dataset (Chen, Lu, and Sougiannis 2012; Dierynck et al. 2012; Kama and Weiss 2013; Venieris et al. 2015; Ballas et al. 2020). Specifically, all our models include municipal fixed effects, in which city-clustered standard errors are used to control for autocorrelation and heteroscedasticity. The economic interpretation of the estimated coefficients is accommodated by the log specification of the variables.

Table 2 presents the estimated sticky cost model (Eq. 2) with the annual log change in total revenues, taking into account different categories of municipal expenditures. Specifically, columns A to C display the different models regarding total expenses, investments, and service provision expenses, respectively. The Table contains the coefficients values and bootstrapped standard errors in parenthesis.

The estimated coefficient b_2 shows that municipalities are associated with anti-sticky cost behavior for total expenses (Table 2; Column A), investments (Table 2; Column B) and service provision expenses (Table 2; Column C). The magnitude of changes occurring in these costs depends on the costs and activity volume of the prior fiscal year. The estimated value of b_1 is 0.840 (0.156), indicating that total expenses (service provision expenses) increased 0.84% (0.15%) per 1% increase in total revenues defined for one-year periods. In the case of investment expenses, the corresponding estimated coefficient b_1 is higher than 1, which indicates that this type of expenses increase more than 1% for a 1% increase in revenues. Investments are sensitive

Table 2. Asymmetric cost behavior, financial sustainability and elections.

	Coefficient Estimates (t - stat)		
	Column A Total Expenses	Column B Investments	Column C Service provision expenses
b_0 : constant	-0.029*** (-4.23)	-0.146*** (-4.69)	-0.031*** (-6.62)
b_1 : $\Delta Rev_{i,t}$	0.840*** (18.26)	1.340*** (6.44)	0.156*** (4.95)
Two – Way Interaction Term			
b_2 : $d_{i,t}^* \Delta Rev_{i,t}$	0.371*** (11.77)	0.280** (1.96)	0.384*** (17.77)
Three – Way Interaction Terms			
b_3 : $d_{i,t}^* \Delta Rev_{i,t}^* (Pop_{i,t}/Rev_{i,t})$	0.154*** (15.40)	0.343*** (7.57)	0.141*** (20.51)
b_4 : $d_{i,t}^* \Delta Rev_{i,t}^* (Debt_{i,t}/Rev_{i,t})$	-0.026* (-1.79)	-0.165** (-2.51)	0.025** (2.53)
b_5 : $d_{i,t}^* \Delta Rev_{i,t}^* d_{sustain}$	0.010*** (3.28)	1.173*** (5.21)	0.007** (2.04)
b_6 : $d_{i,t}^* \Delta Rev_{i,t}^* d_{elect}$	-0.029*** (-2.64)	-0.369*** (-7.41)	-0.026*** (-3.55)
Main Terms			
b_7 : $Pop_{i,t}/Rev_{i,t}$	-0.003 (-1.60)	-0.017 (-1.63)	-0.010*** (-6.45)
b_8 : $Debt_{i,t}/Rev_{i,t}$	-0.004*** (-6.01)	0.001 (0.09)	-0.004*** (-9.42)
b_9 : $d_{sustain}$	0.016*** (18.94)	0.100*** (25.11)	0.010*** (16.55)
b_{10} : d_{elect}	0.006*** (7.41)	0.048*** (11.47)	-0.003*** (-4.94)
Number of Observations	48,096	48,096	48,096
Adj. R-Squared	0.569	0.373	0.346

Note:

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Variable definitions:

$Rev_{i,t}$ total revenues of municipality i in year t .

$Pop_{i,t}$ number of inhabitants

$Debt_{i,t}$ debt level

$d_{sustain}$ a dummy variable which equals 1 if it is a year from 2014 to 2018 and 0 otherwise,

d_{elect} a dummy variable which equals to 1 when the data refer to 2010, 2014 and 2018 which are the years before local elections in 2011, 2015 and 2019.

to total revenues increases (for instance targeted grant transfers) and thus a certain increase in total revenues causes a greater increase in investment expenses than in the case of service provision expenses. The positive and statistically significant (at 1%) estimated value of b_2 provides strong support for total expenses investment and service provision cost anti-stickiness behavior. The combined value of b_1+b_2 which is greater than the estimated value of b_1 , indicates that all types of expenses decreased more with decreases in total revenues than they increased with total revenues' increases. According to the sticky cost theory, costs exhibit anti-sticky behavior when the cost response to an activity level decrease is greater than its response in the case of an activity increase. Accordingly, H_1 is not rejected. Our results suggest that given the decrease in revenues and the stricter budget limitations during the period analyzed, the reaction of municipal governors was to reduce service provision and investment levels. Cohen et al. (2017) show that municipal service provision expenses exhibit cost stickiness during normal financial conditions. In our particular context the impact of the crisis and of the strict regulation appear to affect cost behavior in a different manner.

When it comes to the effect of the financial sustainability legislation, captured by the variable $d_{sustain}$, coefficient b_5 is positive and statistically significant for all three types of expenses. That is, the cost response to a total revenue level decrease is even greater with the adoption of the law. The effect of the financial sustainability legislation is positive and significant for all types of expenses. Therefore, H_2 is not rejected since the anti-sticky behavior of municipality total, service provision and investment expenses is more pronounced with the adoption of the financial sustainability legislation. Municipalities are pressed by the legislation to achieve low levels of deficit and expenses. As expected the impact on both types of expenses is strong (Karatzimas and Griful Miquela 2019), since the legislation is strictly applied, therefore anti-sticky behavior rises. It should be noted, that previously in applying the budgetary stability legislation, municipalities showed laxity in following the rules (Benito, Guillamón, and Bastida 2015). The above highlight the specific legislation's impact on municipal cost behavior, and municipal governors' decision making. It also shows that the impact was more intense compared to that of the financial crisis alone.

By examining the role of size, interesting findings are revealed, as coefficient b_3 is positive and statistically significant. That is, the degree of anti-stickiness increases with the population of the municipalities (ratio of total population over total revenue). Since larger municipalities provide additional services, it could be relatively easier to perform relevant cost adjustments. As regards the municipal debt, coefficient b_4 is negative and statistically significant for total expenses and investments, which means that cost anti-stickiness is decreased with debt intensity (ratio of debt to total revenue). In the case of service provision expenses, the anti-stickiness behavior is increased with debt intensity, that is, b_4 is positive and statistically significant. A plausible explanation is that when revenues decrease, a higher magnitude of outstanding debt drives municipal managers to adjust expenses faster to meet debt level targets. Under the pressure of financial liabilities, municipalities have to first meet the acceptable debt level and they appear more willing to decrease debt, rather than to increase expenses. This was also one of the legislation's targets. Similarly, according to studies on the private sector (Chen, Lu, and Sougiannis 2012; Kama and Weiss 2013 and Banker and Byzalov 2014) managerial incentives to meet earnings target are positively related with the cost anti-stickiness phenomenon⁹.

Election effects

The findings regarding election-periods turn out to be quite interesting. Coefficient b_6 is negative and statistically significant for all three expense categories, which suggests that the degree of anti-sticky cost behavior is decreased before elections. In other words, the response of costs to revenue changes tends to favor lower decreases compared to other periods.

According to the public choice theory and the relevant literature (e.g., García-Sánchez et al. 2012; Hong 2017), the reelection concerns that tend to motivate politicians will lead them to show more output in terms of services and investments in periods preceding elections. Their target is to affect voters' preferences (Kido, Petacchi, and Weber 2012; Slembeck, Jans, and Leu 2014). On the other hand, it is also true that elected politicians could choose to avoid being accused by opposition that they increase expenses for the above stated purposes (Cohen et al. 2017). Also showing deficits before elections could be unfavorable (Brender and Drazen 2008). Our results show that anti-sticky behavior is mitigated a year before elections which means that there is an attempt to maintain relevant expenses, indicating that to an extent local managers' decisions are election-oriented.

Size effects

Driven by the fact that population appears to affect the degree of municipality cost anti-stickiness, the Anderson et al. (2003) approach is repeated for four different subsamples concerning

municipalities' size; population under 5,000 inhabitants, between 5,000 to 20,000 inhabitants, between 20,000 inhabitants and 50,000, and over 50,000. Thus, taking into account that municipalities' responsibilities vary according to their size, an attempt is made to determine the sensitivity of the findings and to provide further support to the inference that, financial crisis, financial sustainability and elections affect municipal cost asymmetry. Tables A1, A2 and A3 in the Appendix present the estimated model of Eq. (2) with the dependent variable of either the annual log change in total expenses, investments or service provision expenses, for the aforementioned size categories respectively.

Analyzing the estimated coefficient b_2 of the model, it appears that almost all size categories of municipalities are associated with anti-sticky cost behavior (coefficient b_2 is positive and statistically significant)¹⁰. However, the values for the coefficients increase with municipalities' population size, confirming that the degree of cost anti-stickiness increase in larger municipalities. Regarding the financial sustainability legislation, coefficient b_5 is positive and statistically significant for all three cost categories and municipality sizes. That is, the degree of anti-stickiness increases with the adoption of the law. Coefficient b_6 , which captures the effect of preelection periods, is negative and statistically significant in total expenses and investments for all size municipalities while in the case of service provision expenses coefficient b_6 is not statistically significant for larger municipalities with more than 20,000 inhabitants.

Additional analysis - alternative specification of asymmetric cost behavior

Despite the econometric merits of the log-linear specifications of Eq. (1) and Eq. (2) we undertake additional analysis in order to determine the sensitivity of our findings using the linear sticky cost model (Balakrishnan et al. 2014):

$$\left(\frac{\text{Exp}_{i,t} - \text{Exp}_{i,t-1}}{\text{Exp}_{i,t-1}} \right) = b_0 + b_1 \left(\frac{\text{Rev}_{i,t} - \text{Rev}_{i,t-1}}{\text{Rev}_{i,t-1}} \right) b_2 d_{i,t} \left(\frac{\text{Rev}_{i,t} - \text{Rev}_{i,t-1}}{\text{Rev}_{i,t-1}} \right) + \varepsilon_{i,t} \quad \text{Eq.(3)}$$

The results of the Balakrishnan et al. (2014) methodology for testing cost stickiness are presented in Tables A4 and A5. Table A4 exhibits the estimation results of the linear specification of Eq. (3) taking into account total expenses (column A), investments (column B), and service provision expenses (columns C). Similarly to the log-linear model municipalities are associated with anti-sticky cost behavior for total expenses, investments and service provision expenses.

In Table A5, estimation results by population size group are reported for all four data subsamples: population under 5,000 inhabitants (column A), between 5,000 to 20,000 inhabitants (column B), between 20,000 inhabitants and 50,000 (column C), and over 50,000 (column D).

Results show that all municipalities' size groups are associated with cost anti-stickiness behavior for all three types of expenses.

Discussion and conclusion

The scope of this article is to examine municipal cost behavior during a period characterized by distinct financial and economic conditions: intense financial crisis followed by strict financial sustainability rules. The setting is that of Spain, a country that went from a prosperity period to the center of a financial crisis, and then managed to recover by applying strict austerity policies and budget-cut measures. Within such a setting, municipal costs are expected to be affected by external pressures but also by political factors related to politicians' incentives. For these reasons, the study uses insights from the neo-institutional theory (DiMaggio and Powell 1983) and the public choice theory (Buchanan 1984). Using this theoretical framework as a basis to build upon, the study employed Anderson et al. (2003) methodological approach to analyze 48,096 observations

from Spanish municipalities for the period 2008-2018. The study contributes to literature by adding to the -still limited- research (e.g., Cohen et al. 2017; Bradbury and Scott 2018) on cost behavior in local governments by expanding the understanding of factors influencing asymmetric cost behavior, documenting how financial crisis, sustainability laws and reelection incentives affect the deliberate resource commitment decisions made in the public sector.

The results indicate that under these special and rather abnormal financial conditions, municipal expenses exhibit anti-sticky cost behavior. This adds to the Cohen et al. (2017) study, which provides evidence of sticky cost behavior for Greek municipalities' expenses but for a normal financial period preceding the financial crisis (2002-2008). In our case, anti-stickiness is evident throughout a period marked by significant reduction in public services -either by eliminating specific services or by reducing the quality of the provided service (Navarro-Galera et al. 2017)- and by strict legislative limitations. It appears that the change in financial normality has an obvious impact on municipal cost behavior. Based on sticky cost literature, during periods of normal financial conditions municipal governors will be unwilling to decrease expenses related to service provision when revenues decrease (Cohen et al. 2017), while during financially turbulent periods municipalities are expected to try and fight the downward trend as much as they can (Habib and Huang 2019). The latter is also in line with public choice theory, according to which it would be of mayors' best interest to try absorbing the crisis with the least visible impact to citizens. This attitude is clearer when compared to the impact of the financial sustainability legislation.

With the adoption of the strict legislation, the recorded anti-stickiness of municipal costs is more intense indicating the degree of pressure exercised by the central government through the relevant legislation rules that led mayors to accelerate resource cuts. Thus, in the process of complying with the legislation, deliberate choices are affected, affecting in turn the degree of cost asymmetry. Mayors have expressed concerns regarding the impact on service provision and investments due to the legislation (Karatzimas and Griful Miquela 2019). Neo-institutional theory poses that the central government can exercise significant coercive isomorphic pressures to local governments (Pina et al., Torres, and Yetano 2009) and this is what happened with Law 27/2013. The possibility of sanctions in case of not achieving the specific rules set, probably works toward this end. Holzhacker et al. (2015) arrive at a similar conclusion.

The mitigation in cost anti-stickiness observed in periods before elections shows a trend of trying to maintain expense levels, which agrees with previous literature (e.g., Kido et al. 2012; Hong 2017). This evidences politicians' reelection concerns, according to which politicians tend to increase spending just before election periods hoping to signal a better picture to potential voters. Finally, the fact that larger municipalities exhibit a higher level of cost anti-stickiness is indicative of the substantial differences between small and large municipalities in terms of flexibility in providing various additional services that can be more easily adjusted when conditions ask for it.

This is -to the best of our knowledge- the first time where municipal cost behavior is studied under subsequent periods with distinct financial characteristics that range from financial crisis to financial sustainability. Therefore, further and more in-depth research is required before the results of the crisis impact and the legislation's effect can be generalized. Further research could be expanded to other countries that suffered from the financial crisis and developed laws to confront the impact; thus our understanding of the role of motivations underlying politicians and/or public managers' decisions in shaping municipalities' cost structures under different financial settings could be enhanced. Probably our results could also offer insights for the current abnormal global conditions, under the COVID-19 pandemic. One important limitation of this study is that due to the unavailability of accrual data, the cash-based budget execution data have been used. Therefore, depending on the availability of data, similar studies could be performed with the use of accrual data coming from the income statement and the balance sheet.

Notes

1. While cost refers to the sacrifice of a resource to achieve a particular purpose, the response of costs to sales/revenues changes is known as cost behavior and applies to both the private and public sector. This behavior may vary with the activity changes or may be unaffected by these changes.
2. i Chapter 6 of the economic classification of expenses which corresponds to Capital Expenses.
3. ii Law 27/2013 on Rationalization and Sustainability of the Local Administration substantially modified articles of Law 7/1985 regulating the local system in order to clarify municipal powers and organizational structure in accordance with the principles of efficiency, budget stability and financial sustainability.
4. The starting point for the development of the Law was the preceding European Union directives, which became known as the “Six Pack”, the “Two Pack” and the “Fiscal Compact”. This set of EU directives targeted at reinforcing EU member states’ public sector budget stability and surveillance.
5. Chapters 1 to 5 of municipal budget revenues include direct taxes; indirect taxes; fees-public prices-other income; current transfers; and equity income, respectively.
6. This is also evident in the concept of budget incrementalism which has been criticized for resulting to short-termism and maintenance of existing policies, with politicians only discussing the increase of budget items from the previous existing base without any room for critical consideration (Rubin, 2019).
7. The extended model (eq. 2) uses 48,096 observations, while the simple linear model (eq. 3) uses 72,253 observations.
8. Given the limited availability of public data at the municipal level, we use information coming from the annual municipal budgets, not from the municipal Balance Sheet and Income Statement.
9. To test further the implications of debt, two subsamples (municipalities with greater debts over revenues and municipalities with lower debts over revenues) were formed. Nevertheless, no significant differences were revealed regarding cost stickiness between these two subsamples (results not tabulated; available upon request).
10. In the case of Investments, coefficient b_2 is not statistically significant for municipalities with population between 5,000 to 20,000, and 20,000 to 50,000 inhabitants.

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Table A1. Population size, asymmetric behavior of total expenses, financial sustainability and elections.

	Coefficient Estimates (t - stat)			
	Column A Pop < 5,000	Column B 5,000 ≤ Pop < 20,000	Column C 20,000 ≤ Pop < 50,000	Column D Pop ≥ 50,000
b_0 : constant	-0.036*** (-4.37)	-0.053*** (-3.10)	-0.054* (-1.65)	-0.752*** (-2.73)
b_1 : $\Delta\text{Rev}_{i,t}$	0.808*** (15.97)	0.572 (1.48)	0.934*** (3.47)	1.964*** (7.35)
Two – Way Interaction Term				
b_2 : $d_{i,t}^*$ $\Delta\text{Rev}_{i,t}$	0.309*** (8.69)	0.369* (1.79)	0.649*** (3.77)	0.671* (1.89)
Three – Way Interaction Terms				
b_3 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* (\text{Pop}_{i,t}/\text{Rev}_{i,t})$	0.135*** (12.05)	0.181*** (2.59)	0.256*** (4.52)	-2.796 (-0.89)
b_4 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* (\text{Debt}_{i,t}/\text{Rev}_{i,t})$	-0.022 (-1.31)	0.059 (1.58)	0.041 (0.53)	1.545* (1.65)
b_5 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* d_{\text{sustain}}$	0.016** (2.33)	0.012*** (9.17)	0.018*** (6.57)	0.018*** (3.70)
b_6 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* d_{\text{elect}}$	-0.023* (-1.83)	-0.058** (-2.05)	-0.120** (-2.15)	-1.129** (-2.53)
Main Terms				
b_7 : $\text{Pop}_{i,t}/\text{Rev}_{i,t}$	-0.005* (-1.90)	-0.012** (-2.10)	-0.013 (-1.24)	-0.195** (-2.10)
b_8 : $\text{Debt}_{i,t}/\text{Rev}_{i,t}$	-0.005*** (-5.66)	-0.002 (-1.61)	-0.001 (-0.87)	-0.006 (-0.40)
b_9 : d_{sustain}	0.016*** (14.97)	0.023*** (14.65)	0.002 (1.13)	0.141*** (7.96)
b_{10} : d_{elect}	0.007*** (6.16)	0.002 (1.40)	0.005** (2.03)	0.062*** (3.41)
Number of Observations	35,007	8,916	2,624	1,549
Adj. R-Squared	0.590	0.451	0.352	0.228

Note:

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Variable definitions:

$\text{Rev}_{i,t}$, total revenues of municipality i in year t .

$\text{Pop}_{i,t}$, number of inhabitants

$\text{Debt}_{i,t}$, debt level

d_{sustain} a dummy variable which equals 1 if it is a year from 2014 to 2018 and 0 otherwise,

d_{elect} a dummy variable which equals to 1 when the data refer to 2010, 2014 and 2018 which are the years before local elections in 2011, 2015 and 2019.

Table A2. Population size, asymmetric behavior of investment expenses, financial sustainability, and elections.

	Coefficient Estimates (t - stat)			
	Column A Pop < 5,000	Column B 5,000 ≤ Pop < 20,000	Column C 20,000 ≤ Pop < 50,000	Column D Pop ≥ 50,000
b_0 : constant	-0.069* (-1.92)	-0.343*** (-3.73)	-0.491*** (-2.99)	-0.752*** (-2.73)
b_1 : $\Delta\text{Rev}_{i,t}$	1.221*** (5.50)	-0.756 (-0.36)	3.151** (2.33)	1.964*** (7.35)
Two – Way Interaction Term				
b_2 : $d_{i,t}^* \Delta\text{Rev}_{i,t}$	0.354** (2.27)	-1.089 (-0.98)	1.006 (1.16)	0.671* (1.89)
Three – Way Interaction Terms				
b_3 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* (\text{Pop}_{i,t}/\text{Rev}_{i,t})$	0.333*** (6.77)	-0.118 (-0.31)	0.699** (2.46)	-2.796 (-0.89)
b_4 : $d_{i,t}^* \Delta\text{Rev}_{i,t} (\text{Debt}_{i,t}/\text{Rev}_{i,t})$	-0.203*** (-2.77)	0.431** (2.13)	-0.008 (-0.02)	1.545* (1.65)
b_5 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* d_{\text{sustain}}$	1.302*** (5.39)	0.019*** (6.65)	0.009*** (2.72)	0.007* (1.80)
b_6 : $d_{i,t}^* \Delta\text{Rev}_{i,t}^* d_{\text{elect}}$	-0.329*** (-5.94)	-0.629*** (-4.12)	-0.826*** (-2.95)	-1.129** (-2.53)
Main Terms				
b_7 : $\text{Pop}_{i,t}/\text{Rev}_{i,t}$	0.001 (0.07)	-0.071** (-2.29)	-0.116** (-2.10)	-0.195** (-2.10)
b_8 : $\text{Debt}_{i,t}/\text{Rev}_{i,t}$	0.007 (1.06)	0.003 (0.44)	-0.014 (-1.46)	-0.006 (-0.41)
b_9 : d_{sustain}	0.088*** (17.96)	0.147*** (17.33)	0.119*** (8.68)	0.141*** (7.97)
b_{10} : d_{elect}	0.046*** (8.84)	0.049*** (5.61)	0.067*** (4.77)	0.062*** (3.41)
Number of Observations	35,007	8,916	2,624	1,549
Adj. R-Squared	0.395	0.278	0.236	0.228

Note:

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Variable definitions: $\text{Rev}_{i,t}$, total revenues of municipality i in year t . $\text{Pop}_{i,t}$, number of inhabitants $\text{Debt}_{i,t}$, debt level d_{sustain} a dummy variable which equals 1 if it is a year from 2014 to 2018 and 0 otherwise, d_{elect} a dummy variable which equals to 1 when the data refer to 2010, 2014 and 2018 which are the years before local elections in 2011, 2015 and 2019.

Table A3. Population size, asymmetric behavior of service provision expenses, financial sustainability, and elections.

	Coefficient Estimates (t - stat)			
	Column A Pop < 5,000	Column B 5,000 ≤ Pop < 20,000	Column C 20,000 ≤ Pop < 50,000	Column D Pop ≥ 50,000
b_0 : constant	-0.008 (-0.86)	0.070*** (4.00)	-0.231 (-1.22)	-0.651** (-2.37)
b_1 : $\Delta\text{Rev}_{i,t}$	0.149*** (4.21)	0.473* (1.90)	0.278* (1.73)	1.964*** (7.35)
Two – Way Interaction Term				
b_2 : $d_{i,t}^*$ $\Delta\text{Rev}_{i,t}$	0.388*** (15.70)	0.448*** (3.36)	0.490*** (4.77)	0.788*** (19.48)
Three – Way Interaction Terms				
b_3 : $d_{i,t}^*$ $\Delta\text{Rev}_{i,t}^*$ $(\text{Pop}_{i,t}/\text{Rev}_{i,t})$	0.142*** (18.13)	0.182*** (4.03)	0.166*** (4.92)	-0.671* (-1.92)
b_4 : $d_{i,t}^*$ $\Delta\text{Rev}_{i,t}$ ($\text{Debt}_{i,t}/\text{Rev}_{i,t}$)	0.021* (1.81)	0.055** (2.28)	0.024 (0.52)	0.075 (0.71)
b_5 : $d_{i,t}^*$ $\Delta\text{Rev}_{i,t}^*$ d_{sustain}	0.029** (2.46)	0.010** (2.12)	0.014** (2.49)	0.045*** (7.17)
b_6 : $d_{i,t}^*$ $\Delta\text{Rev}_{i,t}^*$ d_{elect}	-0.028*** (-3.17)	-0.015 (-0.85)	-0.018 (-0.55)	-0.015 (-0.31)
Main Terms				
b_7 : $\text{Pop}_{i,t}/\text{Rev}_{i,t}$	-0.010*** (-5.57)	-0.007** (-2.05)	-0.010 (-1.64)	-0.032*** (-3.15)
b_8 : $\text{Debt}_{i,t}/\text{Rev}_{i,t}$	-0.005*** (-7.91)	-0.003*** (-4.24)	-0.003*** (-2.61)	-0.003* (-1.94)
b_9 : d_{sustain}	0.010*** (13.39)	0.010*** (9.83)	0.010*** (6.58)	0.005*** (2.76)
b_{10} : d_{elect}	-0.003*** (-4.07)	-0.003*** (-2.84)	-0.002 (-1.55)	-0.001 (-0.71)
Number of Observations	35,007	8,916	2,624	1,549
Adj. R-Squared	0.347	0.343	0.284	0.241

Note:

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Variable definitions: $\text{Rev}_{i,t}$, total revenues of municipality i in year t . $\text{Pop}_{i,t}$, number of inhabitants $\text{Debt}_{i,t}$, debt level d_{sustain} a dummy variable which equals 1 if it is a year from 2014 to 2018 and 0 otherwise, d_{elect} a dummy variable which equals to 1 when the data refer to 2010, 2014 and 2018 which are the years before local elections in 2011, 2015 and 2019.**Table A4.** Linear model - Spanish municipalities asymmetric cost behavior.

	Coefficient Estimates (t - stat)		
	Column A Total Expenses	Column B Investments	Column C Service provision expenses
b_0 : constant	0.036*** (24.51)	0.023 (0.67)	0.009*** (8.10)
b_1 : $[(\text{Rev}_{i,t} - \text{Rev}_{i,t-1})/\text{Rev}_{i,t-1}]$	0.571*** (157.50)	1.212*** (30.27)	0.272*** (98.88)
b_2 : $d_{i,t}^*[(\text{Rev}_{i,t} - \text{Rev}_{i,t-1})/\text{Rev}_{i,t-1}]$	0.251*** (23.41)	0.212** (2.47)	0.118*** (12.08)
Number of Observations	72,253	70,872	72,253
Adj. R-Squared	0.362	0.226	0.134

Note:

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Variable definitions: $\text{Rev}_{i,t}$, total revenues of municipality i in year t .

Table A5. Linear model - Spanish municipalities asymmetric cost behavior and population size.

	Column A						Column B						Column C						Column D		
	Pop < 5,000			5,000 ≤ Pop < 20,000			20,000 ≤ Pop < 50,000			Service provision expenses			Total Expenses			Service provision expenses			Total Expenses		
	Total Expenses	Investments	Service provision expenses	Total Expenses	Investments	Service provision expenses	Total Expenses	Investments	Service provision expenses	Total Expenses	Investments	Service provision expenses	Total Expenses	Investments	Service provision expenses	Total Expenses	Investments	Service provision expenses	Total Expenses	Investments	Service provision expenses
b_0 : constant	0.046*** (25.52)	0.007 (0.29)	0.011*** (7.94)	0.011*** (4.87)	1.257*** (1.98)	0.017*** (10.61)	-0.012*** (-3.09)	-0.470*** (-9.52)	-0.007*** (-2.67)	-0.003 (-0.69)	0.010 (0.28)	0.005** 0.866*** 0.505***	0.010 (0.28)								
b_1 : $[(Rev_{i,t} - Rev_{i,t-1})/Rev_{i,t-1}]$	0.568*** 1.397***	1.397*** 0.272***	0.395*** 0.272***	0.395*** 0.272***	0.866*** 0.195***	0.106*** 0.212***	0.737*** 0.925***	0.925*** 0.446***	0.446*** 0.446***	0.505*** 0.505***	0.866*** 0.866***	0.232*** 0.232***									
b_2 : $d_{i,t} * [(Rev_{i,t} - Rev_{i,t-1})/Rev_{i,t-1}]$	(143.20)	(5.79)	(90.01)	(25.82)	(13.34)	(10.08)	(28.36)	(6.20)	(27.26)	(174.50)	(13.34)	(6.42)	(6.42)	(6.42)	(6.42)	(6.42)	(6.42)	(6.42)	0.157** 0.212**		
Number of Observations	(24.10)	(3.18)	(90.01)	(6.24)	(2.48)	(4.02)	(1.79)	(1.79)	(3.18)	(2.26)	(2.26)	(2.47)	(2.47)	(2.47)	(2.47)	(2.47)	(2.47)	(2.47)	(2.57)		
Adj. R-Squared	0.369	0.092	0.136	0.185	0.084	0.042	0.309	0.377	0.265	0.156	0.018	0.059									

Note:

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Variable definitions:

Rev_{i,t}: total revenues of municipality i in year t.