

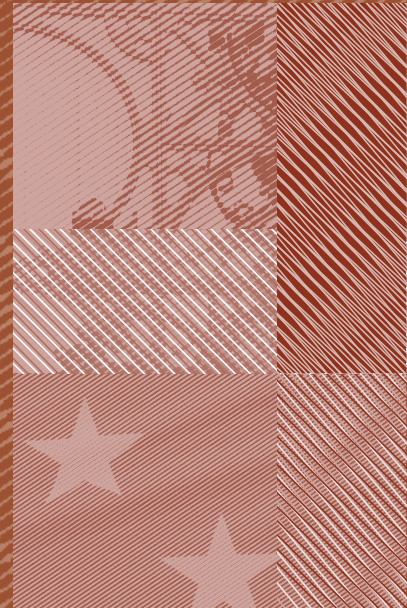
# THE STRUCTURE OF SUB-NATIONAL PUBLIC DEBT: LIQUIDITY VS CREDIT RISKS

2014

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Documentos de Trabajo  
N.º 1403

BANCO DE **ESPAÑA**  
Eurosistema



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# THE STRUCTURE OF SUB-NATIONAL PUBLIC DEBT: LIQUIDITY VS CREDIT RISKS <sup>(\*)</sup>

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(\*) The views expressed in this paper are the authors' and do not necessarily reflect those of the Banco de España or the Eurosystem. We are grateful to participants at the National Bank of Romania/ESCB WGPF Workshop (Bucharest, June 2013), the EcoMod2013 Conference (Prague, July 2013), and the seminar at the Banco de España (July 2013), in particular Claudia Braz, André Kolodziejak, Christopher F. Baum, Amela Hubic, Angi Roesch, Harald Schmidbauer and Ernesto Villanueva, along with as a referee of the Banco de España WP Series, for their useful comments. We also thank Jorge Abad, Luis Gordo, José A. Jiménez, Antonio Casado and José Pina for their help with the data. Correspondence to: Javier J. Pérez (javierperez@bde.es), Servicio de Estudios, Banco de España, c/Alcalá 48, 28014 Madrid, Spain.

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ISSN: 1579-8666 (on line)

## **Abstract**

We analyse the determinants of the structure of public debt in the case of Spain, from a sub-national perspective. The endogenous shift in the composition of debt (among short- vs long-term instruments, and loans vs securities) depends on observable measures of credit and liquidity risks. To discriminate among competing potential determinants, we set out empirical models that incorporate financial, economic and institutional variables. We estimate the models by GMM and make use of a new quarterly dataset of Spanish regional governments' debt structure for the period 1995Q1-2012Q4. Our results show that the most robust determinants of regional public financial management decisions, as reflected by the structure of debt, are rollover risks and the expectation of central government support (as measured by the dynamics of transfers).

**Keywords:** sub-sovereign public debt, public financial management, public debt structure, financial vulnerability indicators.

**JEL classification:** H6; E62; C53.

## **Resumen**

Analizamos los determinantes de la estructura de la deuda pública en el caso de España, desde una perspectiva subnacional. El cambio endógeno en la estructura de la deuda (entre instrumentos de corto plazo e instrumentos de largo plazo, y entre préstamos y valores) depende de medidas observables de riesgo crediticio y de liquidez. Para discriminar entre los determinantes potenciales, diseñamos modelos empíricos que incorporan variables financieras, económicas e institucionales. Estimamos los modelos mediante el Método Generalizado de Momentos y hacemos uso de una nueva base de datos trimestral sobre la estructura de la deuda pública regional española para el período I TR 1995-IV TR 2012. Nuestros resultados muestran que los determinantes más robustos de las decisiones sobre la gestión de deuda pública regional, reflejada por la estructura de la deuda, son los riesgos de refinanciación y la expectativa del apoyo del Gobierno central (medido por la dinámica de las transferencias a las Comunidades Autónomas).

**Palabras clave:** deuda pública subsoberana, gestión pública financiera, estructura de la deuda pública, indicadores de vulnerabilidad fiscal.

**Códigos JEL:** H6; E62; C53.

# 1 Introduction

The level of public debt in Spain more than doubled in the 2007-2012 period to reach 84.2 percent of GDP, almost closing the gap with the euro area aggregate number (90.7% in 2012), even though in 2007 the Spanish public debt-to-GDP ratio was 30 percentage points of GDP below the euro area one.<sup>1</sup> Both central and sub-national governments suffered this surge in debt, leading particularly the latter to substantial pressure when issuing new debt and refinancing operations on maturing debt, both from the point of view of market access problems and increased costs. Thus, a great deal of attention has been paid recently to the determinants of the level of sub-central governments' debt.<sup>2</sup> Sub-national fiscal imbalances have been signalled as a factor to be closely monitored given their potential to generate negative spillovers to overall Spanish public finances (Romeu, 2013, Fernández-Caballero et al., 2012).<sup>3</sup> Indeed, as claimed by van Heck (2013), Spain's sovereign yields were contaminated in 2012 by the debt problems of its Autonomous Communities. Given the existence of spillover effects among debt markets of euro area peripheral countries (Caporale and Girardi, 2013) these risks stemming from regions in one country could become euro-wide risks.

Beyond the level of debt, its financing method and the resulting debt structure are much less explored factors underlying sub-national governments' solvency, even though they have been signalled to impinge on fiscal and macroeconomic outcomes.<sup>4</sup> A perfectly solvent government –from the point of view of the standard debt sustainability analysis– may become insolvent due to short-run liquidity pressures. In fact, debt financing strategies can influence the exposure of a given level of government to short-term liquidity pressures. Therefore, this structure should be designed in such a way as to mitigate risks both for governments and for markets. Beyond the maturity structure, a related issue is the choice between the type

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<sup>1</sup>For a descriptive analysis of debt developments in Spain since the inception of the recent crisis see Gordo et al. (2013). The source of public debt data throughout the paper is the Bank of Spain.

<sup>2</sup>See Argimón and Hernández de Cos (2012), Hernández de Cos and Pérez (2013), and the references quoted therein.

<sup>3</sup>On more general grounds, see also Ahmad et al. (2005).

<sup>4</sup>See e.g. Bacchiocchi and Missale (2005), Faraglia et al. (2008), Alfaro and Kanczuk (2009), Arellano and Ramanarayanan (2012), or Hatchondo and Martínez (2013). Empirical applications and calibrations of theoretical models tend to focus on emerging economies.



of instrument used to cover financing needs, e.g. between loans and securities. Financing maturing debt and deficits by issuing securities tends to be more complicated in situations in which the liquidity risk is high, and typically loans offer an easier alternative. In the case of regional governments in Spain, in addition, loans provided by regional banks (savings banks, “Cajas de Ahorros”) might have been perceived in the pre-crisis period as arising from a relatively safe (“captive”) market as these regional banks were controlled to a large extent by regional governments.

The focus of our paper is on understanding the economic, financial and institutional determinants of the structure of sub-national<sup>5</sup> public debt in the case of Spain, by analyzing a comprehensive database for the period 1995-2012. We deem the purpose of the paper a relevant one from a general point of view for a number of reasons. First, from the public financial management point of view, policy makers may find it instructive to explicitly know the covariates that de facto determine the observed structure of public debt.<sup>6</sup> Second, as regards the interest from a financial point of view, Spain is the sixth sub-sovereign bond issuer world-wide, after the US, Germany, Japan, China and Canada (see Canuto and Liu, 2010). In the fourth quarter of 2012 total outstanding regional and local public debt amounted to 18.5 bn euro (17.6% of Spanish GDP), of which some two-thirds were in the form of securities (other than shares). Third, from the point of view of fiscal federalism, Spain is currently one of the most decentralized countries in the European Union, after three decades of a continued and strong public revenue and expenditure devolution process, a period in which, in addition, a number of supranational and national fiscal rules were put in place in the country. Finally, in this paper we exploit a newly available quarterly dataset on the structure of regional government’s debt.<sup>7</sup>

More in particular, we look at the determinants of the relative stock of debt at each maturity/instrument. If public debt managers were to have in mind a relative target value for each type of debt instrument, this would be, to our mind, the right type of object to study.

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<sup>5</sup>Throughout the paper we will use the term sub-national to refer to Regional (Autonomous Communities).

<sup>6</sup>On related grounds, Moldogaziev and Luby (2012) analyze the covariates associated with the decision to refinance existing debt in the case of California state and local government issuers between 2000 and 2007.

<sup>7</sup>Since September 2012 the Bank of Spain disseminates on a regular basis and at the quarterly frequency information on the structure of Regional and Local governments’ debt, for the period starting in 1995Q1.



Debt managers define an issuance policy (flow) with certain values of the stocks in mind, and departures from these target ratios only occur gradually, i.e. the selected ratios display strong inertia. This is what we observe in the data. In addition, the theoretical literature would support such a view. Beyond this general argumentation, data limitations prevent the scrutiny of issuance policies as such. Data in this regard could be mainly collected for securities other than shares.

The rest of the paper is organized as follows. In Section 2 we pose the main empirical hypotheses to be tested, against the background of existing theoretical and empirical work. In turn, in Section 3, we present some descriptive evidence on the structure of sub-sovereign public debt in Spain. Then, in Section 4, we describe the specific variables used in the empirical analysis as well as the econometric approach, while in Section 5 we present and discuss the main results of our study. Finally, in Section 6 we provide some conclusions and policy messages.

## **2 Theoretical background and hypotheses to be tested**

### **2.1 Theoretical background**

Some empirical studies have analyzed the determination of short-term debt, mainly in emerging market economies (Mehl and Reynaud, 2010; Valev, 2006, 2007; Lee et al., 2011; Borensztein et al., 2004; Rodrick and Velasco, 1999; Bussière and Mulder, 1999; Baldacci et al., 2011; Jedrzejowicz and Kozinski, 2012), some of them focusing on its role as an indicator of vulnerability to international financial crises. Increased reliance on short-term debt may make a government more vulnerable in a crisis framework, because of the need to rollover increased amounts of debt. As signalled by Borensztein et al. (2004), in a case in which a debt crisis mixes elements of illiquidity and insolvency, the government would be vulnerable to a piece of bad news, whose real impact would be amplified by creditors' unwillingness to roll over their claims (see also Jeanne, 2004). In addition, short-term debt can introduce another level of vulnerability for the fiscal accounts given that in an increasing interest rate environment interest payments may increase faster the higher the fraction of short-to-long-

term debt. In this respect, the structure of public debt may become a channel or source of vulnerability to the real economy and the financial system (Das et al., 2010).

The structure of government debt is to be expected to change in the face of an economic and financial crisis, even in a situation in which market access were not compromised. First, because short-term instruments might be the only ones available to keep on covering financing needs. Indeed, investors might be willing to hold short-term debt even in a situation in which they assign a non-zero probability to default as they may expect the sub-central government to repay them before the eventual default takes place. Second, in the case of sub-central governments' debt, investors may expect that the central government bails-out the administration under pressure, thus assigning to the default option a low probability. In the case of Spain some studies suggest that there have been de facto bail-outs of regions by the center over the past decades (see Lago-Peñas, 2005; Sorribas, 2012). This is in line with the so-called “soft budget constraint problem” in intergovernmental fiscal relations, that arises when sub-national governments' spending and borrowing decisions are influenced by the expectation of receiving additional resources from the central government (see Vigneault, 2007, for a survey on this issue).

Third, as Missale et al. (1997) and Campbell (1995) argue, a government committed to fiscal consolidation and debt stabilization may reduce the cost of debt servicing by issuing short-term debt. This is the case in a framework of asymmetric information in which the government and private investors do not share the same information (or perception) and thus long-term debt instruments pay too high interest rates as a reflection of credibility problems. A government can thus issue short-term debt to signal its resolution to carry out its fiscal consolidation plans.

This discussion on vulnerability risks in the domain of the studies that look at the determinants of the structure of sovereign debt can be enriched by considering the broader literature that looks at the determination of corporate debt maturities<sup>8</sup>. The later literature exploits the trade-off between, on the one hand, liquidity risk considerations, which lead to a longer maturity choice, and, on the other hand, borrowers' preference for short-term debt due to private information about future credit rating. In his traditional liquidity risk

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<sup>8</sup>See Berlin (2006) for a survey of this literature.

hypothesis Diamond (1991, 1993) argues that short-term debt creates liquidity risk to the borrower because the lender may refuse to rollover the debt if a piece of bad news arrives. Nonetheless, firms with favorable private information would prefer short-term debt to benefit from refinancing on favorable terms when their true credit quality is revealed to the market at the time of refinancing, while firms with unfavorable private information about future default risk will prefer long-term debt and thereby eliminate the uncertainty about the future refinancing risk. Nevertheless, even in the case of having favorable projections, a given highly-rated borrower may decide to choose long-term debt if liquidity risks are perceived as high. Additionally, because of information asymmetry and extreme adverse selection cost, the firms with very poor credit rating are not able to borrow long-term debt and may have no option but to choose short-term debt. Therefore, as Diamond predicts, both very low-risk and very high-risk firms would use short-term debt. These theoretical prediction of a non-monotonic relationship between debt maturity and liquidity risk has been tested and validated by a wealth of empirical research (see e.g. Barclay and Smith, 1995; Guedes and Opler, 1996; Stohs and Mauer, 1996; Johnson, 1997, 2003; Faulkender and Petersen, 2006): high- and low-ranked firms tend to issue short-term debt, while medium-ranked firms tend to rely on long-term debt.

This theoretical framework on the trade-off between the choice of the maturity of debt and liquidity risks can be instrumental to analyze the problem at hand in our paper. The discussed theories will therefore guide the selection of the variables to be included in the empirical analysis, as discussed in a subsequent section.

## 2.2 Hypotheses to be tested

Against the background of the previous discussion, we pose in our study a number of headline hypotheses to be tested:

- $H_1$  (Liquidity risks): Liquidity risks (proxied by roll-over risks) are expected to increase the fraction of short-term debt. In order to minimize liquidity risks, a given government would pursue long-term debt issuance. Nevertheless, if roll-over risks are high it would be the case that the government may only be able to issue short-term debt, and as such a positive and significant sign is to be expected.

- $H_2$  (Signalling): Signalling concerns (via “quality signals” such as adherence to fiscal targets) are expected to lead to a bias towards short-term debt vs long-term debt. A government would try to get short-term debt if current interest rates on long-term debt are high and the government intends to push for fiscal discipline. If fiscal discipline leads to credibility gains in the future, it would be possible for the government to issue long-term debt in more favorable conditions than currently.
- $H_2^b$  (Signalling and the fraction of loans vs securities): It is expected that a higher perceived quality of a given government may lead to an increase in the fraction of securities vs loans, as a better access to the international markets may be granted.
- $H_3$  (No bail-out and short- vs long-term debt): If investors perceive a strong support of the Central Government, they would be willing to take long-term government debt. Investors may assign a high probability to the bail-out option of a given region by the Central Government, and thus a low probability to the default alternative. As a consequence, investors would be willing to get long-term debt given favorable interest rates and Central Government implicit guarantees. Thus, CG support may help easing access to the markets by regions, while at the same time may induce that too high interest rates are locked-in today for the future (i.e. until the redemption of a given issuance of long-run debt).
- $H_4$  (Business cycles): In adverse cyclical conditions and under market stress, there might be a shift towards shorter-term instruments and loans vs securities, while at the same time an increase in the fraction of resident holders is expected.

### 3 Some stylized facts

Our panel contains quarterly data for each individual regional government, covering the period 1995Q1-2012Q4. In this Section we provide some stylized facts on the main relevant aggregates of the 17 Spanish regions. The recent crisis period has led to a substantial increase in sub-national debt in Spain. This is not a phenomena restricted to these levels of the government sector in Spain, but rather a general fact, as witnessed in Figure 1.

In the particular case of regional governments, their aggregated debt increased from some 5.8% of GDP in 2007Q4 to 13.3 % in 2011Q4 and further to 17.6% at the end of 2012 (see Table 1). In 2012, 3.3 points of GDP of this debt were in the form of loans provided by the Central Government, that put in place along the year a number of programmes to support regional governments subject to liquidity problems. In particular, since early 2012, the Spanish government implemented two types of financial support funds. First, the so-called, “Fund for the Financing of Providers” (*Fondo para la Financiación del Pago a Proveedores*, FFPP) that aimed at paying down commercial debts (“Other accounts payable by the government sector”, in particular, trade credits) of regional and local governments with non-financial corporations. The later had escalated to some 4% of GDP in 2012Q1. As of 2012Q4, some 65% of the latter amount had been paid (some 27 bn euro), while the remaining amounts were paid by the end of 2013 (indeed, as of December 2013 the central government took care of paying down approximately 42 bn euro in cumulative terms since 2012Q1). A second financial support plan was the “Regional Liquidity Fund” (*Fondo de Liquidez Autonómica*, FLA), implemented by mid-2012, that was initially designed to cope with the debt refinancing needs of regional governments. In 2012, the FLA lent a total of 16.6 bn (1.6% of GDP) to regional governments that joined the mechanism (see Gordo et al. (2013) for more details on these issues).

If instead of using GDP we use regional governments’ total revenues<sup>9</sup> as the denominator of the ratio to their public debt, the picture that emerges is noteworthy and gives an idea of the level of financial stress regions have been subject to. Indeed, in 2007Q4 debt was less than 40% of their revenues, after decreasing steadily over the 1990s and 2000s also on the back of a strong devolution process, but it more than tripled since then to reach some 126% in 2012Q4.

The increase in the level of sub-national debt witnessed in Spain in the crisis period came hand-in-hand with a change of its structure. First, the ratio of short- to long-term debt<sup>10</sup>

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<sup>9</sup>Total non-financial revenues, including transfers from other levels of the General Government.

<sup>10</sup>The measure available for long- and short-term debt is the sum of total Securities other than shares and Loans by Resident Financial Institutions. To our knowledge, there is currently no comprehensive dataset publicly available on the short- versus long-term distribution of regional governments’ loans by the Rest of the World.

stood at 11% in 2007Q4, down from the 33% of the beginning of the sample (1995), but increased substantially to close to 25% by 2011Q4 at the height of the euro area sovereign crisis (see Figure 2). The same picture can be drawn from the data by region. This change in structure occurred, in parallel to an increase in the amount of maturing debt by year, as shown in Figure 3 (upper panels), where we show the ratio of short- to long-term debt versus the amount of financing needs (as a percent of each region's GDP). In 2012 the fraction of short- to long-term debt got reduced to levels similar to the ones observed at the beginning of the crisis, but still well above pre-crisis values.

The second change witnessed in the structure of regional debt has to do with the portfolio of securities vs loans. Traditionally, sub-central governments in Spain have relied more intensively on loans than the Central Government. Regional governments managed to increase in a steadily manner the ratio of securities-to-loans from some 66% around 1995 to above 105% by 2007. Since then, the upward trend has been reversed, and in 2012Q4 the stock of regional debt was distributed by almost half between securities and loans. Nevertheless, the relative ratio for 2012 is significantly affected by the fact that a number of financial funds implemented in the course of the year by the Central Government aimed at easing Regional governments' difficulties in accessing the markets were accounted for as loans; excluding the latter factor, the ratio of securities to loans stood at close to 75% in 2012Q4. It is worth noting that support funds were aimed particularly at the more troubled regions (see Figure 4), typically those with a high amount of financing needs and/or high levels of debt.

It is also possible to scrutinize the distribution of regional debt by resident financial institutions and non-resident holders ("Rest of the World"), but only in the case of loans due to data limitations. In this regard, the ratio of loans by non-residents to loans by resident financial institutions decreased by half in the crisis period, after having reached more than 100% in 2007.

Finally, as shown in Figure 5 for the case of regional debt, the discussed debt-structure ratios – namely, the ratio of short-term to long-term debt, the ratio of loans to securities, and

the ratio of loans by residents to those by non-residents – showed positive (unconditional) correlations over the period 1995-2012, with implicit interest rates on overall regional debt.<sup>11</sup>

Summing up, in the pre-crisis period the structure of regional governments' debt was sound according to the usual standards in the “sovereign debt vulnerability” literature. The ratio of short- to long-term debt was at historical lows, the ratio of securities to loans at historical highs, and there was a broad base of non-resident operators in the loans segment of the market. Nevertheless, the impact of the crisis moved all these ratios in the direction that economic theory would have predicted.

## 4 Variables and empirical approach

### 4.1 Variables of interest

As regards the ratio of short- to long-term debt,  $B_t^{ST}/B_t^{LT}$ , both the numerator and the denominator are constructed as the sum of securities other than shares and loans by resident financial institutions, at the corresponding maturity. Thus, both the numerator and the denominator exclude loans by non residents given lack of data on its decomposition by maturity. In addition, it is worth highlighting that loans by the central government are excluded from this definition to avoid distortions in the subsequent analysis. This is a phenomena confined to the year 2012, given that the central government support funds to the regions mentioned in a previous section were implemented through loans. The first ratio of interest captures the relative preference over the maturity of debt. The second ratio of interest is the one of securities to loans,  $B_t^S/[B_t^L - B_t^{CG,L}]$ , where again exceptional Central Government liquidity-support funds in 2012 are excluded.

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<sup>11</sup>The source of interest payments' data is the IGAE. Implicit interest rates are computed as the ratio of interest payments to overall debt and are only available at the annual frequency for the period under study.



## 4.2 Control variables

**Liquidity risks** We proxy “liquidity risks” by a variable measuring “roll-over risks” (*Financing needs*), defined as maturing debt in the period<sup>12</sup> plus deficit financing needs<sup>13</sup>.

**Economic factors** GDP growth is typically used as a proxy to measure current cyclical conditions, but also future potential growth. In economic recessions, budget deficits increase and so public debt does. At the same time, the economic environment may affect the ability of a government to place its debt in the market. When the economy is in a downturn, the market becomes more restrictive and confidence levels decrease, which may entail lenders preference for shorter maturities and safer bonds (De Broeck and Guscina, 2011; Goudswaard, 1990). As a proxy to the business cycle we take the Industrial Production Index (IPI) given the lack of quarterly GDP data<sup>14</sup>. IPI is a widely used measure in the literature analyzing business cycles, and has been shown to be of use in the case of the Spanish regions (see Gadea et al., 2013). We take the annual growth rate of IPI (*Cycle*).

In addition to a measure of economic activity, the literature highlights the importance of price inflation (we use CPI annual growth data, *Inflation*). A positive relationship between inflation and the short- to long-term debt ratio is expected: one can expect that the higher interest rates that increasing prices imply would make shorter maturities more attractive to bond takers (Goudswaard, 1990). Inflation reduction or stabilization may also be seen as a signal of monetary credibility which will affect debt composition towards safer structures. For example Mehl and Reynaud (2010) show that the share of short-term debt in total public debt decreases when inflation declines. Higher inflation is associated with higher inflation uncertainty, leading to higher risk premia on long-term nominal debt and thus leading governments to stop issuing long-term debt (Missale and Blanchard, 1994). Hoogduin, Ozturk and Wierds (2010) show that in an inflationary environment, investors might opt for short

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<sup>12</sup>The source of data on maturing debt is the Bank of Spain. It comprises maturing securities.

<sup>13</sup>There are no quarterly regional government deficit figures available for the period 1995-2010. For this period the annual deficit is taken and distributed among the four quarters of each year on the basis of the profile of the general government figures.

<sup>14</sup>The Spanish National Statistical Institute publishes raw IPI figures for all the Spanish regions. We seasonally-adjusted the raw series using the TRAMO-SEATS package.

term positions. They found that higher inflation increases the share of short term financing. In our application with regional data, though, these considerations might not be relevant because of the different scope of the analysis (regions vs countries) and because almost all debt issued in the past decades was debt in euros within a broad monetary union.

**Size of the issuer** The size of the Region (*Size*) is expected to be positively related to debt maturity. In this sense, wealthier/larger regions are presumed to enjoy easier access to markets and a greater ability to issue safer debt. However, and, at the same time, because of that wider market access for the region, shorter debt instruments are also expected to be more used. We measure this economic concept by the relative GDP of the region compared to the nation-wide one.<sup>15</sup>

**Signalling hypothesis: quality** Debt maturity is and appropriate and valid signal to asymmetrically informed markets about the quality of a firm (Myers, 1977; Leland and Pyke, 1997; Ross, 1997) or a government. Lower debt maturities in the literature looking at the debt maturity choice tends to be associated with a higher quality of the issuer. In the case of sovereign issuers, the fulfilment of budgetary objectives can be considered as a signal of high quality, in particular in times of fiscal consolidation (*Budgetary deviation*). In the same fashion, additional measures might be the level of debt of the region (*Debt/GDP*), its relative debt compared to peers (*Debt deviation*), the change in debt and any interaction of these variables. Missale and Blanchard (1994) show that governments will tend to have a shorter debt maturity to enhance credibility when the debt burden is high, but not necessarily at low levels. Hoogduin et al. (2010) state that a higher debt stock may also signal higher credit risk and limit access to the capital market. They found that higher debt seems to lead to a more “prudent” financing. World Bank (2005) argues that fiscal consolidation is a key component of a credible debt reduction strategy. De Broeck and Guscina (2011) signal that higher debt has a non-linear effect on the domestic medium-to-long term debt with a fixed interest rate shares: debt has to achieve a critical mass for liquidity purposes and generate institutional investor interest. However, once the debt (as a share of GDP) exceeds a certain

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<sup>15</sup>To compute the quarterly ratios, quarterly regional GDPs have been interpolated on the basis of each region’s share in annual overall Spanish GDP.

threshold, sovereign risk is a concern and medium-term instruments are less attractive for investors. Guscina (2008) shows that more heavily indebted countries (as proxied by debt service to GDP ratio) have problems extending the maturity profile of domestic debt.

Finally, we also computed a standard sustainability indicator, namely European Commission's S1 indicator, to use it as a proxy of the quality of public finances in the medium-term. The S1 indicator shows the durable adjustment to the structural primary government balance required to reach a target public debt of 60% of GDP in 2060. The indicators quantify the gap that must be closed to ensure the sustainability of public finances. The larger the value of the gap indicator, the greater is the necessary adjustment to the structural primary balance to ensure sustainability. To compute this indicator for each quarter of the period 1995Q1 to 2012Q4, one needs assumptions about the future evolution of the variables that enter the intertemporal government budget constraint, namely real GDP growth, the nominal interest rate, the inflation rate, public debt and the primary budget balance. First, we take observed values of the variables as the expected values (perfect foresight hypothesis) when possible. Second, we use the forecasts of the latest Spanish Stability and Growth Pact of April 2013 for the period 2013-2016. Finally, to extrapolate beyond 2016 we follow the somewhat standard practice of keeping the necessary variables constant, i.e. equal to the 2016 projected value.

**Term structure** A positive relation is expected between debt maturity and the term structure (see for example Brick and Ravid, 1985) as investors certainly weigh the relative costs of alternative debt instruments. We use a measure of the slope of the yield curve (*Slope*): the average yield in a given quarter of the 10-year Spanish bond minus the equivalent measure of the 6-month T-bill.

**Market preferences** Market preferences on overall Spanish government debt instruments could influence the structure of regional public debt. Market conditions could be measured by the extent to which governments are able to issue all the debt they intend to. For this purpose, we use the ratio of central government bonds and Treasury Bills allocations to requests (*Bonds coverage*). As this ratio is closer to one, the room for implementing debt

issuance strategies by the government diminishes. Therefore, we expect this variable to have a positive sign on the short-to-long regional debt ratio.

Another side of the preference equation is the presence of foreign investors in the market for regional debt. A higher presence of foreign investors (risk-averse) may lead to shorter maturities. Mehl and Reynaud (2008) state that a broader domestic investor base (ratio of gross private savings to GDP) can be expected to make domestic debt composition safer by contributing to support demand for (domestic currency, unindexed) long-dated debt instruments. To avoid endogeneity problems we build up a variable, *NR/R preference* to, be included as a regressor in the equations determining the ratios of interest (short-to-long and securities-to-loans) and that, as will become clearer in the next Section, is the residual of a regression of the ratio of non-resident-to-resident loan providers on all the explanatory variables included in each equation.

**Other controls: political and institutional factors** The literature has proved that institutional and political factors need to be taken into account when fiscal performance is analyzed. On the one hand, we incorporate electoral variables (*Elections dates*). This relates to the evidence proving that as elections are closer governments tend to increase expenditures in an attempt to show voters they care about welfare and social matters. This may therefore influence debt patterns and we are interested in testing whether this affects the debt structure itself or favors any of the issuance strategies considered. More specifically, *Elections dates* is a regional dummy that takes the value 1 in a particular quarter if a regional election took place in that very quarter.<sup>16</sup>

Additionally, there is an existing literature that focuses on whether the quality of institutions influences public debt management. Guscina (2008) states that better institutions decrease the share of short-term debt. Weak institutions can compromise the government's ability to implement effective fiscal policy, to constrain policy commitments, to manage liabilities and to control and limit fiscal risk. Nevertheless, the existence of fiscal and no-bailout

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<sup>16</sup>We also tried in the empirical models another proxy to test for electoral cycles: *Proximity to elections*, that is an indicator that takes the timing of an election into account. We use the version of the latter developed by Franzese (2000), that is calculated as  $ELEC_{it} = [(M - 1) + d/D]/12$ , where  $M$  is the month of the election,  $d$  the day of the election and  $D$  is the number of days in that quarter.

rules may exert some influence on moving market preference to shorter bonds. According to Borensztein et al. (2004) lack of credibility plays an especially important role in periods leading up to crises, as governments tend to shift the composition of their debt towards shorter maturities and foreign-currency denomination. In turn, Valev (2006) finds that weak institutions explain why some countries find it difficult to obtain long-term financing. We use EC's Fiscal Rule Index (*FRI*) in our empirical analysis to test the effect of formal rules on the variables of interest. The *FRI* is a comprehensive time-varying fiscal rule index constructed by the European Commission for each EU Member State. Each individual fiscal rule is weighted by the coverage of general government finances of the respective rule (i.e. public expenditure of the government sub-sector(s) concerned by the rule over total general government expenditure); in the presence of more than one rule covering the same government sub-sector, the second, third, and fourth rules obtain weights  $\frac{1}{2}$ ,  $\frac{1}{3}$  and  $\frac{1}{4}$ , to reflect decreasing marginal benefit of multiple rules applying to the same sub-sector. The assigned weights are mainly determined by the fiscal strength of the rule and its coverage.

The territorial organization of a country has also been pointed out by the literature as a determinant of the fiscal situation. Particularly, the increasing responsibilities assumed by the regions and the available instruments for their funding are factors that influence fiscal outcomes and then public debt patterns. Following this idea, an indicator of fiscal co-responsibility (*Corring*) has been introduced in our analysis. The index is constructed as the ratio of taxes on which regions have normative power (direct<sup>17</sup> and indirect taxes<sup>18</sup>, excluding VAT) to total revenues. To ease changes in expenditures responsibilities in the middle of the sample, we split it into two variables which take the value of the mentioned indicator for the corresponding period (1997-2001 and 2002-2010, respectively<sup>19</sup>) and zero otherwise (*Fiscal corresponsibility 1997-2001* and *Fiscal corresponsibility 2002-2010*). We expect these two variables to have a negative impact on the short- to long-term debt ratio as increasing fiscal responsibility is thought to have led to reductions in systematic debt issuance and possibly disfavor short-term bonds. Additionally, given the different pace of revenue and expenditure devolution in Spain over the past three decades, we also incorporate

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<sup>17</sup>Namely, Inheritance tax, Income tax, Wealth tax, and others.

<sup>18</sup>Namely, Property Transfer and Certified Legal Documents Tax, Excise Duties, and others.

<sup>19</sup>See Hernández de Cos and Pérez (2013) for more details on this issue.

a measure of public expenditure responsibilities. It is worth mentioning that education and health expenditure is almost fully a responsibility of regional governments. Given shortages of data we were only able to compute a measure of health expenditure (*Health expenditure*).

Beyond the latter measures of “fiscal decentralization”, a key variable to incorporate in the analysis is the amount of Central Government transfers (*CG transfers*) to the regions. This is so because of the existence of evidence on the “soft-budget constraint” hypothesis discussed above. To control for changes in the form of regional financing, we construct an aggregate measure (i.e. for the aggregate of regional governments) that sums shared taxes (that started to be devolved at increasing speed as of the end of the 1990s) and genuine Central Government transfers to the regions.

### 4.3 Empirical strategy

The econometric model used can be specified in general terms as

$$Y_{it} = \alpha_i + \sum_{j=1}^N \beta_j \Omega_{jit} + \sum_{j=1}^N \gamma_j X_{jit} + \epsilon_{jit} \quad (1)$$

Where the particular debt structure ratio for each Regional government  $i$  at time  $t$ ,  $Y_{it}$ , depends on two sets of control variables,  $\Omega$  and  $X$ , encompassing all factors mentioned above. The first set,  $\Omega$ , contains the lagged dependent variable along with potential endogenous controls, which will be modeled differently from those comprised in  $X$ , which are thought to be exogenous. We follow the traditional fixed-effects model approach, where  $\alpha_i$  aims at capturing all the unobservable region-specific effects that are time-unvarying, while  $\epsilon_{it}$  is an error term assumed to be a white noise. In order to control for potential correlation between individual effects and regressors, we estimate equation (1) in first differences. This, however, does not avoid latent simultaneity problems that may arise between regressors and the lagged error term  $\epsilon_{it-1}$ . Besides, the lagged dependent variable,  $Y_{it-1}$ , still remains potentially endogenous. For these reasons, the estimation is carried out by the Generalized Method of Moments (GMM). Particularly, we perform GMM estimations instead of difference GMM since lagged levels could be poor instruments for first differences if the variables are close to a random walk. In practice, we implement the Stata routine `xtabond2`, which, along

with the estimation of the model equation (1) in first differences (transformed equation), adds to the system the original equation in levels (untransformed equation) so additional instruments can be brought to increase efficiency. In a first step, differenced variables in (transformed) equation (1) are instrumented with their own available lagged levels. Then, level variables in (untransformed) equation (1) are instrumented with suitable lags of their own first differences.<sup>20</sup>

In our framework, most of the variables included in the analysis are potentially endogenous. In fact, in our empirical models all the potential covariates discussed in the previous Section are considered to be part of  $\Omega$ , with the exception of the variables measuring the institutional strength of fiscal rules and electoral dates. In addition, as briefly discussed in the introductory and stylized facts sections, our dependent variables are quite persistent. Indeed, public debt managers tend to have in mind (either explicitly or implicitly) a relative target value for each type of debt instrument, a situation that to a large extent determines the issuance policy (flow), what creates a strong inertia in the observed equilibrium time series. Given the large amount of variables to be instrumented, we paid special attention to the number of lags used as instruments. We tried several specifications with one, two and more lags. On the one hand, the quarterly nature of our data advises the inclusion of more than one lag, also bearing in mind that more distant lags would qualify as better instruments. Nevertheless, on the other hand, the quality of the Hansen test of the instruments' joint validity deteriorates significantly with more than two lags, even though the quantitative results do not vary significantly, as shown in the next Section. The models with one and two lags are broadly appropriate (as it will be shown in the empirical results' Section) and do not differ significantly among them in qualitative and quantitative terms. Given the quarterly frequency of our dataset we show in the tables the results using two lags.<sup>21</sup>

Finally, even though it is known that in a framework like ours OLS estimators may suffer from the “dynamic panel bias” (the positive correlation between a regressor and the error violates an assumption necessary for the consistency of the OLS estimator), we also provide

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<sup>20</sup>Arellano and Bover (1995), Roodman (2006).

<sup>21</sup>Detailed results using one and three lags are available from the authors upon request, and are not shown for the sake of simplicity. In the next Section we only show one selected set of results using different lags as instruments, for the sake of robustness.



them in all the tables of results shown in the next Section. The reason is that one has to acknowledge that system GMM estimators in finite samples may be subject to instrument proliferation, and as such a simpler and more widely understood estimation alternative may be helpful for the informed reader.

## 5 Results

The main results of the paper are summarized in tables 2, 3, and 4, where we present a subset of the results, that involved a larger number of empirical specifications that combined all the control variables described above. In the tables we show results for the full sample (1995Q1-2012Q4), for the pre-crisis sample (1995Q1-2007Q4) and for the sample excluding 2012.<sup>22</sup>

As regards the determinants of the ratio of short- to long-term debt,  $B_t^{ST}/B_t^{LT}$ , the following results are worth highlighting (tables 2 and 3).

First, the variable measuring roll-over risks (*Financing needs*) appear as the most robust regressor in all the specifications considered. An increase in the amount of financing needs (either in the form of maturing debt or current deficit financing) leads to a debt structure more leaned towards short-term debt, i.e. the amount of short-term debt increases in relative terms with respect to the amount of long-term debt. This result lends support to the view that increased liquidity risks imply a shortening of debt maturities, once the rest of variables included in the empirical specification are controlled for. The costs associated with short-term debt (risk associated to potential difficulties to rollover the debt) are thus outweighed by other factors. This result holds for the whole sample and also for the pre-crisis sample (i.e. when the post-2007 sample is excluded from the estimation). In line with the theoretical priors laid out before, one may claim that this result is consistent with a situation in which Autonomous Communities, that presented a sharp reduction in their credit ratings since

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<sup>22</sup>We show in the tables point estimates and their significance. Regarding statistical tests, we check for both autocorrelation and overidentifying restrictions. With respect to the former, the Arellano-Bond test is implemented. As regards the latter, given that the Sargan statistic is not robust to heteroskedasticity or autocorrelation, for one-step robust estimation (and for all two-step estimation), only the Hansen J statistic is reported, which is the minimized value of the two-step GMM criterion function, and is robust.

the inception of the crisis, were not able to borrow as much long-term debt as desired and may have no option but to choose short-term debt. From a different point of view, one may read this empirical evidence, according to a stream of the literature, from the angle that governments would have tried to reveal to the markets their solvency – reflected in the long-term fundamentals or the expectations of a central government bail-out – or their commitment to fiscal consolidation by issuing more short-term debt in relative terms, in an attempt to obtain refinancing in the near term on favorable terms when their true credit type is assessed by investors. On related grounds, and in order to rationalize the pre-crisis results, one may argue that governments facing a favorable stream of revenues (as in the pre-crisis period) would have preferred short-term debt to benefit from better refinancing conditions if this were taken by the market as a quality signal at the time of refinancing.

Second – still on the determinants of  $B_t^{ST}/B_t^{LT}$  – the variable measuring Central Government transfers (*CG transfers*) appears also as a quite robust regressor across empirical specifications and samples. The negative sign denotes that investors anticipate that the Central Government would increase transferred resources (be it genuine transfers or improvements in the financing arrangements) in case a given region face financial problems, and thus they will be willing to finance longer-term debt to that particular region at favorable conditions for them. This is in line with the prescription of the “soft budget constraint” theory. The implicit bail-out that increased central government transfers might imply can be seen to the light of investors as a safeguard against the potential losses of a given regional government’s default.

Third, the size of the region (*Size*), is significant and presents a positive sign. This is consistent with the standard result in the empirical literature that the size of a debt issuer is significant for market access, possibly because it implies a deeper debt market.

Fourth, stricter adherence to previous year’s budgetary target (*Budgetary deviation*) tends to be associated with easier access to short-term debt in relative terms. This result would support the view outlined above that quality signals would be associated with a will to issuing more short-term debt in relative terms, in order to obtain more favorable refinancing conditions in the near future. Even presenting the expected negative sign, the estimates when only the pre-crisis sample is considered are less precise and thus the variable lose statistical significance.

Fifth, the variable that measures preference for Spanish debt, measured by the slack in Treasury's auctions (*Bonds coverage*) is significant and presents the expected positive sign. Finally, the shock to the preference of non-resident debt holders (*NR/R preference*)<sup>23</sup> has a negative sign, indicating that foreign investors' non-systematic behavior (not explained by fundamentals) is more favorable to longer maturities. This variable turns out to be only statistically significant when the crisis years are included in the estimation, as might have been expected.

A significant group of variables were not found to present statistical relevance for the determination of the ratio of short- to long-term debt. Among others, the variables measuring the business cycle influence, the long-term sustainability of public finances (S1) and those related to institutions and the political cycle variables. As a matter of fact, some of these variables (and other) are typically found in the literature to be explanatory factors of the level of public debt, which do not imply that they should have explanatory power on the structure of debt itself, in a framework in which different types of debt tended to move in similar directions.

Regarding the determinants of the ratio of Securities to Loans ( $B_t^S/[B_t^L - B_t^{CG,L}]$ ), that are displayed in Table 4, the following results can be underlined. First, as in the case of the maturity structure, the variable measuring financing needs shows up statistically significant. The negative sign, in this case, indicates that increased financing needs shifts the portfolio composition more towards loans, as expected. In times of financial hardship regional governments would tend to resort in relative terms more to loans. The reliance on loans could be expected given that this source of financing rests mainly on the (national/regional) banking sector and thus entails less trouble than open issuance in the market. This is clear in the case of Spain given that Autonomous Communities could rely over most of the sample period analyzed on regional, savings banks ("Cajas de Ahorros"). The particular governance structure of these entities, that involved significant regional government presence, may have facilitated the use of this channel of financing. Second, the expectation of Central

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<sup>23</sup>Remember this is constructed by using the same specification as in the baseline equation but with the ratio of non-resident to resident loan providers.

Government bail-out (*CG transfers*) is also statistically significant in the broader sample and presents a positive sign in all cases. This implies that central government support made it easier for regional governments to twist their portfolio, everything else being equal, towards securities, as it would have been expected. Nevertheless, when considering all the empirical specifications and samples, this regressor is less robust than in the case of the short- vs long-run ratio. Finally, the shock to the preference of non-resident debt holders (*NR/R preference*) presents a positive sign, indicating that foreign investors' non-systematic behavior (not explained by fundamentals) is more favorable to securities rather than loans in relative terms, also as expected. As for the rest of control variables, only the interaction of the level of debt with the deficit, among the indicators of "quality", turned out to be statistically significant in a consistent way across specifications, presenting the expected negative sign.

Finally, as a matter of additional robustness check for the GMM estimator, we show in Table 5 the results obtained for the main empirical specifications for different number of lags used as instruments (1, 2, and 3 lags). The figures presented show that our main results are quite robust to this critical GMM issue.

## 6 Conclusions

We analyze the determinants of the structure of public debt in the case of Spain, from a sub-national perspective, focusing on the ratios of short- to long-term debt and, securities vs loans. We incorporate a number of variables that proxy liquidity and credit risks and assess their relative merit.

Our results can be summarized as follows, to the light of the hypothesis posed. As regards  $H_1$  liquidity risks (proxied by roll-over risks) are found to increase the fraction of short- to long-term debt. Thus, the costs associated with short-term debt (potential difficulties to rollover the debt) are found to be outweighed by other considerations. In particular, one may rationalize this result given the potential inability of low-rated Autonomous Communities to have the desired access, in relative terms, to longer term instruments. From a different point of view, though, one may read this evidence to the light of one strand of the literature

that states that fundamentally sound governments may be willing to issue in relative terms more short-term debt, in order to obtain refinancing in the near term on favorable terms when their true credit type is assessed by investors. As regards the impact of liquidity risks on the choice of securities vs loans, we find that increased financing needs shifts the portfolio composition more towards loans, as expected.

Regarding the signalling hypothesis ( $H_2$ ), we find only a reduced set of statistically significant determinants (budgetary deviations, size of issuer). In the cases in which the variables were significant we found that quality signals were conducive to a relative bias towards short-term debt vs long-term debt and securities vs loans.

Central government support is found to be consistent with some form of the “soft budget constraint hypothesis”, namely that investors may be assigning a high probability to the bail-out option of a given region by the Central Government. As a consequence, investors would display a relative preference for holding longer-term debt, and securities.

Other factors play a much lower role in explaining the debt structure ratios of interest. In particular, institutional and political factors are not found to be of relevance in a robust manner across empirical specifications. This is also the case for the influence of the business cycle ( $H_4$ ).

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Figure 1: The evolution of General Government (EDP) debt and aggregate of Regional Governments' non-consolidated debt in Spain, 1990-2012.

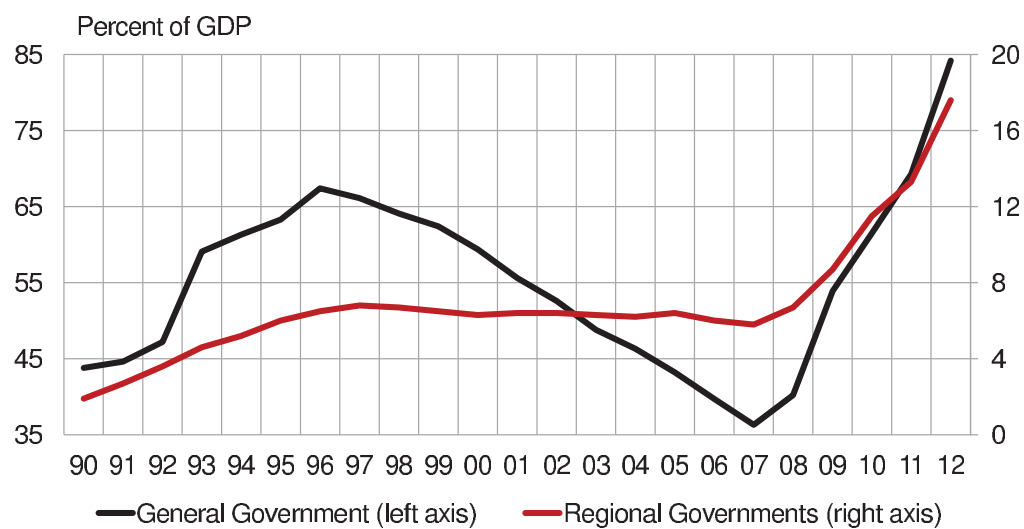


Table 1: The structure of regional governments' debt in Spain.

		1995Q4	2007Q4	2011Q4	2012Q4
Total debt <sup>a</sup> as a percent of GDP	$B_t/Y_t$	6.0	5.8	13.3	17.6
of which Central Gov. support Funds	$B_t^{L,CG}/Y_t$	-	-	-	3.3
Total debt as a percent of total revenue		59.3	38.6	96.6	126.2
Long-term <sup>b</sup> debt as % of long+short <sup>b</sup>	$B_t^{LT}/[B_t^{LT} + B_t^{ST}]$	75.2	90.1	81.1	87.4
Short-term <sup>b</sup> debt as % of long+short <sup>b</sup>	$B_t^{ST}/[B_t^{LT} + B_t^{ST}]$	24.8	9.9	18.9	12.6
Short-term <sup>b</sup> as % of long-term <sup>b</sup> debt	$B_t^{ST}/B_t^{LT}$	33.0	10.9	23.3	14.4
Securities as a percent of total debt	$B_t^S/B_t$	39.7	51.4	44.9	34.5
Loans as a percent of total debt	$B_t^L/B_t$	60.3	48.6	55.1	65.5
of which Central Gov. support Funds	$B_t^{L,CG}/B_t$	-	-	-	18.6
Securities as % of loans	$B_t^S/B_t^L$	65.8	105.9	81.4	52.7
excluding Central Gov. support Funds	$B_t^S/[B_t^L - B_t^{L,CG}]$	-	-	-	73.6
Loans by resident FI <sup>c</sup> as % of total loans	$B_t^R/B_t^L$	80.2	47.4	59.5	44.1
excluding Central Gov. support Funds	$B_t^R/[B_t^L - B_t^{L,CG}]$	-	-	-	61.6
Loans non-residents <sup>d</sup> as % of resident FI <sup>c</sup>	$B_t^{NR}/B_t^R$	24.8	106.1	59.4	53.5

Notes: <sup>a</sup> Sum of Securities other than shares ( $B_t^S$ ) and Loans ( $B_t^L$ ). The breakdown of  $B_t^S$  between Short-term and Long-term securities is available, but not the breakdown between resident and non-resident holders of Securities.  $B_t^L$  is the sum of Resident Financial Institutions, Rest of the World, Central Government, and Public-private Partnerships. The breakdown of Loans by Resident Financial Institutions by short-term and long-term is available. <sup>b</sup> Sum of Securities other than shares and Loans by Resident Financial Institutions. <sup>c</sup> FI: Financial Institutions. <sup>d</sup> Loans by the Rest of the World.

Figure 2: The structure of regional governments' debt.

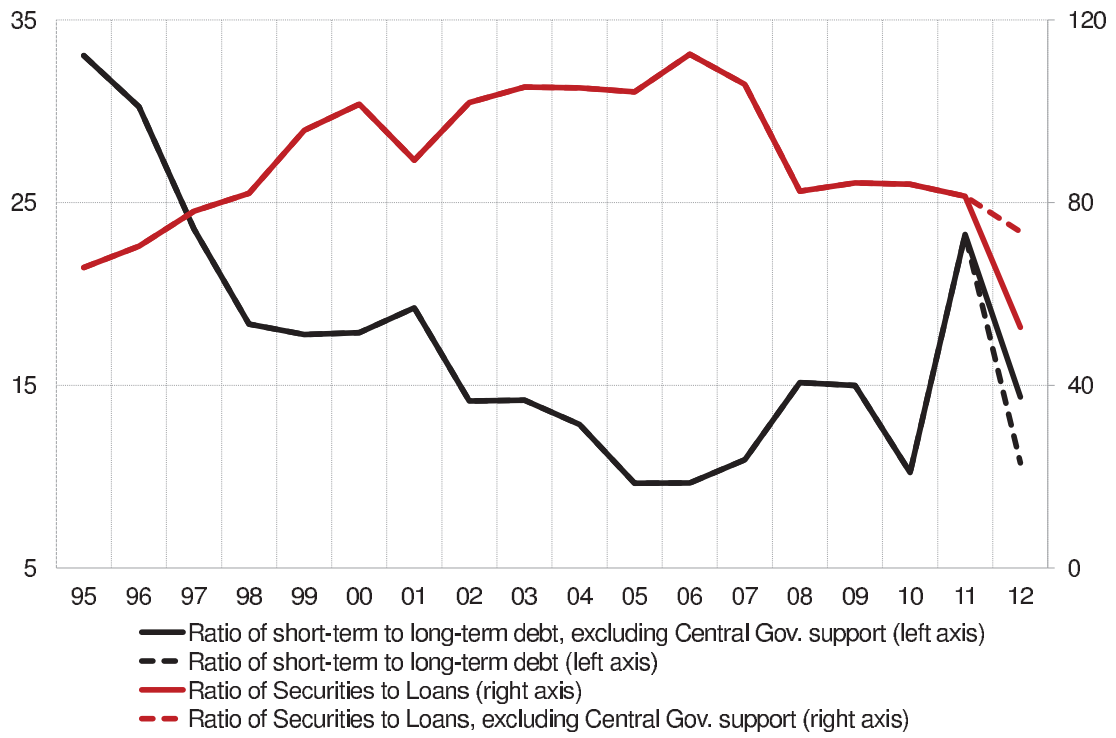
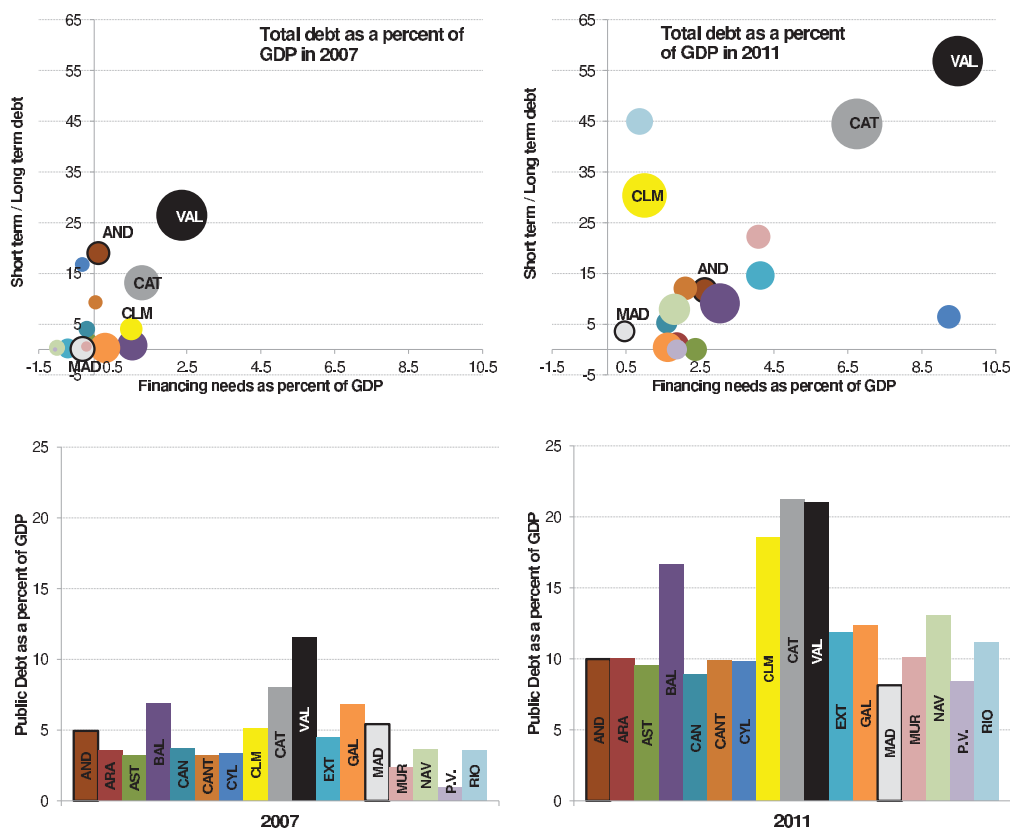
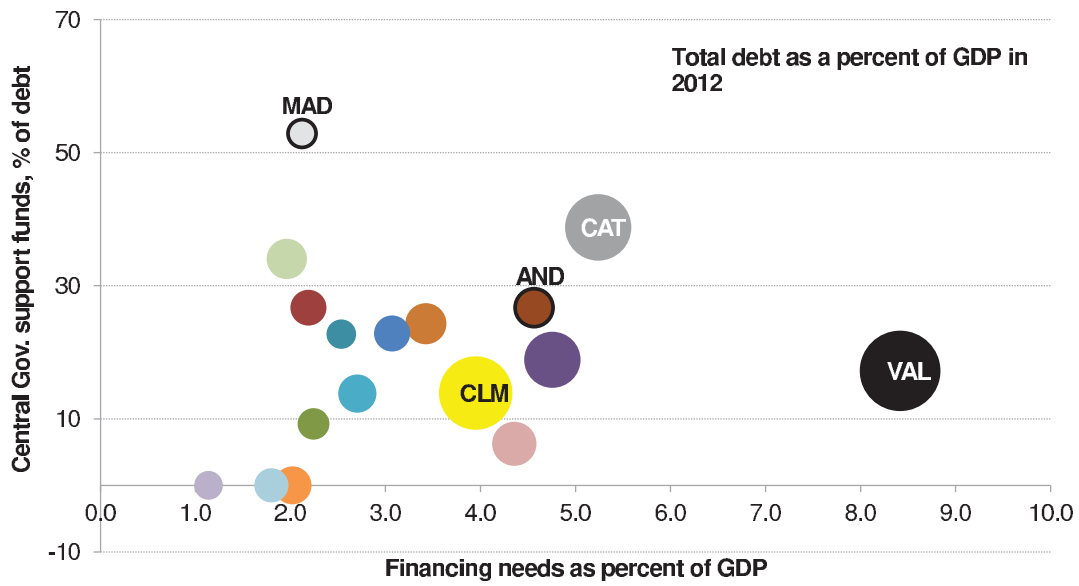


Figure 3: The structure of regional governments' debt: ratio short- to long-term debt<sup>a</sup> versus financing needs (the size of the bubble measures the relative level of public debt as a percent of each region's GDP).



Notes: <sup>a</sup> Short(long)-term debt is the sum of short(long)-term Securities and Loans by Resident Financial Institutions. The breakdown by maturity of the aggregates of loans by the “Rest of the World” and Loans by the “Central Government” are not available. AND: Andalusia; ARA: Aragon; AST: Asturias; BAL: Balearic Islands; CAN: Canary Islands; CANT: Cantabria; CYL: Castille and Leon; CLM: Castille- La Mancha; CAT: Catalonia; VAL: Valencia; EXT: Extremadura; GAL: Galicia; MAD: Madrid; MUR: Murcia; NAV: Navarre; PV: Basque Country; RIO: La Rioja.

Figure 4: The Central Government support Funds<sup>a</sup> to ease Regional Governments' liquidity troubles.

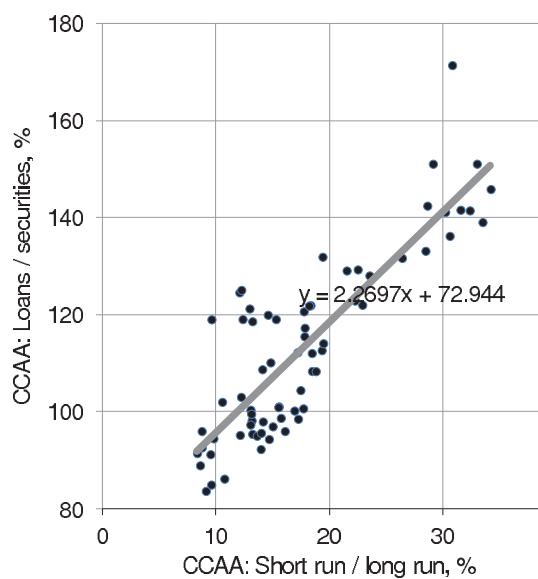


Notes: <sup>a</sup> FLA: *Fondo de Liquidez Autónoma* (Regional Liquidity Fund), and FFPP: *Fondo para la Financiación del Pago a los Proveedores* (Fund for the Payment of Providers). See also footnote to Figure 3.

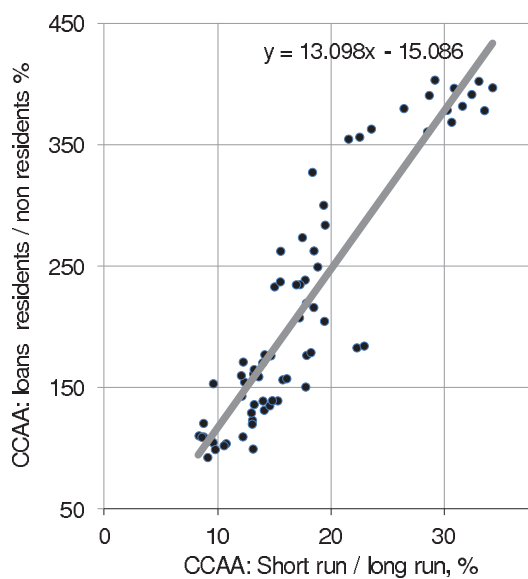


Figure 5: Regional governments' debt: unconditional correlations between main debt structure indicators (annual data: 1995-2012).

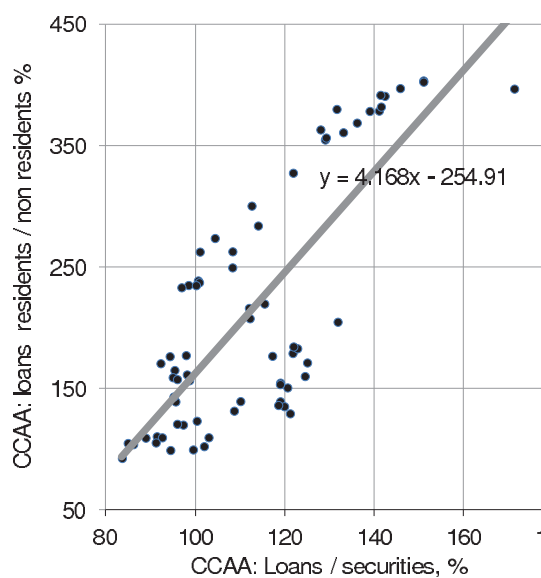
Ratio of loans to securities vs  
Ratio of short-run to long-run debt



Ratio of loans to residents vs non residents vs  
Ratio of short-run to long-run debt



Ratio of loans to residents vs non residents vs  
Ratio of loans to securities



Implicit interest rate vs  
Ratio of short-run to long-run debt

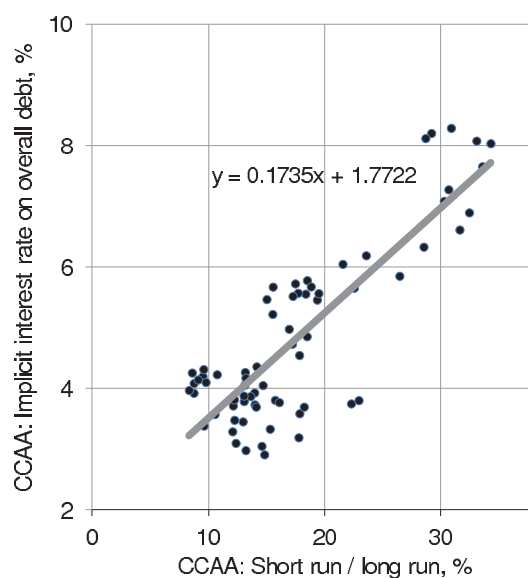


Table 2: The determinants of regional governments' debt structure: ratio of short- to long-term debt,  $B_t^{ST}/B_t^{LT}$ .

	Sample 1995Q1-2012Q4						
	[1]	[2]	[3]	[4]	[5]	[6]	[6b] OLS
Lagged dependent variable	0.46 <sup>a</sup>	0.47 <sup>a</sup>	0.46 <sup>a</sup>	0.46 <sup>a</sup>	0.47 <sup>a</sup>	0.47 <sup>a</sup>	0.76 <sup>a</sup>
Financing needs	3.73 <sup>a</sup>	3.89 <sup>b</sup>	2.84 <sup>b</sup>	2.64 <sup>b</sup>	3.02 <sup>b</sup>	3.02 <sup>b</sup>	4.07 <sup>a</sup>
Cycle	-0.09	-0.09	-0.08				
Sustainability (S1)	0.02						
Size	0.86 <sup>c</sup>	0.90 <sup>b</sup>	1.02 <sup>b</sup>	0.99 <sup>c</sup>	1.05 <sup>b</sup>	1.05 <sup>b</sup>	0.07
Budgetary deviation	-2.94 <sup>c</sup>	-2.79	-2.97	-2.85	-3.51 <sup>c</sup>	-3.51 <sup>c</sup>	0.72
Debt x Change in debt	-0.08	-0.09					
Debt deviation	-0.13	-0.16					
CG transfers, % GDP	-1.05 <sup>c</sup>	-1.13 <sup>c</sup>	-1.13 <sup>c</sup>	-1.24 <sup>b</sup>	-1.05 <sup>b</sup>	-1.05 <sup>b</sup>	-0.89 <sup>b</sup>
Slope	0.24	0.42		0.55			
FRI	0.32	0.35	0.37	0.37	0.31	0.31	0.34 <sup>c</sup>
Bonds coverage	0.10 <sup>b</sup>	0.09 <sup>c</sup>	0.10 <sup>c</sup>	0.10 <sup>b</sup>	0.10 <sup>c</sup>	0.10 <sup>c</sup>	0.00
NR/R preference	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.03 <sup>b</sup>
Elections dates	1.71						
Number of obs.	1,088	1,088	1,088	1,088	1,088	1,088	1,088
N. of Regions	16	16	16	16	16	16	
Hansen p-value	1.000	0.998	0.917	0.809	0.702	0.702	
AR1 p-value	0.004	0.004	0.004	0.004	0.004	0.004	
AR2 p-value	0.290	0.293	0.284	0.287	0.287	0.287	
F p-value	0	0	0	0	0	0	

<sup>a</sup>, <sup>b</sup>, <sup>c</sup>: significance at the 1%, 5% and 10% levels. Instruments: regressors used in each specification.

Table 3: The determinants of regional governments' debt structure: ratio of short- to long-term debt,  $B_t^{ST}/B_t^{LT}$  (continued).

	1995Q1-2012Q4			1995Q1-2011Q4			1995Q1-2007Q4		
	[7]	[8]	[8b] OLS	[9]	[10]	[10b] OLS	[11]	[12]	[12b] OLS
Lagged dep. variable	0.46 <sup>a</sup>	0.47 <sup>a</sup>	0.76 <sup>a</sup>	0.46 <sup>a</sup>	0.48 <sup>a</sup>	0.75 <sup>a</sup>	0.52 <sup>a</sup>	0.56 <sup>a</sup>	0.74 <sup>a</sup>
Financing needs	3.73 <sup>a</sup>	3.02 <sup>b</sup>	4.07 <sup>a</sup>	6.80 <sup>a</sup>	6.07 <sup>a</sup>	4.91 <sup>a</sup>	7.13 <sup>a</sup>	10.01 <sup>a</sup>	7.68 <sup>a</sup>
Cycle	-0.09			0.02			-0.05		
Sustainability (S1)	0.02			-0.60			3.25		
Size	0.86 <sup>c</sup>	1.05 <sup>b</sup>	0.07	0.97 <sup>b</sup>	1.30 <sup>b</sup>	0.07	0.67 <sup>c</sup>	0.56 <sup>c</sup>	0.06
Budgetary deviation	-2.94 <sup>c</sup>	-3.51 <sup>c</sup>	0.72	-7.71	-8.75 <sup>c</sup>	-0.86	-5.40	-10.08	-2.89
Debt x Change in debt	-0.08			-0.27			-0.94		
Debt deviation	-0.13			0.12			-0.10		
CG transfers, % GDP	-1.05 <sup>c</sup>	-1.05 <sup>b</sup>	-0.89 <sup>b</sup>	-1.15	-1.32	-0.90 <sup>c</sup>	-0.49	-1.41 <sup>c</sup>	-0.32
Slope	0.24			-0.03			0.34		
FRI	0.32	0.31	0.34 <sup>c</sup>	0.33	0.33	0.35	0.22	0.55	0.15
Bonds coverage	0.10 <sup>b</sup>	0.10 <sup>c</sup>	0.00	0.10 <sup>c</sup>	0.09	-0.00	0.11 <sup>a</sup>	0.10 <sup>b</sup>	0.02
NR/R preference	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.03 <sup>b</sup>	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.03 <sup>a</sup>	-0.12	-0.12	-0.03 <sup>a</sup>
Elections dates	1.71			1.86			3.27		
Number of obs.	1,088	1,088	1,088	1,024	1,024		768	768	
N. of Regions	16	16		16	16		16	16	
Hansen p-value	1.000	0.702		1.000	0.794		1	0.694	
AR1 p-value	0.004	0.004		0.005	0.005		0.017	0.013	
AR2 p-value	0.290	0.287		0.294	0.296		0.316	0.262	
F p-value	0	0		0	0		0	0	

<sup>a</sup>, <sup>b</sup>, <sup>c</sup>: significance at the 1%, 5% and 10% levels. Instruments: regressors used in each specification.

Table 4: The determinants of regional governments' debt structure: ratio of Securities to Loans,  $B_t^S/[B_t^L - B_t^{CG,L}]$ .

	1995Q1-2012Q4			1995Q1-2011Q4			1995Q1-2007Q4		
	[1]	[2]	[2b] OLS	[3]	[4]	[4b] OLS	[5]	[6]	[6b] OLS
Lag. dep. var.	0.65 <sup>a</sup>	0.66 <sup>a</sup>	0.90 <sup>a</sup>	0.67 <sup>a</sup>	0.66 <sup>a</sup>	0.90 <sup>a</sup>	0.66 <sup>a</sup>	0.64 <sup>a</sup>	0.94 <sup>a</sup>
Financing needs	-26.27 <sup>a</sup>	-26.61 <sup>a</sup>	-7.58 <sup>a</sup>	-32.28 <sup>b</sup>	-24.61 <sup>b</sup>	-7.84 <sup>a</sup>	-63.70 <sup>b</sup>	-59.28 <sup>a</sup>	-18.18 <sup>a</sup>
Cycle	0.24			0.23			0.13		
Sustainability	-1.69			-2.72			-4.39		
Size	0.92	-0.28	0.34	1.38	-0.24	0.31	2.45	3.67	0.33 <sup>b</sup>
Budgetary dev.	7.82	6.32	-3.46	2.43	18.21 <sup>b</sup>	-5.66	22.38	18.15	-20.35 <sup>c</sup>
Debt x $\Delta$ debt	-0.68 <sup>b</sup>			-0.91 <sup>b</sup>			-1.49 <sup>b</sup>		
Debt deviation	1.87			4.02			6.29		
CG transfers	3.31 <sup>b</sup>	4.00 <sup>b</sup>	-0.57	4.43 <sup>c</sup>	5.43 <sup>b</sup>	-1.20	6.39	4.98	0.22
Slope	-2.02			-1.65			3.57		
FRI	-0.29	-0.56	0.20	-0.89	-1.40 <sup>c</sup>	0.46	-1.87	-1.57	-0.17
Bonds coverage	0.28	0.30	0.01	0.24	0.31	0.02	0.03	0.04	0.06
NR/R pref.	0.57 <sup>a</sup>	0.58 <sup>a</sup>	0.11	0.57 <sup>a</sup>	0.60 <sup>a</sup>	0.11	0.55 <sup>b</sup>	0.61 <sup>a</sup>	0.08
Elections dates	-2.37			-4.01 <sup>b</sup>			-5.14		
Number of obs.	1,088	1,088	1,088	1,024	1,024	1,088	768	768	
N. of Regions	16	16		16	16		16	16	
Hansen p-value	1.000	0.799		1.000	0.857		1.000	0.928	
AR1 p-value	0.259	0.270		0.257	0.272		0.108	0.144	
AR2 p-value	0.284	0.294		0.280	0.294		0.205	0.242	
F p-value	0	0		0	0		0	0	

<sup>a</sup>, <sup>b</sup>, <sup>c</sup>: significance at the 1%, 5% and 10% levels. Instruments: regressors used in each specification.

Table 5: The determinants of regional governments' debt structure: robustness test for the number of lags used as instruments. Selected results (estimation period: 1995Q1-2012Q4).

	Ratio of short- to long-term debt				Ratio of Securities to Loans			
	1 lag	2 lags	3 lags	OLS	1 lag	2 lags	3 lags	OLS
Lagged dep. variable	0.64 <sup>a</sup>	0.47 <sup>a</sup>	0.46 <sup>a</sup>	0.76 <sup>a</sup>	0.55 <sup>a</sup>	0.66 <sup>a</sup>	0.60 <sup>a</sup>	0.90 <sup>a</sup>
Financing needs	1.56	3.02 <sup>b</sup>	3.71 <sup>a</sup>	4.07 <sup>a</sup>	-56.41 <sup>a</sup>	-26.61 <sup>a</sup>	-62.75 <sup>b</sup>	-7.58 <sup>a</sup>
Size	0.98	1.05 <sup>b</sup>	1.02 <sup>c</sup>	0.07	3.76	-0.28	3.27	0.34
Budgetary deviation	-3.04	-3.51 <sup>c</sup>	-2.76	0.72	14.47	6.32	49.31	-3.46
CG transfers,%GDP	-0.88 <sup>b</sup>	-1.05 <sup>b</sup>	-0.86 <sup>c</sup>	-0.89 <sup>b</sup>	6.44	4.00 <sup>b</sup>	7.97	-0.57
FRI	0.23	0.31	0.12	0.34 <sup>c</sup>	-1.77	-0.56	-3.02	0.20
Bonds coverage	0.05	0.10 <sup>c</sup>	0.13 <sup>b</sup>	0.00	0.03	0.30	0.15	0.01
NR/R preference	-0.18 <sup>c</sup>	-0.16 <sup>c</sup>	-0.16 <sup>c</sup>	-0.03 <sup>a</sup>	0.63 <sup>a</sup>	0.58 <sup>a</sup>	0.52 <sup>b</sup>	0.11
Number of obs.	1,088	1,088	1,088		768	1,088	768	
N. of Regions	16	16	16		16	16	16	
Hansen p-value	0.199	0.702	0.991		0.161	0.799	0.938	
AR1 p-value	0.0187	0.00365	0.00408		0.125	0.270	0.128	
AR2 p-value	0.303	0.287	0.292		0.232	0.294	0.225	
F p-value	0	0	0		0	0	0	

<sup>a</sup>, <sup>b</sup>, <sup>c</sup>: significance at the 1%, 5% and 10% levels. Instruments: regressors used in each specification.

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