



The structure of sub-national public debt in Spain: reflecting fiscal vulnerabilities?*

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Abstract

We analyze 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, loans- vs securities, or by resident debt holders vs non-residents) 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 quarterly dataset on the structure of regional governments' debt for the period 1995Q1-2012Q4 recently disseminated by the Bank of Spain. Our results show that rollover risks appear as the most robust determinant of the portfolio decision of sub-national governments' debt managers over time.

JEL Classification: H6; E62; C53.

Keywords: Public debt structure; Short-term vulnerability indicators; Sub-sovereign public debt.

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1 Introduction

Spanish public debt level more than doubled in the 2007-2012 period, reaching euro area averages in only four years, after a prior long period of downsizing that started in the mid 1990s. The overall increase has been reflected in the debt of the central and sub-national governments alike, 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 government debt and the possible existence of debt thresholds or limits in Spain, from the aggregate and regional point of views.¹ Nevertheless, not only the level but also the financing method and the resulting structure of debt are relevant factors from the macroeconomic and fiscal perspectives (Bacchiocchi and Missale, 2005, Faraglia et al., 2008). Debt financing strategies can influence for example the exposure of a given level of government to short-term liquidity pressures, the broader liquidity structure of the economy, and the developments of the interest burden of the government debt. In addition, 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). Therefore, this structure should be designed in such a way as to mitigate risk both for the governments and for markets.

In an economic and fiscal crisis episode, and in case market access were not fully compromised, a shift in the composition of debt as reflected, for example, by increased ratios of short-to-long-term debt is to be expected. First, because these 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,

¹See Banco de España (2013), Andrés et al. (2013), Hernández de Cos and Pérez (2013), Argimón and Hernández de Cos (2012).

2005; Sorribas, 2012). 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.

Some empirical studies have found short-term debt to be an indicator of vulnerability to international financial crises (Borensztein et al., 2004; Rodrick and Velasco, 1999; Bussière and Mulder, 1999). 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.

The focus of our paper is in understanding the economic, financial and institutional determinants of the structure of public debt in the case of Spain by means of the study of the composition of sub-national (regional²) debt in the period 1995-2012. We deem this as a relevant endeavor for a number of reasons. First, the use of regional data provides a cross-section data dimension that allows us to have a sufficient sample size for the analysis of the Spanish case. Second, sub-national debt developments in Spain have received recently significant attention (see Hernández de Cos and Pérez, 2013, and the references quoted therein) due to the significant part of the ongoing national fiscal consolidation process that has been assigned to regional governments. In addition, in the course of 2011 and, particularly, 2012, the central government put into operation a number of liquidity-support-funds aimed at relieving liquidity-related pressure on sub-national governments, in part because of de facto exclusion of some regional governments from sovereign debt markets. Third, Spain

²Throughout the paper we will use the term sub-national to mainly refer to Regional.

is the sixth sub-sovereign bond issuer world-wide, after the US, Germany, Japan, China and Canada (see Canuto and Liu, 2010, Romeu, 2011). 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 35% was in the form of securities (other than shares). Finally, in this paper we exploit a newly available quarterly dataset on the structure of regional government's debt.³

The rest of the paper is organized as follows. In section 2 we present some descriptive evidence on the structure of sub-sovereign public debt in Spain and describe the data used in the main body of the analysis. In turn, in Section 3 we pose the main empirical hypotheses to be tested, in the framework of an stylized theoretical model. Next, we present the empirical approach in Section 4 and the results in Section 5. Finally, in Section 6 we provide some conclusions and policy messages.

2 Some stylized facts

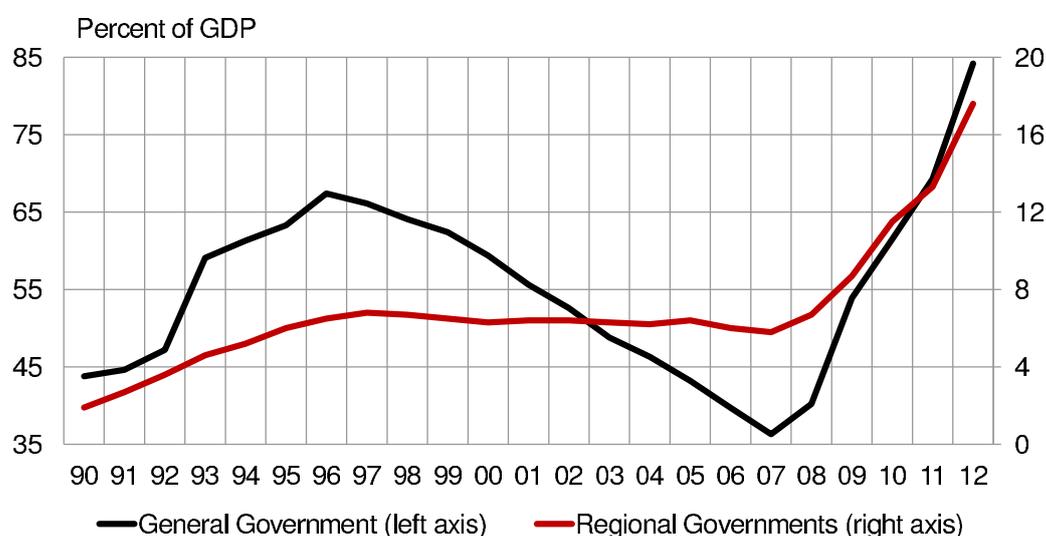
Our panel contains individual quarterly data for each regional government, covering the period 1995Q1-2012Q4. In this Section we provide some stylized facts on the main relevant aggregates of the 17 Spanish regions. The recent crisis period has led to a substantial increase in sub-national debt in Spain. This is not a phenomena restricted to these levels of the government sector, but rather a general fact, as witnessed in Figure 1. Indeed, after the General Government debt downsizing that occurred since the mid 1990s until the end of 2007, mainly due to the contribution of the Central Government, the public debt of all levels of government doubled in less than 5 years.

In the particular case of Regional governments, their debt increased from some 5.3% 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 the liquidity problems of the Regions.⁴ If instead of using GDP we use Regional Governments'

³Since 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.

⁴See Gordo, Hernández de Cos and Pérez (2013) for more details on this issue.

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



total revenues⁵ 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 and are still 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 125% 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 long- to short-term debt⁶ 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. The same picture can be drawn from the data by Region. This change in structure occurred, and in part caused, an increase in the amount of maturing debt by year (see 2). In 2012 the fraction of short- to long-term debt got reduced to levels similar to the ones observed in the mid 1990s, but still well above pre-crisis values.

⁵Total non-financial revenues, including transfers from other level of the General Government.

⁶The measure available for long- and short-term debt is the sum of total Securities other than shares and Loans by Resident Financial Institutions. There is no data available on the short/term distribution of loans by the Rest of the World.

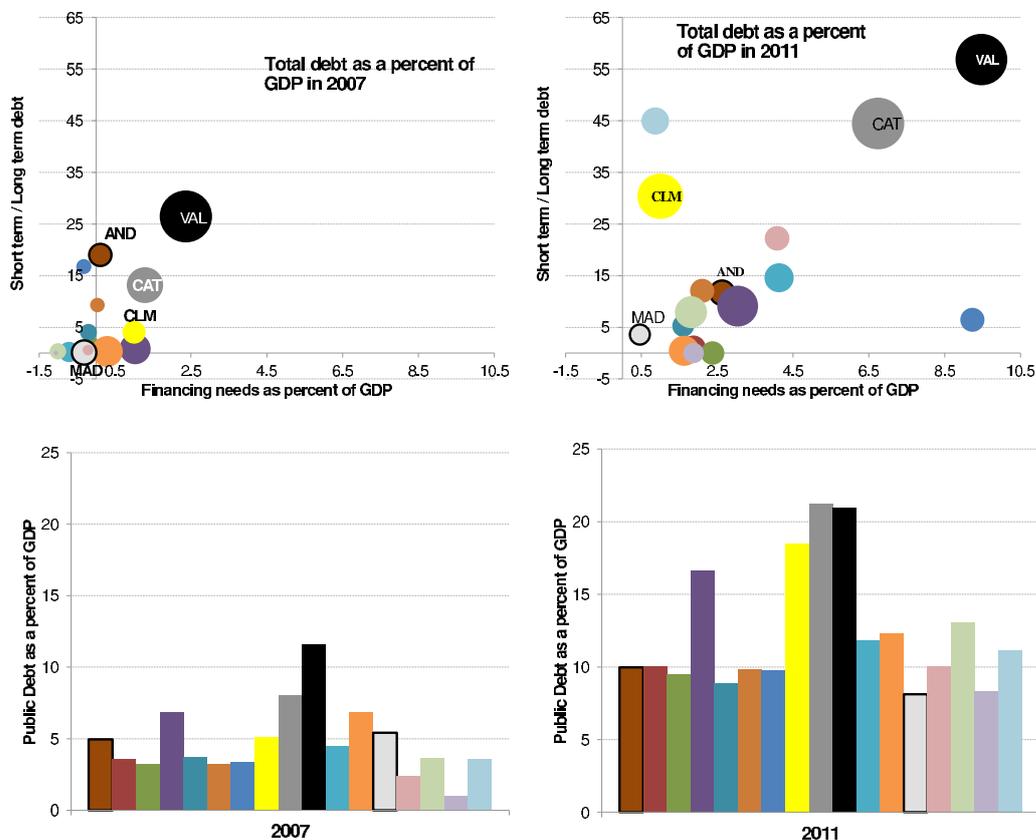
Table 1: The structure of regional governments' debt in Spain.

		1995Q4	2007Q4	2011Q4	2012Q4
Total debt ^a 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 ^b debt as % of long+short ^b	$B_t^{LT}/[B_t^{LT} + B_t^{ST}]$	75.2	90.1	81.1	87.4
Short-term ^b debt as % of long+short ^b	$B_t^{ST}/[B_t^{LT} + B_t^{ST}]$	24.8	9.9	18.9	12.6
Short-term ^b as % of long-term ^b 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 ^c 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 ^d as % of resident FI ^c	B_t^{NR}/B_t^R	24.8	106.1	59.4	53.5

Notes: ^a 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. ^b Sum of Securities other than shares and Loans by Resident Financial Institutions. ^c FI: Financial Institutions. ^d Loans by the Rest of the World.

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 rather than on securities. 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 heavily 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

Figure 2: The structure of regional governments' debt (short- vs long-term debt^a), financing needs and the level of public debt (2011 vs 2007).



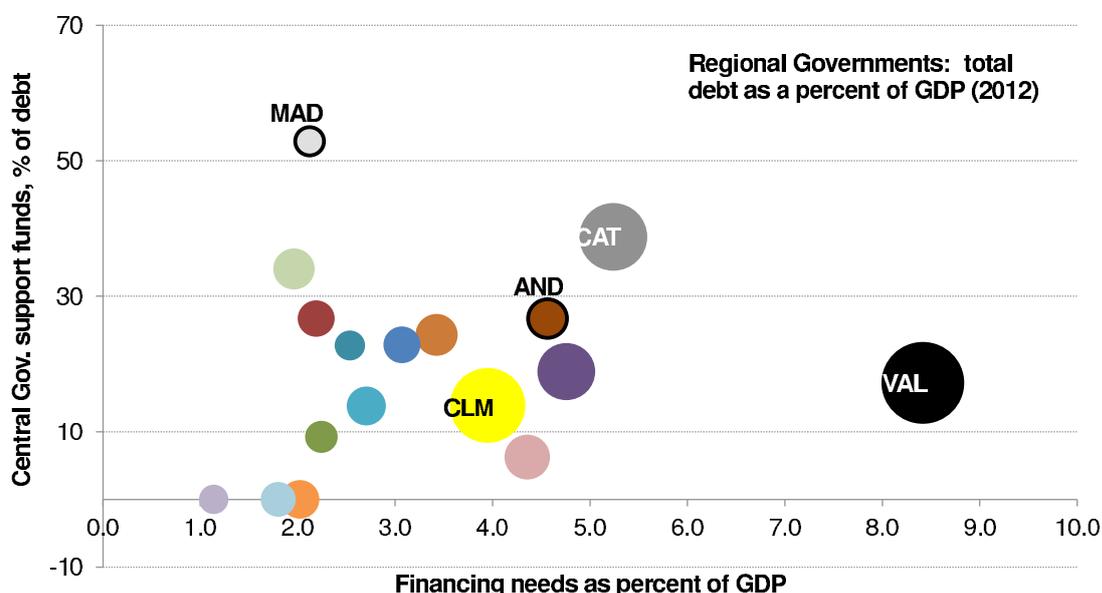
Notes: ^a Short(long-)-term debt is the sum of short(long-)-term Securities and Loans by Resident Financial Institutions. The breakdown by maturity of the aggregates of loans by the “Rest of the World” and Loans by the “Central Government” are not available.

support funds were aimed particularly at the more troubled regions (see 3), typically those with a high amount of financing needs and/or high levels of debt.

Finally, it is possible to have a look at the the distribution of regional debt by resident financial institutions and non-resident holders (“Rest of the World”), but only in the case of loans. 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.

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

Figure 3: The Central Government support Funds to ease Regional Governments' liquidity troubles.



Notes: ^a FLA: *Fondo de Liquidez Autonómica* (Regional Liquidity Fund), and FFPP: *Fondo para la Financiación del Pago a los Proveedores* (Fund for the Payment of Providers).

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. As shown in Figure 4 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.⁷

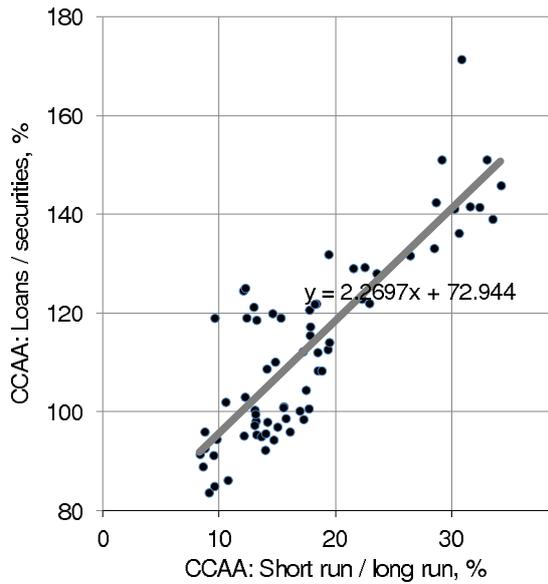
3 More on the theoretical background

The discussion provided in a previous Section on vulnerability risks in the domain of the studies that look at the determinants of the structure of sovereign debt can be enriched

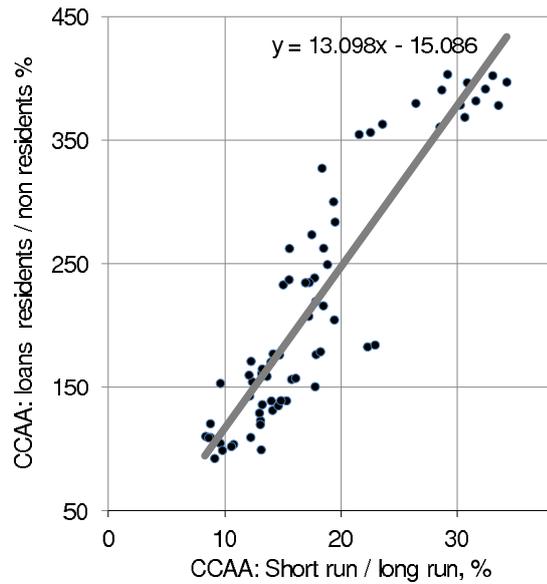
⁷The source of the debt data is the Bank of Spain. The source of interest payments' data is the IGAE. Implicit interest rates are computed as the ratio of interest payments to overall debt.

Figure 4: Regional governments' debt: unconditional correlations between main debt structure indicators.

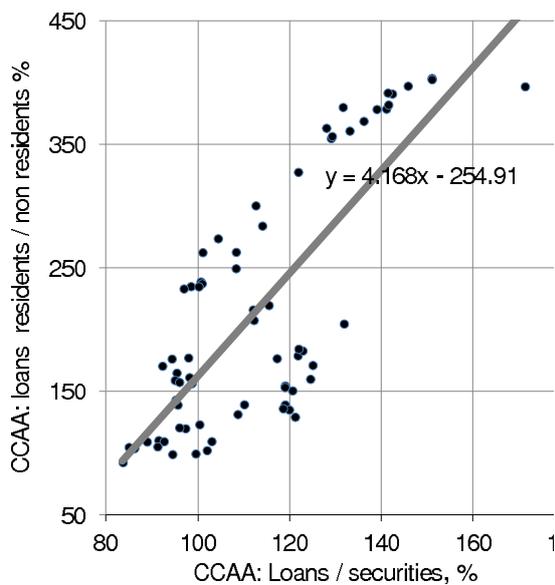
Ratio of loans to securities vs
Ratio of short-run to long-run debt



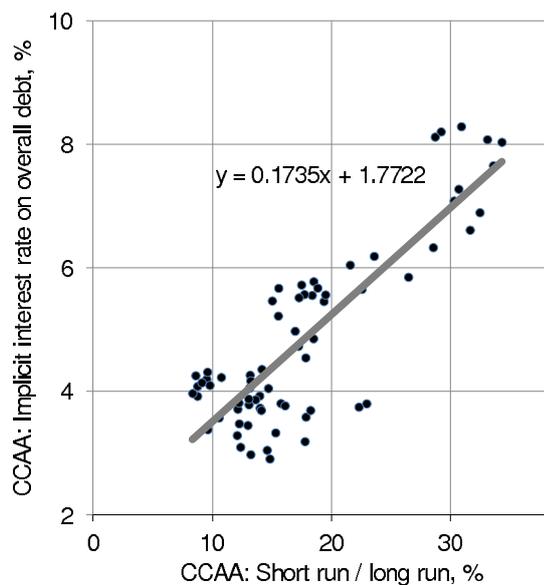
Ratio of loans to residents vs non residents vs
Ratio of short-run to long-run debt



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



by considering the broader literature that looks at the determination of corporate debt maturities⁸. The later literature exploits the trade-off between, on the one hand, the liquidity risk considerations, that lead to a longer maturity choice, while, on the other hand, borrowers' preference is for short-term debt due to private information about future credit rating. In his traditional liquidity risk 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. 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. Diamond predicts that both very low-risk and very high-risk firms would use short-term debt. 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. On the contrary, firms with lower credit ratings prefer long-term debt to reduce refinancing risk. Nevertheless, 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. 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, Faulkender and Petersen): 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. Beyond the decision between short- and long-term debt, in our case there is one additional choice that have to be studied: the choice between loans vs securities. This is a decision that depends on market conditions but that can also be influenced by the issuer. Financing maturing debt and deficits by issuing securities tend to be more complicated in situation in which the liquidity risk is high, and typically loans offer an easier alternative. In the case of Regional governments in

⁸See Berlin (2006) or Venugopalan and Vij (2013) for informative surveys of this literature.

Spain, in addition, loans provided by Regional banks (savings banks, “Cajas de Ahorros”) were perceived in the pre-crisis period as arising from a relatively “captive market” as these Regional banks were controlled by Regional Governments.

We will proxy “liquidity risks” by a variable measuring “roll-over risks”, defined as maturing debt in the period⁹ plus deficit financing needs¹⁰. The control variables to be used in the analysis are presented in the next Section.

4 Empirical approach

4.1 Control variables used in the analysis

Economic factors GDP growth is typically used as a proxy to measure current cyclical conditions, but also and 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 a preference for shorter maturities and safer bonds (de Broeck and Guscina, 2011, Gaudswaard,1990). As a proxy to the business cycle we take the Industrial Production Index (IPI) given the lack of quarterly GDP data¹¹. 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**).¹²

⁹The source of data on maturing debt is the Bank of Spain. It comprises maturing securities.

¹⁰There are no quarterly Regional government deficit figures available for the period 1995-2010. For this period the annual deficit is taken and distributed by four.

¹¹The Spanish National Statistical Institute publishes raw IPI figures for all the Spanish regions. We seasonally-adjusted the raw series using the TRAMO-SEATS package.

¹²In 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 (Gaudswaard, 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 (2008), who show that the share of short-term debt in total public debt decreases when inflation declines in the case of . Higher inflation is associated with higher

Size of the issuer The size of the Region (**Size**) is expected to be positively related to debt maturity. We measure this economic concept by the relative GDP of the region compared to the nation-wide one. Quarterly regional GDPs have been interpolated on the basis of each region's share in annual overall Spanish GDP.

Signalling hypothesis: quality Debt maturity is and appropriate and valid signal to asymmetrically informed markets about the quality of a firm (Myers, 1997, 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, A. and O.J. Blanchard (1994) show that governments will tend to have a shorter debt maturity to enhance credibility when 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. The World Bank (2005) argues that fiscal consolidation is a key component of a credible debt reduction strategy. De Broeck, M and A. 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 threshold, sovereign risk is a concern and DLTF 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

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 Wiertz (2010) show that in an inflationary environment, investors might opt for short 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.

domestic debt.

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 (**Yield**): the average yield in a given quarter of the 10-year Spanish bond minus the equivalent measure of the 6 months T-bill.

Market preferences In order to take into consideration how market preferences of overall Spanish debt instruments could influence the structure of regional public debt we incorporate in the analysis the short-to-long ratio of Central Government debt. Market conditions could also 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 State bonds allocation to requests (**Bonds coverage**). As this ratio is closer to one, the room for implement debt issuance strategies by 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, A. and J. 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.

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, proximity to elections**). 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 debt structure itself or favors any of the issuance strategies considered. 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 debt¹³. 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 rules may exert some influence on moving market preference to shorter bonds. According to Borensztein, Chamon, Jeanne, Muaro and Zettelmeyer (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. We use EC’s Fiscal Rule Index (**FRI**) in our empirical analysis.

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 direct and indirect taxes (excluding VAT) to total revenues. Since changes in expenditures responsibilities might make the indicator not homogeneous across 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, fitting with the duration of two financing arrangements between the center and the regions) and zero otherwise (Fiscal corresponsibility 1997-2001 and Fiscal corresponsibility 2002-2010). However, 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 3 decades, we also incorporate a measure of public expenditure responsibilities through health expenditure carried by Regions (**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 a

¹³Institutional variables are taken from the International Country Risk Guide (ICRG) database.

measure 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.

4.2 Some hypothesis to be tested and expected signs

From the discussion in previous Sections, a number of headline hypothesis can be summarized as follows:

- 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_{2b} (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. According to the “soft budget constraint hypothesis”, 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. CG support thus, in situation of fiscal stress may help easing access to the markets by Regions, thus easing liquidity risks, but at the same time

may induce that too high interest rates are locked-in today for the future (term of the long-term debt).

- H_4 (Business cycles): In adverse cyclical conditions and under market stress, there would 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.

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 short-to-long term debt ratio for each regional government i at time t , Y_{it} , depends on two sets of control variables, Ω and X , encompassing all factors mentioned above. The first set, Ω , 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 α_i aims at capturing all the unobservable Region-specific effects that are time-unvarying, while ϵ_{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 ϵ_{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 Moment (GMM). 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 their own first differences¹⁴. In addition, the `xtabond2` routine allows for different instrumentation methods according to the nature

¹⁴Non-serial correlation in the error term is assumed.

of the regressors. This way, variables in Ω will be instrumented following the “GMM style”¹⁵ while variables in X will be instrumented with standard “IV style”.^{16 17}

5 Results

The main results of the paper are summarized in tables 2, 3 and 5. In these two tables we just present a summary of the results, that involved a great 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, given that the behavior of all the agents (regional governments, financial institutions, resident and foreign investors) might have been distorted by the significant financial support provided by the Central Government to the Regions, in the form of loans. In this regard, even in the case of the sample that incorporates 2012, all the estimation results exclude the Central Government Funds. We show in the tables point estimates and their significance.

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. 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 cur-

¹⁵Endogenous variables are instrumented with lagged values of the variables in levels.

¹⁶Exogenous variables are instrumented with themselves.

¹⁷The Stata version of xtabond2 also includes the option to use the forward orthogonal deviations transform instead of first differencing. Proposed by Arellano and Bover (1995) the orthogonal deviations transform, rather than subtracting the previous observation, subtracts the average of all available future observations. The result is then multiplied by a scale factor chosen to yield the nice but relatively unimportant property that if the original ϵ_{it} are i.i.d., then so are the transformed ones (see Arellano and Bover, 1995, and Roodman, 2006). Like differencing, taking orthogonal deviations removes fixed effects. Because lagged observations of a variable do not enter the formula for the transformation, they remain orthogonal to the transformed errors (assuming no serial correlation), and available as instruments. In fact, for consistency, the software stores the orthogonal deviation of an observation one period late, so that, as with differencing, observations for period 1 are missing and, for an instrumenting variable in Ω , first lag enters the formula for the transformed observation stored at i, t . With this move, exactly the same lags of variables are valid as instruments under the two transformations.

rent deficit financing) leads to a debt structure more leaned towards short-term debt, thus giving support to the reasoning that liquidity risks imply a shortening of debt maturities. Second, the variable measuring central government transfers (**CG transfers**) is also quite robust across empirical specifications and samples. The negative sign denotes that investors anticipate that the central government would increase transfers in case a given region face financial problems, and thus it is willing to finance longer-term debt to that particular region. This is in line with the prescription of the “soft budget constraint” theory. Third, the size of the region (**SIZE**) is significant for market access, possibly because this implies a deeper debt market. Fourth, stricter adherence to budgetary target (**Budgetary deviation**) tends to be associated with easier access to long-term debt in relative terms. 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 holders¹⁸ has a negative sign, indicating that foreign investors’ non-systematic behavior (not explained by fundamentals) is more favorable to shorter maturities, maybe for the reasons discussed above.

When comparing the full sample with the pre-crisis sample, three differences are worth highlighting. First, CG transfers are significant only in the crisis period, which would be according to a priori intuitions given that in the pre-crisis, expansion period, Regional governments had at their disposal enough resources to cover their needs. In addition, the implicit bail-out that increased CG transfers might have implied, can be seen to the light of investors as a safeguard against default. Second, although weakly significant, formal rules (FRI) and market-induced rules (adherence to budgetary targets) gain significance in the broader sample. Third, the residents/non-residents shock, even presenting the expected negative sign for all the specifications, it turns out to be only relevant when the crisis years are included in the estimation, as expected.

A similar discussion can be articulated for the choice of maturities using as representative variable the ratio of long-term debt to total debt, through the regressions with the determinants of $B_t^{LT}/[B_t - B_t^{CG,L}]$ (Table 4). The only additional results worth highlighting is the

¹⁸This is constructed by regressing using the same specification as in the baseline equation but with the ratio of non-resident to resident loan providers.

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]
Lagged dependent variable	0.454 ^a	0.454 ^a	0.453 ^a	0.458 ^a	0.458 ^a	0.457 ^a
Financing needs	3.196 ^a	3.078 ^b	2.507 ^b	2.210 ^b	2.709 ^b	2.661 ^b
Cycle	-0.055	-0.042	-0.078			
Sustainability (S1)	-0.094					
SIZE	0.851 ^c	0.879 ^b	0.992 ^b	0.906 ^c	0.966 ^b	0.923 ^c
Budgetary deviation	-3.181 ^c	-3.085 ^c	-3.162 ^c	-3.115	-3.609 ^c	-3.748 ^b
Debt x Change in debt	-0.152	-0.157				
Debt deviation	-0.149	-0.162				
CG transfers, % GDP	-1.598 ^a	-1.596 ^a	-1.564 ^a	-1.501 ^b	-1.379 ^b	-1.394 ^b
SLOPE	0.423	0.402		0.405		
FRI	0.712 ^c	0.705 ^c	0.673 ^c	0.607	0.570	0.570
Bonds coverage	0.086 ^c	0.087 ^c	0.091 ^c	0.098 ^b	0.093 ^c	0.100 ^c
NR/R preference	-0.157 ^c	-0.156 ^c	-0.156 ^c	-0.159 ^c	-0.159 ^c	-0.158 ^c
Elections dates						1.929
Number of obs.	1088	1088	1088	1088	1088	1088

^a, ^b, ^c: significance at the 1%, 5% and 10% levels.

positive sign of the variable “cycle”, not significant in the regressions in which the relative preference between short- and long-term debt was the variable to be explained. In addition, the determinants of the ratio of Securities to Loans ($B_t^S/[B_t^L - B_t^{CG,L}]$) are displayed in Table 5.

6 Conclusions

We analyze 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-

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]	[9]	[10]	[11]	[12]
Lagged dependent variable	0.454 ^a	0.458 ^a	0.448 ^a	0.465 ^a	0.505 ^a	0.539 ^a
Financing needs	3.196 ^a	2.709 ^b	7.055 ^a	5.389 ^a	6.958 ^a	7.720 ^a
Cycle	-0.055		-0.000		-0.117	
Sustainability (S1)	-0.094		-0.841		2.147	
SIZE	0.851 ^c	0.966 ^b	0.988 ^a	1.326 ^a	0.577	0.480
Budgetary deviation	-3.181 ^c	-3.609 ^c	-7.802	-6.857	-1.998	-3.258
Debt x Change in debt	-0.152		-0.297		-0.932	
Debt deviation	-0.149		0.158		-0.373	
CG transfers, % GDP	-1.598 ^a	-1.379 ^b	-1.528 ^c	-1.516 ^c	-0.504	-0.721
SLOPE	0.423		0.468		0.965	
FRI	0.712 ^c	0.570	0.512	0.436	0.208	0.293
Bonds coverage	0.086 ^c	0.093 ^c	0.085	0.079	0.082 ^b	0.089 ^b
NR/R preference	-0.157 ^c	-0.159 ^c	-0.158 ^c	-0.155 ^c	-0.120	-0.118
Elections dates						
Number of obs.	1088	1088	1024	1024	768	768

^a, ^b, ^c: significance at the 1%, 5% and 10% levels.

Table 4: The determinants of regional governments' debt structure: ratio of long-term debt (Long-term Securities and long-term loans by resident FRIs) to total debt, $B_t^{LT}/[B_t - B_t^{CG,L}]$.

	1995-2012		1995-2011		1995-2007	
	[1]	[2]	[3]	[4]	[5]	[6]
Lagged dependent variable	0.862 ^a	0.881 ^a	0.852 ^a	0.884 ^a	0.810 ^a	0.856 ^a
Financing needs	-1.541 ^b	-2.206 ^b	-4.558 ^a	-3.538 ^a	-1.479	-1.680
Cycle	0.272 ^b		0.384 ^b		0.323 ^c	
Sustainability (S1)	-0.338		-0.645		-0.774	
SIZE	0.508 ^c	0.531	0.161	0.004	0.277 ^c	0.345 ^c
Budgetary deviation	-0.375	-0.074	1.179	2.956	-0.448	-4.078
Debt x Change in debt	0.015		-0.042		-0.123	
Debt deviation	0.039		0.528		-0.026	
CG transfers, % GDP	1.870 ^a	1.596 ^a	3.578 ^a	3.080 ^a	4.123 ^a	3.963 ^a
SLOPE	0.545		1.009		1.387 ^b	
FRI	-0.541 ^a	-0.408 ^b	-1.179 ^b	-0.924 ^b	-1.467 ^a	-1.463 ^a
Bonds coverage	0.030	0.022	0.019	0.015	0.060 ^c	0.047
NR/R preference	0.130 ^c	0.131 ^c	0.127 ^c	0.132 ^c	0.100	0.097
Elections dates						
Number of obs.	1088	1088	1024	1024	768	768

^a, ^b, ^c: significance at the 1%, 5% and 10% levels.

Table 5: 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]	[3]	[4]	[5]	[6]
Lagged dependent variable	0.650 ^a	0.655 ^a	0.661 ^a	0.659 ^a	0.680 ^a	0.656 ^a
Financing needs	-25.499 ^a	-23.215 ^a	-33.182 ^a	-19.880 ^b	-63.711 ^b	-54.384 ^b
Cycle	0.178		0.197		0.320	
Sustainability (S1)	-0.909		-2.954		-1.472	
SIZE	1.664	0.642	1.839	0.779	2.181	3.217
Budgetary deviation	8.417 ^c	6.636	-0.687	13.234	27.436	14.035
Debt x Change in debt	-0.511 ^b		-0.880 ^c		-1.324 ^b	
Debt deviation	1.783		5.132		8.119	
CG transfers, % GDP	3.260	3.862	7.897 ^c	6.487 ^c	11.566 ^c	8.459
SLOPE	-1.825		-1.246		2.030	
FRI	-0.556	-0.802	-2.974	-2.278	-4.439 ^c	-3.550
Bonds coverage	0.263	0.270	0.210	0.239	0.058	0.054
NR/R preference	0.584 ^a	0.596 ^a	0.567 ^a	0.602 ^a	0.563 ^b	0.621 ^a
Elections dates						
Number of obs.	1088	1088	1024	1024	768	768

^a, ^b, ^c: significance at the 1%, 5% and 10% levels.

term instruments, loans- vs securities, or by resident debt holders vs non-residents) 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 quarterly dataset on the structure of regional governments' debt for the period 1995Q1-2012Q4 recently disseminated by the Bank of Spain. Our results show that rollover risks appear as the most robust determinant of the portfolio decision of sub-national governments' debt managers over time.

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