Irving Fisher Committee on
Central Bank Statistics

BANK FOR INTERNATIONAL SETTLEMENTS

IFC-ECCBSO-CBRT Conference on *"Uses of Central Balance Sheet Data Offices' information"*

Co-organised by the IFC, the European Committee of Central Balance Sheet Data Offices (ECCBSO) and the Central Bank of the Republic of Turkey (CBRT)

Özdere-İzmir, Turkey, 26 September 2016

Towards a more comprehensive understanding of corporate leverage ratios[1]

Nicolas Griesshaber, European Central Bank

[1] This paper was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

Towards a more Comprehensive Understanding of Corporate Leverage Ratios

Using firm-level data from Central Balance Sheet Data Offices to disentangle the role of firm, sector and region specific characteristics

Nicolas Griesshaber, European Central Bank[1]

Abstract

The current paper aims to take a more encompassing perspective on capital structures of non-financial corporations (NFCs), investigating the relative importance of firm, sector and region specific determinants of leverage. Utilising unique cross-country micro data on NFC balance sheet information for six euro area countries, obtained from Central Balance Sheet Data Offices, it explicitly takes into account the possible role played by firms' more local environment in shaping corporate financing structures. Employing cross-classified multilevel estimations to account for the hierarchical structure in the data, our findings suggest that both sector and regional characteristics are relevant to explain the variation of leverage across firms. The relative importance of these characteristics thereby seems to vary depending on the size of firms, with regional aspects being most relevant among smaller companies. Nevertheless, most of the variation across firms is still linked to firm specific differences.

Keywords: Capital Structure, Non-Financial Corporations, Regional Determinants, Balance Sheet Data, Multilevel Analysis

JEL classification: F30; F36; G32

[1] The views expressed in this paper are those of the author and do not necessarily represent those of the European Central Bank. All errors are the sole responsibility of the author. I would like to thank Annalisa Ferrando, Linda Fache Rousová, Ioannis Ganoulis, Manfred Koch, Sébastien Pérez-Duarte, Carlos Sánchez Muñoz, Livio Stracca and Caroline Willeke for their valuable comments and suggestions with respect to the current research. Contact: nicolas.griesshaber@ecb.europa.eu.

1. Introduction

As highlighted by a comprehensive ECB structural issues report on "Corporate Finance and Economic Activity in the Euro Area" (ECB 2013: 13), capital structure choices of non-financial corporations (NFCs) can have important implications for the financial stability and economic performance of the wider economy (see also Kühnhausen & Stieber 2013: 1). Moreover, companies' capital structure and financing choices are likely to play a central role for the transmission of monetary policy to the real economy, as these affect firms' access to finance and thus, their ability to seize investment opportunities. In consequence, gaining a comprehensive understanding of the underlying determinants of NFCs' financing policies, particularly in the aftermath of the financial crisis, appears of primary importance.

Such goal, however, necessitates i) availability of harmonised financial micro information on NFCs that offers sufficient data quality and coverage and ii) a more encompassing analytical approach to capital structure that accounts for both firm specific determinants as well as characteristics related to a firm's particular environment. While in the wake of the seminal study by Rajan and Zingales (1995) a substantial empirical literature on corporate capital structure has developed, existing evidence on the determinants of firms' financing choices appears far from conclusive. Moreover, most research to date is characterised by a rather narrow focus on specific factors or selective samples and thus, mostly lacks a more encompassing perspective. The current research aims to address these issues, investigating the role of firm, sector and region specific characteristics as determinants of leverage (measured as the ratio of total liabilities over assets). Building upon a vast empirical research tradition, it thereby aims to make the following main contributions.

First, it utilises a unique cross-section of harmonised large-scale NFC micro data from six euro area countries, expanding upon existing research that often focuses on single countries, small scale survey data or specific subsets of firms. The data is obtained from Central Balance Sheet Data Offices (CBSOs) as part of a pilot exercise on the value of a centralised collection of harmonised CBSO micro data, conducted by the European Central Bank (ECB).

Second, it goes beyond an exclusive focus on firm-level characteristics to also include the role of industry and regional differences. While the relevance of the former has been widely acknowledged in the literature on corporate capital structures, the latter in particular has been mostly neglected in cross-country investigations. However, regional aspects are likely to matter for firms' financing structures, providing relevant financial infrastructures as well as institutional, economic and social contexts that can affect the access to finance of NFCs. In addition, it is often argued that the recent financial crisis has reinforced regional differences within the euro area, increasing the relevance of an assessment of their economic effects. Understanding the nature, extent and origins of such possible regional differences with respect to NFCs' capital structures should be of significant relevance for policymakers as elimination of regional divergences in the access to finance are crucial for efforts towards convergence of non-financial corporations at European level (see also Palacín-Sánchez and di Pietro 2013: 3). To analyse the role of firms' respective environment, the current study distinguishes between 17 different sectors (based on main NACE rev. 2 sections) as well as 87 basic regions according to the Nomenclature of territorial units for statistics (NUTS). It will

consider several sector and region specific factors that are assumed to have an impact on firms' financing decisions.

Finally, from a technical point of view, the current study explicitly considers the cross-hierarchical structure of the data, aiming to disentangle the relative importance of firms' respective industry as well as their local environment. While several existing contributions have analysed the possible role of the institutional environment and sector specific characteristics, they mostly pursue this in an isolated way (Kayo & Kimura 2011: 362), merely including dummy variables or specific characteristics of the respective environment. Meanwhile, empirical investigations that simultaneously analyse the effect of firm, sector and region specific differences while accounting for the nested structure of the data remain scarce (an exception is the multilevel study by Kayo & Kimura 2011). The present paper estimates crossed random-effects models, taking into account that intercepts may vary across sectors, regions as well as across their interaction. This allows assessing to what extent elements beyond mere firm characteristics may influence firms' financing choices and thus, their ability for future acquisition of capital. In consequence, the current study should help to provide a more comprehensive understanding of firms' capital structure, constituting an important basis for analysing economic and financial stability impacts of corporate financing and the transmission of monetary policy.

Results indeed indicate that, while most of the variation in leverage ratios across firms is linked to firm-level differences, both sector and regional characteristics are found to be of relevance (in particular with respect to the use of long-term debt). The relative importance of these characteristics seems to vary depending on the size of firms, pointing out to further differences in the transmission of monetary policy across firms. While capital structures of SMEs appear more strongly connected to their regional environment, large firms seem more affected by sectoral features.

This paper contributes to the literature that tries to gain a more encompassing perspective on corporate financing structures in the non-financial sector, confirming that firms' specific environment along with the specific characteristics of a firm are important elements that deserve a deeper analysis. It further indicates the value of a newly constructed cross-country database of harmonised firm-level information from CBSOs for such an analysis along with its monetary policy implications.

The remainder of the paper is organised as follows. Section 2 provides an overview of the main theoretical as well as empirical literature on corporate capital structure, summarising the existing evidence with respect to the main determinants of NFC leverage ratios. Section 3 introduces the firm-level data obtained from CBSOs, including a brief description of the data source as well as the conducted data adjustments. Section 4 focuses on the possible role of NFCs' industry and regional environment for the financing choices of firms, deriving the main expectations for the analysis. Section 5 describes the main variables considered in the analysis, along with their expected effects, as well as the estimation method that is employed. The results of the empirical analysis are discussed in section 6. The last section concludes.

2. Theoretical Foundations and Existing Evidence

More than half a century ago, the seminal work by Modigliani and Miller (1958) provided a starting point for a vast literature on corporate capital structure – also known as the debt-equity choice. Under the assumption of perfect and frictionless capital markets and a neutral tax system, their work suggested that financing choice has no effect on firm value as well as cost or availability of capital (Myers 2001: 81). While the logic of these results is by now widely accepted, various contributions have since relaxed the strict assumptions of Modigliani and Miller (1958), concluding that financing choices can matter. In consequence, several theories of optimal capital structure have developed. These mainly differ with respect to their relative emphasis and interpretation of certain main underlying factors that determine firms' debt-equity choices (Myers 2001: 82; ECB 2013: 40 f.).

The trade-off theory assumes that firms choose an optimal level of debt at which tax advantages of additional debt would be offset by the cost of possible financial distress (Myers 2001: 81). The pecking order theory (see Myers & Majluf 1984; Myers 1984) emphasises the role of information asymmetries between lenders and company insiders, which determine financing costs. In consequence, firms prefer the use of internal over external funds and debt over equity issuance when internal funds are not sufficient to cover expenditures. Yet another theoretical strand focuses on capital structure being determined by the benefits of debt against its agency costs – i.e. costs arising from conflicts of interest (see, e.g. Jensen & Meckling 1976; Harris & Raviv 1991: 300-301). Overall, while providing conditional theories based on different economic aspects, none of these theories seems to provide a more universal explanation of corporate financing decisions (Myers 2001: 99).

As regards existing empirical work, Rajan and Zingales (1995) conducted one of the first cross-country studies (across G7 member states), identifying firm size, growth opportunities, tangibility and profitability to be central determinants of firm leverage.[2] Since then, an increasing number of studies have empirically investigated the determinants of corporate financing structures. Existing contributions thereby predominantly focus on firm specific characteristics, largely finding a negative connection to profitability and growth opportunities and a positive relation with size and asset tangibility (e.g., among others, Ferrando et al. 2014; see also ECB 2013: 41).

In addition, a firm's age and liquidity have been brought forward as further factors that can affect corporate financing decisions, with existing evidence mostly pointing to a negative relation with leverage (e.g., among others, Michaelas et al. 1999; de Jong et al. 2008; Brav 2009; Bhaird & Lucey 2010; Kühhausen & Stieber 2014).[3] Firm risk, mostly measured by the variation in earnings or operating income, has also been found to be negatively connected to leverage in some contributions (Psillaki & Daskalakis 2009; Köksal et al. 2013). Finally, from a trade-off theory perspective, taxation may also affect corporate financing structures, leading some

[2] Before then, most empirical work was almost exclusively based on US firms (Rajan & Zingales 1995: 1421).

[3] La Rocca et al. (2011) find a non-linear effect for firm age.

studies to account for the possible effect of the effective tax rate and non-debt tax shields (Titman & Wessels 1988; Michaelas et al. 1999; Sogorb-Mira 2005; de Jong et al. 2008; Degryse et al. 2012; Köksal et al. 2013). However, resulting empirical evidence remains mixed and inconclusive.

Besides firm-specific determinants, some contributions have focused on the role of industry characteristics (e.g. McKay & Phillips 2005; La Rocca et al. 2011; Degryse et al. 2012; Kühnhausen & Stieber 2014). However, this often is restricted to the mere inclusion of industry dummies (e.g. Kester 1986; Titman & Wessels 1988; La Roca et al. 2011; see also Kayo & Kimura 2011: 360), mostly revealing significant variation across sectors. One common explanation for such differences is that managers take industry benchmarks such as the median leverage into account when choosing their own debt structure (Frank and Goyal 2009: 8). Indeed, studies using median leverage ratios to capture target capital structures of industries show a consistently positive connection to firms' debt ratios (e.g. Hovakimian et al. 2001; Frank and Goyal 2009; Degryse et al. 2012; Köksal et al. 2013; Kühnhausen & Stieber 2014). Besides median leverage, industries' growth environment (Frank & Goyal 2009; Kühnhausen & Stieber 2014) and concentration (MacKay & Phillips 2005; Kayo & Kimura 2011) have also been found to affect leverage ratios.[4]

Some cross-national studies have also investigated the possible effect of the institutional context and other country specific factors, showing that some differences in corporate financing structures reflect differences in firms' economic, institutional or cultural environment (e.g. Rajan & Zingales 1995; Demirguç-Kunt & Maksimovic 1999; de Jong et al. 2008; Psillaki & Daskalakis 2009; Öztekin & Flannery 2012; Kühnhausen & Stieber 2014). Exploring the relative importance of country characteristics, Fan et al. (2012) indicate that the country of residence appears to constitute a more important determinant of firms' capital structures than their industry affiliation. Country-level factors often associated to the use of debt financing include economic development and growth, tax policy as well as inflation (which decreases the relative value of debt while increasing the value of tax deductions from debt financing; see, e.g., Booth et al. 2001; de Jong et al. 2008, Frank & Goyal 2009; Fan et al. 2012; Köksal et al. 2013; Kühnhausen & Stieber 2014). The effectiveness and development of the financial system as well as developments in capital markets are also argued to be important determinants of corporate financing structures as financial markets and intermediaries provide direct sources of capital as well as mechanisms to ensure access to firm information for investors (Demirguç-Kunt & Maksimovic 1999: 2108; for the role of capital market developments, see also Fan et al. 2012; Köksal et al. 2013; Kühnhausen & Stieber 2014). However, empirical research with respect to specific characteristics and indicators in this regard remains mixed and far from conclusive. Finally, countries' legal tradition, the effectiveness of the legal system as well as the quality of public governance and thus, the enforcement of property and investor rights are often argued to be of high relevance. Indeed, Fan et al. (2012), among others, show the strength of the legal system and public governance to matter for corporate capital structure, finding weaker laws and higher corruption to be associated to higher debt ratios with shorter debt maturity while countries with explicit bankruptcy codes have higher debt ratios with longer maturities. Overall, these contributions have revealed

[4] For further industry specific variables not mentioned in this chapter, see for instance MacKay and Phillips (2005) and Kayo and Kimura (2011).

a significant role of the residential context of firms in regard to their financing choices. Nevertheless, research on the role of the economic, institutional and socio-cultural environment thus far remains mostly at the level of countries and thus, usually neglects the possible impact of the more local environment.

Only recently, characteristics related to the local environment of firms have received some attention. La Rocca et al. (2010), Palacín-Sánchez and di Pietro (2013) and Palacín-Sánchez et al. (2013) show for Italian and Spanish regions, respectively, that leverage ratios as well as the role of firm-level determinants varies across regions and that development and structure of the regional financial system as well as regional economic conditions affect SMEs' capital structure. However, these studies are restricted to single countries, leaving the question whether certain regional characteristics affect firms' financing structures beyond an individual country setting unaddressed.

Finally, more encompassing research, which fully accounts for the different levels that might influence firms' financing decisions and which addresses the hierarchical structure of the underlying firm level data remains scarce. One exception is Kayo & Kimura's (2011) multilevel study on the role of industry and country differences for corporate capital structure (measured as the ratio of long-term debt to total assets). Using panel data for 17,061 NFCs from 40 countries over a period from 1997 to 2007 and employing mixed random effects estimation, they show that, although industry and country differences account for less variance in firm leverage than firm and time specific factors, their effect is far from negligible.

Strongly building upon the approach by Kayo and Kimura (2011), the current research takes a more regional perspective with respect to the geographical and institutional context instead of focusing on overall differences between countries. It further utilises more extensive, detailed and comprehensive data on NFCs' balance sheets for selected euro area countries, sacrificing a larger cross-section of countries in exchange for a higher coverage of the non-financial sector in the respective countries as well as high quality and depth of the firm-level data.

3. Data

The current analysis draws on a unique cross-country dataset of harmonised firm-level balance sheet information of NFCs from six euro area countries. The data stems from micro data underlying the Bank for the Accounts of Companies Harmonized (BACH) database and was obtained from Central Balance Sheet Data Offices (CBSOs) in the respective countries as part of an ECB pilot exercise on the value of a centralised collection of NFC micro data. BACH is a publicly available meso-aggregated database of the European Committee of Central Balance Sheet Data Offices (ECCBSO). It publishes non-consolidated accounting information of non-financial incorporated enterprises for currently 11 European countries, aggregated separately in each country by business sector and enterprise size.

Financial items are mostly based on common templates which have been harmonised to increase cross-country comparability.[5]

Six of the eleven national providers currently participating in BACH (i.e. Belgium, Spain, France, Italy, Portugal and Slovakia) agreed to provide the underlying annual firm-level data for their respective countries, resulting in a unique cross-country dataset of large scale firm-level data that has not been compiled at this level before. While the obtained data provides a time series dimension, the resulting cross-country panel data is rather diverse and unbalanced across countries and does only cover a rather short period (mostly 2009-2013). With respect to the current analysis, this limits the sample as well as the explanation power of the time dimension while adding more complexity to the estimations. Moreover, capital structure is expected to be rather stable across a shorter period of time (for empirical support, see, e.g., Lemmon et al. 2008).[6] Thus, in a first step, only a cross-section of NFCs is used instead of the full panel data. The data is pooled over time with each observation containing the latest record available for the respective firm. Only annual records from 2011 or later are considered.

Furthermore, only observations with non-missing information regarding all main variables central to the analysis are included. In addition, the sample is restricted to those firms with leverage ratios between 0 and 1 (following Kühnhausen & Stieber 2014: 7) in order to exclude influential outliers and observations with implausible values. The data was further adjusted to only contain observations with profitability values between -1 and 1 and tangibility and liquidity ratios between 0 and 1 (again following Kühnhausen & Stieber 2014). A description of the individual measures mentioned here is given in section 5 below. The final cross-section of NFCs from Belgium, Spain, France, Italy, Portugal and Slovakia analysed in the current study amounts to a total of 1,969,284 companies.

4. Accounting for Differences between Industries and Regions

The present analysis particularly considers that firms' financing decisions and capital structure may not be purely determined by intrinsic characteristics of the firm, but are likely to be influenced by their respective environment.

As discussed in section 2, various studies on corporate capital structures have previously highlighted the existence of significant variation in leverage ratios across sectors of activity. According to Frank and Goyal (2009: 8), two main reasons for such variation can be distinguished. First, managers might orient themselves along industry benchmarks when setting their own leverage ratios, treating such benchmarks as target capital structures. Second, companies within the same industry are likely exposed to common forces that affect their financing decisions, which may reflect different industry characteristics such as the nature of

[5] For a detailed description of the BACH database as well as its underlying national data providers, refer to BACH Working Group (2015).

[6] Preliminary analysis using the panel data shows that including a time dimension does not seem to add considerable explanation power to the analysis.

competition or industry heterogeneity in the types of assets, business risk, technology or regulation. Simerli and Li (2000) further point out that environmental factors may similarly affect corporate strategies of all organisations of a given industry (see Kayo & Kimura 2011: 360). In addition, industries can also differ regarding the type of firms that are predominantly active in them, possibly implying different financing strategies between different sectors due to the specific characteristics of firms in the respective industries. Overall, this leads to the expectation that a considerable part of variation in corporate leverage ratios across NFCs should be due to differences between industries, which likely reflect both differences in the composition of firms across sectors as well as specific industry characteristics that influence individual financing decisions. In consequence, it seems not only necessary to investigate the role of specific industry characteristics, but to also aim at establishing the relative importance of overall sector differences.

Sector differences are taken into account by distinguishing between 17 main sections based on the Statistical Classification of Economic Activities in the European Community (NACE, rev.2).[7] All observations from companies indicated as active in the financial sector (i.e. mostly holding companies) are excluded. In addition, firms from sector O – i.e. Public Administration and Defence; Compulsory Social Security – are dropped from the final analysis due to only 6 companies in the sample being active in this sector.

In addition to the role played by sectors, the current research focuses on specific characteristics of firms' local environment (i.e. the region) as a relevant factor affecting the capital structure of firms in a cross-country setting. While most existing research on the role of the institutional context and the regional environment concentrates on the level of countries (see section 2), some contributions have highlighted the existence of institutional differences at the local level, which are likely to have crucial impacts on corporate financing decisions (see La Rocca et al. 2011: 113). Moreover, development and infrastructure of regional financial sectors are likely to differ, which may strongly influence access to external financing for various firms (see also Palacín-Sánchez and di Pietro 2013: 5). Finally, economic forces and social factors can also vary considerably across local environments instead of being stable across geographic areas of the same country. It thereby appears reasonable that firms are often rather affected by these regional forces instead of country aggregates. Hence, regional differences should constitute relevant influences on firms' financing decisions, particularly for companies operating purely in a more local environment.

However, the role of regional characteristics may differ given the size of firms. As Palacín-Sánchez and di Pietro (2013: 5) argue, regional divergences in financial sectors would decrease in their relevance the better the possibility for firms to access any financial market. While large firms are likely to have access to wider financial markets across regional borders, smaller firms are often restricted to their more immediate environment and have limited access to financial companies operating in other regions. Thus, regional factors should be of particular relevance

[7] While information on the NACE classification provided in the BACH micro data from CBSOs allows for a more detailed sector breakdown up to the four digit level, such detailed view would reduce the number of cases in some sectors considerably, particularly when considering the interaction between sectors and regions.

for financing decisions of smaller firms, while larger corporations should be rather affected by broader environments such as features of the overall industry.

The present study will distinguish between regions according to the Nomenclature of territorial units for statistics (NUTS), focusing mainly on the NUTS 2 level, which corresponds to basic regions for the application of regional policies. NUTS classifications were mostly derived from the postal code utilising conversion tables from Eurostat. For Portugal, where information on the NUTS region was available with a high coverage, no postal code to NUTS conversion was conducted.

5. Variables and Estimation

After establishing the final sample as well as the distinction between different sectors and regions, the current chapter concentrates on the main variables of the analysis as well as the analytical method that is employed. The former includes a thorough discussion of the main explanatory factors considered, providing details on their operationalisation and expected connection to firms' financing structures.

Dependent Variables – Firm Leverage

To analyse firms' capital structure, *leverage* – measured in this paper as the ratio of total liabilities to total assets – will serve as the main dependent variable that captures a company's respective overall debt versus equity choice (where equity equals total assets minus liabilities). This is in line with a large part of the previous literature on NFC capital structures (e.g. MacKay & Phillips 2005; Palacín-Sánchez & di Pietro 2013; Palacín-Sánchez et al. 2013; Kühnhausen & Stieber 2014).[8] Figures 5.1 to 5.4 illustrate median leverage ratios across NUTS 2 regions for the six pilot countries, separately by firm size. Firms are thereby distinguished into micro, small, medium and large firms based on their total assets (applying the thresholds as set out in the European Commission Recommendation 2003/361/EC of 6 May 2003).[9]

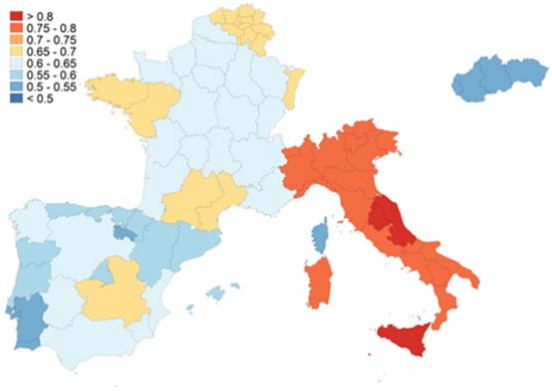
As can be observed, leverage ratios seem to differ across regions, although differences between countries seem to dominate. In general, median leverage ratios appear to be smaller across most French, Spanish and Portuguese regions, while they seem to be largest among regions in Southern Italy. At the same time, clear differences across size classes can be observed, with an overall tendency towards lower debt financing with increasing firm size. In line with the argumentation of Palacín-Sánchez et al. (2013: 508), regional differences seem to be more pronounced for SMEs compared to large firms. Moreover, differences between size classes seem to vary across regions. Whereas leverage ratios seem to be rather consistent across size classes among French regions, differences are more pronounced in Slovakia, central Spain and in particular the north of Italy.

[8] Please note that the overall leverage measure chosen here differs from the sum of short- and long-term debt over total assets (often considered as financial leverage) as, along with both short- and long-term debt, it further includes provisions, trade payables, current payments received on account of orders as well as deferred liabilities.

[9] Total assets are used here as other indicators such as the number of employees or net turnover contain missing information for a relatively large fraction of observations in the sample.

Figure 5.1: Median leverage – Micro firms

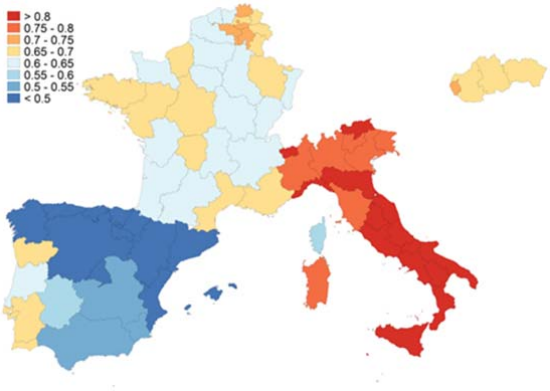
(by NUTS 2 region)



Note: Micro firms are defined as those firms with less than EUR 2 million in total assets.

Figure 5.2: Median leverage – Small firms

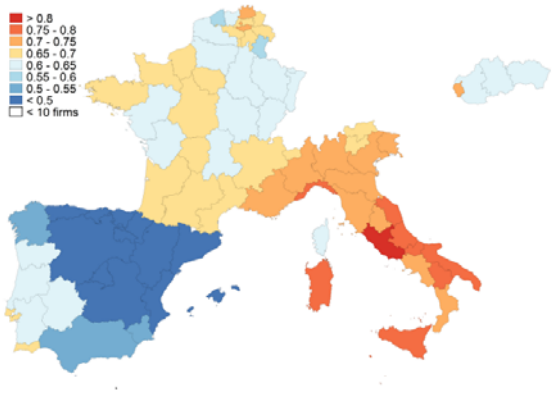
(by NUTS 2 region)



Note: Small firms are defined as those firms with EUR 2 – 10 million euros in total assets

Figure 5.3: Median leverage – Medium firms

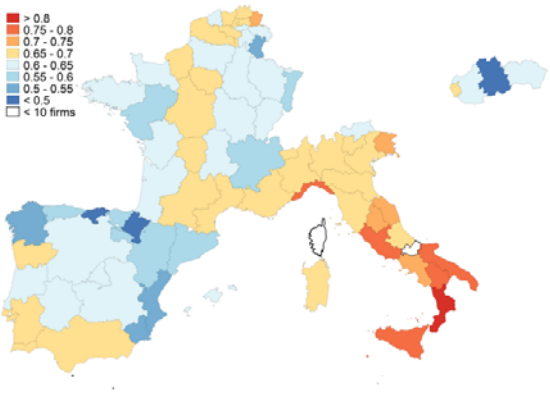
(by NUTS 2 region)



Note: Medium-sized firms are defined as those firms with EUR 10 to 43 million in total assets

Figure 5.4: Median leverage – Large firms

(by NUTS 2 region)



Note: Large firms are defined as those firms with more than EUR 43 million in total assets

In addition to overall leverage, further analysis will focus on the maturity of financial debt, distinguishing between short- and long-term financial liabilities over total assets (see also, among others, Demirgüç-Kunt & Maksimovic 1999; Palacín-Sánchez et al. 2013; Kühnhausen & Stieber 2014).

Explanatory Variables – Firm, Sector and Regional Characteristics

Explanatory variables will first of all include the main firm characteristics identified in the literature (i.e. firm size, age, asset structure, profitability and liquidity). Table 5.1 gives an overview of the explanatory variables included in this study, along with their indicators and expected relationship with leverage.

Table 5.1: Overview of main explanatory factors – Measurement & Expected Effect

Variable	Indicator & Operationalisation	Expected effect
Firm level		
Firm size	Log of total assets	+
Firm age	Log of firm age in years	-
Asset structure/Tangibility	Tangible / Total assets	+
Profitability	Net operating profit (EBIT) / Total assets	-
Liquidity	Total cash & cash equivalents / total assets	-
Sector level		
Growth	Median growth in net turnover	-
Concentration	Herfindahl-Hirshman Index: Sum of squared ratios of firm turnover to total industry turnover	+,-
Regional level		
GDP	Log GDP 2012 (at current prices; NUTS 2; from Eurostat)	+
Urbanisation; Infrastructure	Population Density (NUTS 2; from Eurostat)	+
Industry concentration	Herfindahl-Hirshman Index: Sum of squared ratios of total industry turnover per region over total regional turnover	+,-
Level of generalised trust	Question A3 from European Social Survey on the degree to which most people can be trusted (individual scores lie on a scale from 0 (you cannot be too careful) to 10 (most people can be trusted) Final measure: Regional % of respondents with trust score 7 or higher.	-
Regional industry concentration	Herfindahl-Hirshman Index: Sum of squared ratios of firm turnover to total industry turnover by NUTS 2 region	+,-

Firm size is one of the main determinants of firms' capital structure found in the existing literature. Larger firms are thereby often assumed to be more established, diversified and less prone to bankruptcy, leading them to be more highly leveraged as size serves as an inverse proxy of bankruptcy risk (Titman & Wessels 1998: 6; Kühnhausen & Stieber 2014: 8 f.). However, Titman and Wessels (1998: 6) also argue that the cost of issuing debt and equity securities is related to firm size with small firms paying more to issue new equity and long-term debt. In consequence, smaller firms should be more leveraged with an inclination to short-term debt (Titman & Wessels 1998: 6). Moreover, size can be a proxy for the degree of information outside investors have, which should imply a preference for equity (Rajan & Zingales 1995: 1451; Psillaki & Daskalakis 2009: 325). Despite these ambiguities in existing theoretical argumentations, empirical evidence mostly finds a positive relationship between firm size and leverage (exceptions are Kester 1986; Titman & Wessels 1988 and Heyman et al. 2008). For the current analysis, firm size is measured as the logarithm of total assets (see also, among others, Michaelas et al. 1999; Fama & French 2002; Flannery & Rangan 2006; Brav 2009; Frank & Goyal 2009; Degryse et al. 2012; Fan et al. 2012). Total assets are used instead of alternative indicators of firm size such as turnover or the number of employees, as the latter show relatively high fractions of missing observations for some countries (mostly for small companies), which would reduce as well as distort the final sample considerably.

Firm age is expected to be negatively connected to leverage as young firms tend to be strongly based on external financing, while older firms are likely to

increasingly rely on accumulated retained profits (Michaelas et al. 1999: 116; Bhaird & Lucey 2010: 361). Firm age is measured as the natural logarithm of the difference (in years) between the respective reference year and the year of incorporation.

Firms' *asset structure* is also taken into account, using the ratio of tangible to total assets (see also Brav 2009; Frank & Goyal 2009; Psillaki & Daskalakis 2009; Degryse et al. 2012). Larger proportions of tangible assets on a firm's balance sheet imply more assets that can be placed as collateral, which should further increase firms' ability to acquire loans (Rajan & Zingales 1995: 1451; Kühnhausen & Stieber 2014: 10). Tangible assets are further assumed to be more easily assessed and valued by outsiders than intangible ones, mitigating expected distress and debt-related agency costs. Hence, one would expect a positive connection with leverage.

Profitability is also widely considered to be strongly related to leverage with existing evidence consistently suggesting a negative connection (see section 2). Following a pecking order argumentation, more profitable firms should have more internal financing available and thus, should use these funds rather than debt to finance new investments in order to minimise costs from information asymmetries (Rajan & Zingales 1995: 1451; Psillaki & Daskalakis 2009: 325).[10] In line with several previous contributions (e.g. Fama & French 2002; Sogorb-Mira 2005; Flannery & Rangan 2006; Psillaki & Daskalakis 2009), profitability is captured using the ratio of net operating profit (EBIT) over total assets.

Finally, *liquidity* is assumed to affect leverage as cash and other liquid assets can function as internal funds that, according to the pecking order theory, are likely to be utilised first instead of debt (de Jong et al. 2008: 1961). Thus, liquidity should be negatively related to leverage (see Brav 2009; Kühnhausen & Stieber 2014). Liquidity is measured as the amount of cash equivalents over total assets (see also Brav 2009; Kühnhausen & Stieber 2014).

Besides these firm-level factors, certain characteristics of firms' respective industries (based on NACE rev 2) are also considered. These will include *industry growth* captured by median growth in turnover across firms active in the same NACE section as well as *industry concentration*. For the latter, a Herfindahl-Hirshman index will be constructed (following Kayo & Kimura 2011), defined as the sum of squared market shares (i.e. the ratio of a firm's net turnover over total turnover of their respective industry) of firms within a given NACE section.

Industry growth should be negatively related to leverage as firms in low-growth industries should use debt for "its disciplinary function in avoiding the misuse of free cash flows", while firms in high-growth industries have "incentives to signal that they do not engage in adverse selection and moral hazard costs" (e.g. through underinvestment and asset substitution) and thus, to carry less leverage (La Rocca et al. 2011: 113). Meanwhile, previous studies on the role of industry concentration have usually assumed a positive connection with leverage ratios, due to differences in profitability, size and firm risk between firms in highly and lowly concentrated industries (Kayo & Kimura 2011: 361). However, existing empirical evidence on the connection of industry concentration and leverage remains mixed (see, e.g., MacKay & Philips 2005 for a positive, Kayo & Kimura 2011 for a negative relationship).

[10] However, from a trade-off theory perspective, profitable firms are expected to use more debt financing in order to capitalise on tax shield benefits of debt (Psillaki & Daskalakis 2009: 325; see also Harris & Raviv 1990).

In addition to industry specific factors, some characteristics of the local region are also included in the analysis. *Regional GDP* is considered to capture the level of economic development, while *population density* by region serves as a proxy for urbanisation and local infrastructure. Both are expected to improve the access to external financing and thus to be related to higher leverage ratios. Both measures refer to the NUTS 2 region level and are obtained from Eurostat.

Industry structure is also expected to play a relevant role for corporate financing decisions at regional level as one would expect notable differences between regions dominated by certain industries and those regions with a more diversified non-financial sector economy. A region's industry structure is measured using a Herfindahl-Hirshman index across industries in each region. Thus, it is defined as the sum of squared shares of individual industries in total regional turnover.

A more social factor that may affect costs related to information asymmetries for different forms of financing is *trust*. The current study will thereby focus on the concept of generalised rather than particularised trust.[11] Generalised trust has been widely argued to have various positive economic externalities as it reduces transaction costs and facilitates economic interactions (Alesina & La Ferrara 2002: 207, Uslaner 2003: 44). More specifically, generalised trust should reduce the need and effort to obtain additional information regarding the reliability of counterparts in financial and economic interactions (Knack & Keefer 1997: 1252). Higher levels of generalised trust should therefore mitigate the importance of information asymmetries and thus should increase the use of long-term over short-term debt and equity over debt financing. The regional level of generalised trust is obtained from the sixth wave of the European Social Survey (ESS) conducted in 2012.[12] The current research thereby draws on question A3 of the ESS asking respondents whether they would say "that most people can trusted, or that you can't be too careful in dealing with people" (see ESS Round 6 Main Questionnaire). Respondents are asked to answer on a scale from 0 (can't be too careful) to 10 (most people can be trusted). The percentage of respondents in each NUTS 2 region with a trust score of 7 or higher is thereby taken as the final measure of generalised trust at the regional level. Regional trust scores at NUTS 2 are replaced by aggregates at NUTS 1 for regions with less than 30 respondents.[13]

Finally, industry concentration is also considered at the regional level. Specific characteristics of a firm's respective industry may not only have a general effect on

[11] While particularised trust is based on personal knowledge and restricted to a specific social unit (Freitag et al. 2009: 498), generalised trust is based on the assumption that most people are part of the own moral community (Uslaner 2003). Therefore, it is independent of specific persons or groups and thus, can rather be understood as an estimate of the trustworthiness of the average person (Coleman 1990: 104; Robinson & Jackson 2001: 119, Paxton 2007: 48; Griesshaber & Geys 2012: 58).

[12] See ESS round 6 documentation report for technical details.

[13] Apart from the regional characteristics considered here, other factors of the regional environment in which firms are operating may be of importance. In particular the regional institutional context, the financial infrastructure and a measure of financial deepening at regional level might constitute relevant determinants of firms' financing decisions (see Palacín-Sánchez & Di Pietro 2013; Palacín-Sánchez et al. 2013). However, good indicators of these factors such as the number of bank branches per 100,000 inhabitants in each region, utilised in previous country specific studies (e.g. La Rocca et al. 2010, Palacín-Sánchez et al. 2013), could not be obtained on a comparable basis for all countries of the current study. An assessment regarding the role of such factors in a cross-country setting is thus left to future research.

firms' capital structure across geographical units. Instead, firms may also be strongly affected by their more local industry environment to which individual firms adjust their financing decisions. *Regional industry concentration* is computed as before (via a Herfindahl-Hirshman index), but separately for each NUTS 2 region.

Statistical Estimation

Given the hierarchical structure of the data (firms are nested in both sectors and regions), cross-classified multilevel models are employed. Ignoring such a hierarchical structure in the data would increase the risk of incorrect standard as well as type I errors since residuals might be correlated across observations from the same industry or region (Kreft & de Leeuw 1998: 9; Steenbergen & Jones 2002: 219 f.). Conducting multilevel estimations explicitly accounts for the possibility that intercepts may vary between industries, regions as well as their interaction. It further allows controlling for the effect of sector and region specific factors absent of the assumption that these factors explain all existing variation between sectors and regions. Sectors and regions are thereby introduced at the same level since one cannot establish a clear hierarchy between the two.

In a first step, variance component models are estimated to assess the relative importance of each level regarding the overall variance of leverage. The basic model can be set up as follows, starting with the firm-level (subscripts i for firm, j for industry and k for region).[14]

$$Lev_{ijk} = \beta_{0jk} + \varepsilon_{ijk} \quad (1.1)$$

where the leverage ratio of firm i within sector j and region k is a function of mean leverage β_{0jk} of industry j in region k plus an error term ε_{ijk}. As mentioned above, it seems rather unlikely that financing choices of firms from the same sector or region are completely independent. Therefore, in a next step, a second level will be introduced by modelling the mean leverage of industry j in region k (β_{0jk})

$$\beta_{0jk} = \beta_{000} + \delta_{0j0} + \zeta_{00k} + \vartheta_{0jk} \quad (1.2)$$

where β_{000} reflects the grand mean of the sample and δ_{0j0} and ζ_{00k} represent the industry and region specific error components, respectively. In addition, a random interaction term ϑ_{0jk} is introduced, reflecting all existing combinations of sector and region.[15] Substituting (1.2) into (1.1) then gives the complete mixed effects model.

$$Lev_{ijk} = \beta_{000} + \delta_{0j0} + \zeta_{00k} + \vartheta_{0jk} + \varepsilon_{ijk} \quad (1.3)$$

The variance of the respective level-specific error terms δ_{0j0}, ζ_{00k}, ϑ_{0jk} and ε_{ijk} finally reflect the relative importance of these levels with respect to firm leverage. The former (i.e. δ_{0j0}, ζ_{00k},) remain constant across firms from the same sector and region,

[14] The employed method and its discussion in this chapter are strongly based on Kayo and Kimura (2011: 363 f.).

[15] A likelihood ratio test to compare this specification with an additive random-effects model excluding a random interaction supports the inclusion of an interaction term between sectors and regions for all considered debt ratios.

respectively, while ϑ_{0jk} is assumed to be independent from the other error components as well as across combinations of sector and region (see also Rabe-Hesketh and Skrondal 2008: 485). The firm-level residuals represent the deviation of a firm's specific leverage ratio from the mean for sector j and region k, and are assumed to be independent across firms, sectors, regions as well as the interaction of sectors and regions.

Following the estimation of this basic ('empty') specification, explanatory factors at firm, sector and regional level are introduced in a next step. The main random intercept model is thereby derived as before, with firm specific predictors included in the firm-level specification (1.1).

$$Lev_{ijk} = \beta_{0jk} + \beta_{1jk} \cdot Size_{ijk} + \beta_{2jk} \cdot Age_{ijk} + \beta_{3jk} \cdot Tangibility_{ijk} + \beta_{4jk} \cdot Profitability_{ijk} + \beta_{5jk} \cdot Liquidity_{ijk} + \varepsilon_{ijk} \quad (2.1)$$

The sector and region specific variables as well as the measure of industry concentration within regions are then included as determinants of the random firm-level intercept.

$$\beta_{0jk} = \beta_{000} + \beta_{01k} \cdot Ind\_Growth_j + \beta_{02k} \cdot Ind\_Concentration_j + \beta_{0j1} \cdot Reg\_GDP_k + \beta_{0j2} \cdot Reg\_PopDensity_k + \beta_{0j3} \cdot Reg\_IndStructure_k + \beta_{0j4} \cdot Trust_k + \beta_{011} \cdot RegInd\_Concentration_{jk} + \delta_{0j0} + \zeta_{00k} + \vartheta_{0jk} \quad (2.2)$$

Please note that by retaining the specific error components of industry, region and their interaction (i.e. δ_{0j0}, ζ_{00k} and ϑ_{0jk}) one takes into account that the region- and sector-level factors considered in the model may not completely explain all existing variation in the intercepts. Consolidating specifications (2.1) and (2.2) then results in the full random intercept model (2.3), where leverage of firm i of sector j in region k is a function of the mean intercept plus firm, sector and region specific covariates and their respective random errors. Thereby, it is assumed that the firm-level effects $\beta_{1jk} - \beta_{5jk}$ are fixed across sectors and regions (i.e. $\beta_{pjk} = \beta_{p00}$ for p = 1, 2, … , 5), while sector specific effects are fixed across regions and vice versa ((i.e. $\beta_{0pk} = \beta_{0p0}$ for p = 1, 2; $\beta_{0jp} = \beta_{00p}$ for p = 1, 2, …, 4; see also Steenbergen and Jones 2002: 229).

$$Lev_{ijk} = \beta_{000} + \beta_{100} \cdot Size_{ijk} + \beta_{200} \cdot Age_{ijk} + \beta_{300} \cdot Tangibility_{ijk} + \beta_{400} \cdot Profitability_{ijk} + \beta_{500} \cdot Liquidity_{ijk} + \beta_{010} \cdot Ind\_Growth_j + \beta_{020} \cdot Ind\_Concentration_j + \beta_{001} \cdot Reg\_GDP_j + \beta_{002} \cdot Reg\_PopDensity_k + \beta_{003} \cdot Reg\_IndStructure_k + \beta_{004} \cdot Trust_k + \beta_{011} \cdot RegInd\_Concentration_{jk} + \delta_{0j0} + \zeta_{00k} + \vartheta_{0jk} + \varepsilon_{ijk} \quad (2.3)$$

where β_{000} constitutes the overall mean intercept, $\beta_{100} - \beta_{500}$ reflect the firm-level effects on leverage for firm size, age, tangibility, profitability and liquidity, β_{010} and β_{020} stand for the sector specific effects of industry growth and concentration and $\beta_{001} - \beta_{004}$ represent the region-level effects of regional GDP, population density, a region's industry structure and trust. β_{001} finally reflects the effect of sector concentration within regions. As before, δ_{0j0}, ζ_{00k}, ϑ_{0jk} and ε_{ijk} constitute the level-specific error terms.

All models are estimated using maximum likelihood estimation and only non-missing observations regarding all relevant variables of the analysis are included in each model. All models were tested for possible multi-collinearity among covariates. However, pairwise correlations between explanatory variables are found to be lower than 0.5 in all cases. Moreover, estimated variance inflation factors (VIFs) remain well below common thresholds and thus, do not show any indication of possible multi-collinearity.

6. Empirical Findings

Discussion of the main results obtained through estimation of the models specified in section 5 first concentrates on overall firm leverage (i.e. the ratio of total liabilities over total assets). Table 6.1 reports the results of the corresponding crossed random-effects estimations. Model 1 thereby refers to the empty specification in order to decompose the variances of the level-specific random errors, while model 2 adds firm, sector, region and sector-region specific characteristics as explanatory variables. Estimations are based on a cross-section of 1,969,284 firms from 17 different NACE sections and 87 different NUTS 2 regions (located in BE, ES, FR, IT, PT and SK).

Results for the variance decomposition indicate that a vast proportion of variance in leverage ratios is allocated at the firm-level, suggesting that it is mainly intrinsic factors of firms that seem to drive financing decisions (see also Kayo & Kimura 2011: 365). From the point of European economic integration and monetary union, the high relevance of firm specific differences compared to regional ones seems reassuring as strong regional differences should not persist when aiming towards convergence of NFCs (SMEs in particular) by improving overall access to finance across the whole euro area (Palacín-Sánchez & di Pietro 2013: 3). Nevertheless, region and sector differences still seem to matter to some degree with the intra-class correlation for firms from the same region and sector amounting to 0.1. Regional differences thereby seem to be more relevant than industry characteristics, which appear to be of minor importance.

After establishing the relative importance of the different levels in regard to the overall variation in leverage ratios, subsequent inclusion of explanatory variables indicates which firm, sector and region specific characteristics pose relevant impacts on firms' leverage ratios and can explain some of the variance in leverage found at the respective levels. Results for the main firm-level variables are thereby mostly in line with large parts of the empirical literature, confirming the theoretical expectations derived in section 5. Firm size and asset tangibility are both found to be positively connected to leverage, supporting the view that firms of larger size or with more tangible assets signal lower bankruptcy risk and can post relatively more collateral against debt, which improves their access to debt financing. Similarly, findings show the expected negative links for firm age, profitability and liquidity.

Table 6.1: Multilevel analysis I – The determinants of firm leverage

Dep. Variable: Firm Leverage	(1)	(2)
Firm level		
Log of total assets		0.0209***
		(0.0001)
Log of firm age		-0.0766***
		(0.0002)
Profitability		-0.144***
		(0.001)
Tangibility		0.00239**
		(0.0008)
Liquidity		-0.355***
		(0.0009)
Industry level		
Concentration		-0.145*
		(0.061)
Median growth in turnover		-0.583
		(0.370)
Region level		
Population density 2012		-1.14e-05*
		(5.69e-06)
Log of GDP 2012		0.0342***
		(0.007)
Industry structure		-1.4e-05*
		(5.5e-06)
Trust		0.000159
		(0.0007)
Industry concentration by region		-0.0266*
		(0.013)
Constant	0.599***	0.388***
	(0.0117)	(0.069)
Number of Firms	1,969,284	1,969,284
Number of Sectors	17	17
Number of Regions (Nuts 3)	87	87
Number of Sectors by Region	1,460	1,460
Variance decomposition (in % of residual variance)		
Variance: Sector-level	1.4%	1.0%
Variance: Region-level	6.7%	4.2%
Variance: Sector x Region	2.2%	2.2%
Variance: Firm-level	89.7%	92.6%

The table reports the results of the crossed random intercept models specified in section 5 when using overall leverage (i.e. total liabilities/assets) as the dependent variable. Non-standardised regression coefficients are reported with standard errors in parentheses.

Significance Levels: * < 0.05, ** < 0.01, *** < 0.001

As regards the role of the sector specific characteristics considered in the analysis, firms in more highly concentrated industries appear to have lower leverage ratios. This supports the finding of Kayo and Kimura (2011) rather than MacKay and

Philips (2005). The effect of industry growth also seems to be negative (yet insignificant). Turning to the results for the regional factors, firms in regions with higher economic development seem to have higher leverage ratios. Meanwhile, negative effects are found for population density and industry structure, which nevertheless remain rather marginal. Regarding the regional level of trust, the obtained positive connection with leverage is also small and insignificant. Finally, industry concentration also seems to matter within regions. Firms operating in regional industries that are more concentrated thereby seem to have lower leverage ratios, which again partially supports the finding of Kayo and Kimura (2011).

Overall, the included covariates explain around 40% of the part of variation in firm leverage that is due to differences across sectors. However, the share of variation in leverage allocated at the level of sectors in general is rather small, causing the value added through the considered sector characteristics to remain limited. With respect to regional differences, the model is able to explain close to half of the variance allocated at this level. Thereby, a considerable amount is explained by the firm-level variables, suggesting that regions differ in regard to their population of firms, which in turn explains some of the differences in capital structures across regions. Nevertheless, the considered region specific variables provide further explanatory value, supporting the view that there are specific features of the regional environment that can affect corporate financing choices.

Exploring Differences between Size Classes

As mentioned in section 4, the role and relative importance of firm, industry and regional differences may differ depending on the size of firms. Smaller companies might be more restricted to local financial markets and more likely affected by the features of the local economy and their respective regional industry. Larger firms, meanwhile, should have higher capabilities of operating across regional boundaries and thus, should be less constrained by regional characteristics. Instead, those firms should rather be affected by broader developments and features regarding their markets and industries.

Table 6.2: Distinguishing by firm size – Variance Decomposition

Dep. Variable: Firm Leverage	Micro	Small	Medium	Large
Number of Firms	1,627,649	262,105	61,171	18,359
Number of Sectors	17	17	17	17
Number of Regions (Nuts 3)	87	87	87	87
Number of Sectors by Region	1,452	1,420	1,282	1,001
Variance decomposition (in % of residual variance)				
Sector-level	1.1%	2.0%	4.2%	6.0%
Region-level	6.1%	12.7%	8.5%	3.4%
Sector x Region	2.1%	3.2%	4.1%	2.7%
Firm-level	90.7%	82.1%	83.2%	87.9%

The table reports the estimation results of the empty crossed random intercept models when using overall leverage (i.e. total liabilities / total assets) as the dependent variable. Distinction by size is based on total assets – i.e. Micro: < EUR 2 million; Small: EUR 2-10 million; Medium: EUR 10-43 million; Large: > EUR 43 million.

Table 6.3: Distinguishing by firm size – Multilevel analysis

Dep. Variable: Firm Leverage	Micro	Small	Medium	Large
Firm level				
Log of total assets	0.0429***	-0.0140***	-0.00387	0.00412*
	(0.0002)	(0.001)	(0.002)	(0.002)
Log of firm age	-0.0833***	-0.0666***	-0.0461***	-0.0247***
	(0.0002)	(0.0006)	(0.001)	(0.002)
Profitability	-0.152***	-0.389***	-0.422***	-0.445***
	(0.001)	(0.005)	(0.010)	(0.018)
Tangibility	0.00973***	-0.0807***	-0.0628***	-0.0362***
	(0.0009)	(0.002)	(0.004)	(0.007)
Liquidity	-0.328***	-0.388***	-0.333***	-0.171***
	(0.001)	(0.004)	(0.009)	(0.019)
Industry level				
Concentration	-0.122	-0.0798	-0.213	-0.262*
	(0.065)	(0.078)	(0.116)	(0.132)
Median growth (in turnover)	-0.560	-0.129	-0.629	-1.084
	(0.394)	(0.474)	(0.699)	(0.770)
Region level				
Population density 2012	-9.67e-06	-1.37e-05	-2.49e-06	-4.48e-06
	(5.04e-06)	(9.48e-06)	(9.38e-06)	(6.37e-06)
Log of GDP 2012	0.0273***	0.0324**	0.0266*	0.0220**
	(0.006)	(0.011)	(0.010)	(0.007)
Industry structure	-1.01e-05*	-1.19e-05	-1.12e-05	-3.66e-06
	(4.84e-06)	(9.08e-06)	(8.05e-06)	(4.85e-06)
Trust	0.00046	-0.00128	-0.00209*	-0.00121
	(0.0006)	(0.001)	(0.001)	(0.0006)
Industry concentration by region	-0.0101	-0.0446*	-0.00883	0.0140
	(0.013)	(0.022)	(0.032)	(0.041)
Number of Firms	1,627,649	262,105	61,171	18,359
Number of Sectors	17	17	17	17
Number of Regions (Nuts 3)	87	87	87	87
Number of Sectors by Region	1,452	1,420	1,282	1,001
Variance decomposition (in % of residual variance)				
Sector-level	1.1%	1.7%	3.5%	4.6%
Region-level	3.3%	12.1%	8.9%	2.8%
Sector x Region	1.9%	4.0%	5.1%	3.4%
Firm-level	93.7%	82.3%	82.6%	89.2%

The table reports the estimation results of the crossed random intercept models specified, when using overall leverage (i.e. total liabilities / total assets) as the dependent variable. Distinction by size is based on total assets – i.e. Micro: < EUR 2 million; Small: EUR 2-10 million; Medium: EUR 10-43 million; Large: > EUR 43 million. Non-standardised regression coefficients are reported, standard errors in parentheses.

Significance Levels: * < 0.05, ** < 0.01, *** < 0.001

To further investigate such possible differences, firms are distinguished into four categories based on their size in terms of total assets (i.e. micro, small, medium

and large) and the above models are re-estimated separately for each sub-sample. Results of the variance components and multilevel models are reported in table 6.2 and 6.3, respectively. As can be observed, the relative importance of industry and region differences indeed seems to vary with firm size. Although most of the variance in leverage across all size classes still appears due to firm specific differences, regional characteristics seem to be of higher relevance among small and medium-sized companies compared to larger firms. In particular among companies with EUR 2 to 10 million in total assets, differences between regions independent of differences between industries seem to account for 12.7% of the variance in leverage (with slightly lower intra-class correlations for firms from the same region but different sectors among the samples of micro and medium-sized firms). In contrast, the relative importance of the industry level is found to increase with firm size. Both findings confirm the above expectations that smaller firms are more affected by their local environment, while overall industry differences seem to matter mostly for large companies.

Including explanatory variables in the estimations by size class shows that the previously identified negative connections for firm age, profitability and liquidity consistently hold across all size classes. The positive relationship between tangibility and leverage revealed for the full sample seems to only hold for the sub-sample of micro firms with less than EUR 2 million in total assets. In contrast, among all other size classes, firms with relatively more tangible assets on their balance sheet appear to have lower debt ratios.

As before, the coefficient for industry concentration is found to be negative yet insignificant in most estimations. The only exception is among large firms where the effect becomes significant at a 5% level, again supporting the idea that overall industry characteristics such as concentration are most influential among larger firms. The relationship between median industry growth and individual firm leverage, meanwhile, is not found to be significant among any size class.

Regarding regional specific variables, only GDP seems to be consistently (positively) associated with firm leverage across all size classes. Interestingly, trust is found to be negatively connected to firm leverage among medium-sized companies, possibly suggesting that in high trust environments availability of equity financing improves. Meanwhile, small firms active in industries with higher concentration in the respective region choose lower debt financing. Not surprisingly, it is among those size classes with larger shares of variance being allocated at the level of regions, where significant effects for regional variables are more likely found.

Distinguishing between Short- and Long-Term Debt

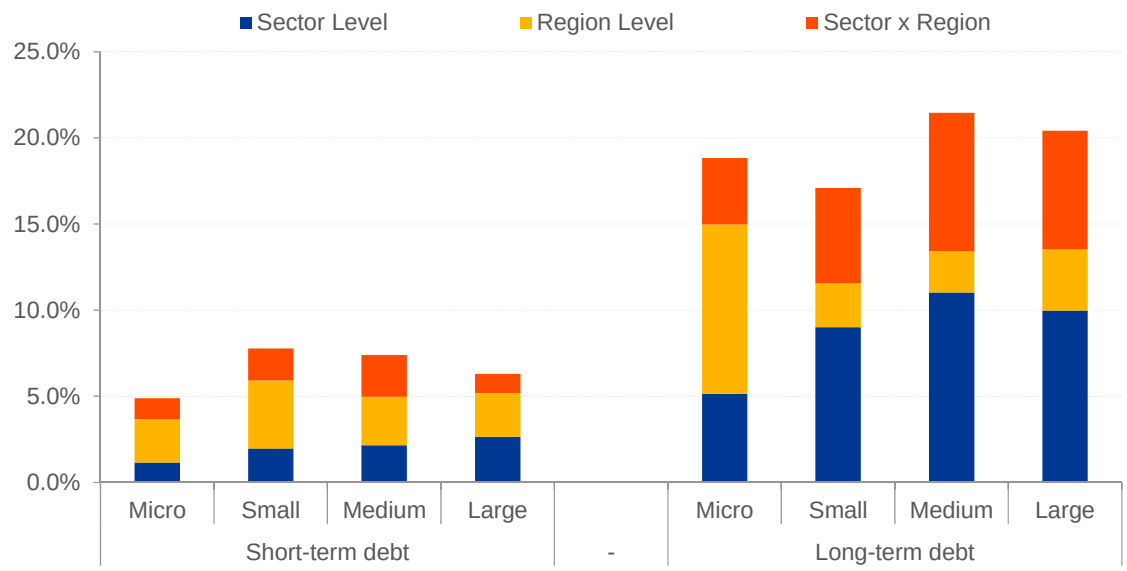
Several studies on the determinants of corporate capital structures have accounted for the maturity of debt, highlighting that the underlying reasons for the use of short-term versus long-term debt financing are likely to differ significantly (e.g., among others, Fan et al. 2012). The present study therefore re-estimates the previous models separately for short- and long-term liabilities. Estimations again are conducted individually for each size class.

Figure 6.1 shows the results of the variance decomposition by size class for both types of debt financing, whereas the full models including all covariates considered in the current analysis are reported in table 6.4. Results thereby indicate

that firms' relative use of short-term debt financing does not seem to be considerably connected to region or sector specific characteristics. Instead, variation in short-term leverage ratios seems to be almost exclusively due to firm specific differences. There further do not seem to be notable differences between size classes. On the other hand, differences between regions and sectors seem to be of some relevance with respect to the use of long-term leverage, jointly accounting for around 17-22% of the variance in the dependent variable across the different size classes. As before, regional differences seem to matter most for smaller firms (micro firms in particular), while industry differences appear more important with increasing firm size. Furthermore, industry differences do not only seem to affect long-term debt financing across regions but also appear to matter at the local level.

Figure 6.1: Short- and long-term debt

Variance decomposition (by firm size)



The graph illustrates the results of the variance components estimations, using ratios of short- and long term liabilities over total assets as dependent variables. The models are separately estimated for firms of different size classes.

Regarding the role of specific firm-level factors, firm size, age, profitability, tangibility as well as liquidity appear consistently negatively related to short-term leverage. Overall, these findings are in line with most theoretical expectations (see section 5), supporting the view that smaller as well as less established firms should encounter higher costs of long-term debt and equity financing and thus, are more likely to opt for short-term financing. Higher profitability as well as higher liquidity should increase the availability of retained earnings to finance investment, which is supported by the obtained negative relation. Meanwhile, relatively more tangible assets that can be posted as collateral are likely to facilitate access to long-term financing, as confirmed by the opposed effects obtained for short- and long-term financing. The latter most likely also explains the opposed effects found for tangibility with respect to overall leverage across size classes (see above).

Table 6.4: Short- and long-term debt – Including explanatory factors (by firm size)

	DV: Short-term debt / Total assets				DV: Long-term debt / Total assets			
	Micro	Small	Medium	Large	Micro	Small	Medium	Large
Firm level								
Log of total assets	-0.007***	-0.017***	-0.004*	-0.007***	0.020***	-0.004***	0.002	0.018***
	(0.0002)	(0.0008)	(0.002)	(0.001)	(0.0001)	(0.0009)	(0.002)	(0.001)
Log of firm age	-0.027***	-0.007***	-0.003***	0.003*	-0.021***	-0.0426***	-0.0320***	-0.0250***
	(0.0002)	(0.0005)	(0.0009)	(0.002)	(0.0002)	(0.0005)	(0.001)	(0.002)
Profitability	-0.0345***	-0.131***	-0.151***	-0.126***	-0.055***	-0.094***	-0.127***	-0.165***
	(0.001)	(0.004)	(0.008)	(0.013)	(0.0009)	(0.004)	(0.008)	(0.016)
Tangibility	-0.057***	-0.124***	-0.122***	-0.110***	0.230***	0.242***	0.248***	0.226***
	(0.0008)	(0.002)	(0.003)	(0.005)	(0.0006)	(0.002)	(0.003)	(0.006)
Liquidity	-0.184***	-0.185***	-0.164***	-0.119***	-0.077***	-0.231***	-0.209***	-0.148***
	(0.0009)	(0.003)	(0.007)	(0.014)	(0.0007)	(0.003)	(0.007)	(0.016)
Industry level								
Concentration	-0.043	-0.030	-0.067	-0.023	-0.056	-0.066	-0.103	-0.201
	(0.060)	(0.051)	(0.046)	(0.063)	(0.065)	(0.085)	(0.108)	(0.122)
Median growth (in turnover)	-0.249	0.030	0.168	-0.261	0.276	0.037	-0.275	-0.036
	(0.360)	(0.305)	(0.265)	(0.339)	(0.396)	(0.517)	(0.651)	(0.714)
Region level								
Pop. density 2012	-4.4e-06	-3.3e-06	4.5e-06	1.8e-06	2.5e-07	-1.5e-06	2.8e-06	3.3e-06
	(2.9e-06)	(4.1e-06)	(4.0e-06)	(3.7e-06)	(4.7e-06)	(5.0e-06)	(5.5e-06)	(7.3e-06)
Log of GDP 2012	-0.003	-0.006	-0.009*	-0.012**	0.026***	0.031***	0.021**	0.016
	(0.003)	(0.005)	(0.00427)	(0.00444)	(0.006)	(0.006)	(0.006)	(0.008)
Industry structure	5.1e-06	9.2e-06*	1e-05***	1.2e-5***	-2e-05***	-2e-5***	-2e-5***	-1.1e-05*
	(2.7e-06)	(3.7e-06)	(3.1e-06)	(2.8e-06)	(4.6e-06)	(4.5e-06)	(4.4e-06)	(5.6e-06)
Trust	0.001***	0.0006	0.0004	0.0008*	-0.002***	-0.002***	-0.002***	-0.002**
	(0.0003)	(0.0005)	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0005)	(0.0007)
Industry concentr. by region	-0.023*	-0.016	-0.004	-0.004	0.014	-0.025	-0.022	-0.064
	(0.010)	(0.015)	(0.020)	(0.026)	(0.012)	(0.020)	(0.028)	(0.039)
Firms	1,627,649	262,105	61,171	18,359	1,627,649	262,105	61,171	18,359
Sectors	17	17	17	17	17	17	17	17
Regions	87	87	87	87	87	87	87	87
Sectors by Region	1,452	1,420	1,282	1,001	1,452	1,420	1,282	1,001
Variance Decomposition								
Sector-level	1.2%	1.2%	1.0%	1.6%	2.0%	3.0%	4.9%	4.9%
Region-level	1.2%	3.4%	2.5%	1.9%	5.1%	4.2%	3.7%	5.0%
Sector x Region	1.1%	1.9%	2.5%	0.8%	3.2%	5.4%	7.2%	7.1%
Firm-level	96.5%	93.5%	94.0%	95.7%	89.7%	87.4%	84.2%	83.0%

The table reports the results of the crossed random intercept estimations, using ratios of short- and long term liabilities over total assets as dependent variables. The models are separately estimated for firms of different size classes. Distinction by size is based on total assets – i.e. Micro: < EUR 2 million; Small: EUR 2-10 million; Medium: EUR 10-43 million; Large: > EUR 43 million. Standard errors are reported in parentheses.

Significance Levels: * < 0.05, ** < 0.01, *** < 0.001

The rationale for the effect of firm age, profitability and liquidity should apply to both short- as well as long-term leverage. Hence, the consistently negative connections with long-term leverage are again in line with expectations. Contrary to short-term debt, firm size appears mostly positively connected to the use of long-term debt (except for the sample of small firms where a slightly negative relationship is obtained), broadly supporting previous findings in the literature.

As the overall relevance of region and sector differences with respect to the use of short-term debt appears to be fairly limited, it is not surprising that industry and region specific factors considered in the analysis are mostly not found to have a considerable and significant effect on this type of debt financing. Exceptions are significant negative effects for regional GDP among medium and large firms and a positive effect of regional trust on the use of short-term debt among micro and large companies. With respect to long-term debt, SMEs show increased use in regions with higher economic development. Higher levels of trust existing in the local community seem connected to lower relative usage of long-term debt.[16] Overall, while regional and sector characteristics appear to matter quite significantly for firms' decisions regarding the use of long-term debt, the considered regional variables only seem to explain a limited part of this role. In consequence, future analysis needs to further investigate potential alternative factors related to companies' industry and regional environment that may be of relevance.

The Issue of Zero Leverage Ratios

One issue often raised with respect to the analysis of leverage ratios concerns the fact that many firms may not use any debt, implying a large share of companies with leverage ratios of zero in the sample. Neglecting the special nature and possible extent of these zero leverage ratios may therefore result in a misspecification of the estimated models (see also Ramalho & da Silva 2009: 628-630). The current section focuses on the possible issue of large fractions of firms with zero leverage ratios, distinguishing them from firms with non-zero debt ratios.

However, the percentage of firms with leverage ratios of zero appears rather low in the case of overall leverage as well as short-term debt. Thus, their effect on the previously reported results for these types of debt financing should be limited. Indeed, results remain overall robust when restricting the previous estimations only to those firms with non-zero leverage in these cases (available upon request).

The case of long-term debt ratios seems to be different, as almost 40% of the firms appear to hold no long-term debt on their balance sheet. In this case, the results of the previous linear hierarchical estimations run the danger of being biased. In consequence, a two-part approach is adopted, separately estimating logistic regressions of having non-zero long-term debt in a first step, followed by a re-estimation of the previous crossed random-effects model exclusively for those firms with a long-term debt ratio larger than zero. For the first part, simple logistic estimations are conducted, including sector and region dummies when no other

[16] One explanation could be the increased use of equity financing as higher trust might reduce costs related to information asymmetries.

region or sector specific variables are considered and allowing error terms to be clustered by combinations of region and sector.[17]

Results indicate that the probability of having non-zero long-term debt seems to vary notably across regions (available upon request). Besides differences in the composition of firms and the possible impact of regional characteristics, this may also point to different treatment of missing information in the data across countries. Obtained results for the firm-level covariates in the logit regressions further show that zero-leverage ratios are more likely for smaller, less profitable companies with relatively less tangible assets.

The hierarchical estimations for long-term debt conditional on having non-zero leverage show that sector differences seem to play a more considerable role than before, while the proportion of variance explained purely at the regional level independent of sector differences is reduced. Hence, the importance of overall regional differences appears diminished when accounting for the fact that the occurrence of zero leverage ratios explains some of the previously found variation across regions. Nevertheless, the relative importance of sector and regional characteristics still continues to differ across size classes, with the former being more relevant among smaller and the latter more important among larger firms. In consequence, differences between regions as well as between industries at regional level continue to matter, in particular among SMEs.

8. Conclusion

The present paper investigated the role and relative importance of firm, sector and region specific determinants of leverage ratios, aiming to provide a more comprehensive perspective on corporate capital structures. It used cross-country micro data on NFC balance sheet information from six euro area countries, collected for the first time at the European Central Bank. The paper particularly explored to what extent elements beyond mere firm characteristics, related to firms' more immediate environment (i.e. industries and regions), may influence financing choices of NFCs and their access to capital.

The empirical results show that the major part of variation in corporate leverage ratios appear to be related to differences at the firm-level, suggesting that it is the individual characteristics of the firm that strongly drive NFCs' financing structures. Findings with respect to the main firm-level factors are thereby in line with previous contributions, confirming the expected effects for firm size (+), age (-), profitability (-), asset tangibility (+) and liquidity (-). Nevertheless, both sector and regional characteristics are found to be of some relevance (in particular with respect to long-term debt). Moreover, the relative importance of differences between sectors and regions seems to vary depending on the size of firms. Firms' more local environment thereby appears to be particularly relevant with respect to financing structures of small and medium-sized companies, while overall industry characteristics play a more significant role among larger firms. In consequence, the

[17] Please note that the employed two-part approach consisting of independent estimations implicitly assumes that the error terms between the separate estimations are uncorrelated.

respective environment of firms seems to matter when it comes to NFCs' financing strategies and thus, should not be neglected in a more encompassing analysis of corporate financing in the euro area.

The main implications of these results are twofold. On one hand, the relative importance of firm specific characteristics indicated in the analysis reassures European efforts towards convergence of NFCs by improving overall access to finance across the whole euro area. On the other hand, regional differences (also between industries) still seem to exist, making it important for policymakers to gain a profound understanding of the nature, extent and origin of these differences as well as their importance for NFCs' access to external financing.

Despite the importance of the conducted analysis, the present results must be qualified. First, the analysis of this paper purely relied on cross-sectional data of annual balance sheet information between 2011 and 2013. While this offers a valuable starting point for a more comprehensive assessment regarding the relative importance of firm, sector and regional determinants of leverage, future investigations need to test the robustness of the results using panel data. As the micro data obtained for the ECB pilot on NFC balance sheet information seems only partially suited for such an analysis (due to its limited time span and its unbalanced character), alternative data sources need to be explored in this regard. This further appears important as the data utilised for the pilot exercise is (with some few exceptions) limited to the post-crisis period. In consequence, additional analysis needs to be conducted on an extended time-series to investigate possible changes occurring in the aftermath of the financial crisis.

Second, the micro data obtained from CBSOs only covers six euro area countries, making generalisations to the wider euro area rather difficult. Future investigations should therefore complement this data with a wider country sample. This further allows distinguishing the role of regions from the wider country context. However, with respect to such data, the availability and quality of NFC reference information, which allows the incorporation of a regional perspective, appears crucial.

Third, while the current results have pointed to some relevance of differences in firms' respective industry and regional environments, the importance of the considered sector and region specific factors has remained limited. Therefore, further investigations should particularly aim at identifying possible alternative characteristics of regions and industries that may play a role regarding the debt-equity structures of NFCs. Thereby, a specific focus should be put on the structure and size of the financial sector existent at the regional level, necessitating the collection of appropriate indicators that are comparable across countries. Finally, differences at the level of industries and regions may not only influence corporate capital structures directly by affecting firms' access to external finance, but might also have an impact on the effect of firm specific determinants. While such possible indirect effects of contextual factors have been previously investigated with respect to sector and country specific characteristics, future analysis should also explore the possibility of cross-level interaction effects at the regional level.

References

Alesina, A. and E. La Ferrara (2002): Who trusts others. *Journal of Public Economics*, 85: 207-234.

BACH Working Group (2015): The Bank for the Accounts of Companies Harmonized (BACH) database. *ECB Statistics Paper Series*, No 11.

Bhaird, C., and Lucey, B. (2010): Determinants of capital structure in Irish SMEs. *Small Business Economics*, 35 (3): 357–375.

Booth, L., Aivazian, V., Demirguc¸-Kunt, L., and Maksimovic, V.(2001). Capital structures in developing countries. *Journal of Finance*, 56 (1): 87–130.

Brav, O. (2009): Access to Capital, Capital Structure, and the Funding of the Firm, *Journal of Finance*, 64 (1): 263-308.

Coleman, J.S. (1990): *Foundations of Social Theory*. Cambridge. MA: Harvard University Press.

Degryse, H., P. de Goeij and P. Kappert (2012): The Impact of Firm and Industry Characteristics on Small Firms' Capital Structure. *Small Business Economics*, 38: 431-447.

De Jong, A.. R. Kahir and T. Nguyen (2008): Capital Structure around the world: The roles of firm- and country-specific determinants. *Journal of Banking & Finance*, 32 (9): 1954-1969.

Demirgüç-Kunt, A. and V. Maksimovic (1999): Institutions, financial markets, and firm debt maturity. *Journal of Financial Economics*, 54: 295-336.

European Commision Recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. *Official Journal of the European Union*, L 124, p. 36 (20 May 2003).

ESS Round 6: European Social Survey (2016): ESS-6 2012 Documentation Report. Edition 2.2. Bergen, European Social Survey Data Archive, NSD - Norwegian Centre for Research Data for ESS ERIC.

ESS Round 6: European Social Survey Round 6 Data (2012). *Data file edition 2.2. NSD - Norwegian Centre for Research Data, Norway* – Data Archive and distributor of ESS data for ESS ERIC.

European Central Bank (2013): Corporate Finance and Economic Activity in the Euro Area, Structural Issues Report 2013, *ECB Occasional Paper Series*, No. 151, Task Force of the Monetary Policy Committee of the European System of Central Banks.

Fama, E.F. and K.R. French (2002): Testing Trade-Off and Pecking Order Predictions about Dividends and Debt. *Review of Financial Studies*, 15 (1): 1-33.

Fan, J.P.H., S. Titman and G. Twite (2012): An International Comparison of Capital Structure and Debt Maturity Choices. *Journal of Financial and Quantitative Analysis*, 47 (1): 23-56.

Ferrando, A., M.-T. Marchica and R. Mura (2014): Financial flexibility across the euro area and the UK. *ECB Working Paper Series*, No. 1630.

Flannery, M.J. and K.P. Rangan (2006): Partial adjustment toward target capital structures. *Journal of Financial Economics*, 79 (3): 469-506.

Frank, M.Z. and V.K. Goyal (2009): Capital Structure Decisions: Which Factors Are Reliably Important. *Financial Management*, 38 (1): 1-37.

Freitag, M., N. Grießhaber and R. Traunmüller (2009): Associations as Schools of Trust? An Empirical Analysis of the Swiss Civil Society. *Swiss Political Science Review*, 15 (3): 463-495.

Griesshaber, N. and B. Geys (2012): Civic Engagement and Corruption in 20 European Democracies. *European Societies*, 14 (1): 57-81.

Harris, M. and A. Raviv (1991): The Theory of Capital Structure. *Journal of Finance*, 46 (1): 297-355.

Heyman, D., M. Deloof and H. Ooghe (2008): The Financial Structure of Private Held Belgian Firms. *Small Business Economics*, 30 (3): 301-313.

Hovakimian, A., T. Opler and S. Titman (2001): The debt–equity choice. *Journal of Financial and Quantitative Analysis*, 36 (1), 1–24.

Jensen, M.C. and W. Meckling (1976): Theory of the firm: Managerial behaviour, agency costs, and capital structure. *Journal of Financial Economics*, 3 (4): 305-360.

Kayo, E.K. and H. Kimura (2011): Hierarchical determinants of capital structure. *Journal of Banking & Finance*, 35 (2): 358-371.

Kester, W.C. (1986): Capital Ownership Structure: A Comparison of United States and Japanese Manufacturing Corporations. *Financial Management*, 15 (1): 5-16.

Knack, S. and P. Keefer (1997): Does Social Capital Have an Economic Payoff? A Cross-Country Investigation. *Quarterly Journal of Economics*, 112 (4): 1251-1288.

Köksal, B., C. Orman and A. Oduncu (2013): Determinants of Capital Structure: Evidence from a Major Emerging Market Economy. *Munich Personal RePEc Archive Paper*, No. 48415.

Kreft, I. and J. De Leeuw (1998): *Introducing Multilevel Modeling*. London/Thousand Oaks/New Dehli: SAGE Publications.

Künhausen, F. and H.W. Stieber (2014): Determinants of Capital Structure in Non-Financial Companies. *Munich Discussion Paper*, No. 2014-38: University of Munich.

La Rocca, M., T. La Rocca and A. Cariola (2010): The influence of local institutional differences on the capital structure of SMEs: Evidence from Italy. *International Small Business Journal*, 28 (3): 234-257.

La Rocca, M., T. La Rocca and A. Cariola (2011): Capital Structure Decisions During a Firm's Life Cycle. *Small Business Economics*, 37 (1): 107-130.

Lemmon, M.L., M.R. Roberts and J.F. Zender (2008): Back to the beginning: Persistence and the cross-section of corporate capital structure. *Journal of Finance*, 63 (4): 1575-1608.

MacKay, P. and G.M. Philips (2005): How does Industry affect Firm Financial Structure? *The Review of Financial Studies*, 18 (4): 1433-1466.

Michaelas, N., F. Chittenden and P. Poutziouris (1999): Financial Policy and Capital Structure Choice in U.K. SMEs: Empirical Evidence from Company Panel Data. *Small Business Economics*, 12 (2): 113-130.

Modigliani, F. and M. Miller (1958): The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, 68 (3): 261-297.

Myers, S.C. (1984): The Capital Structure Puzzle. *Journal of Finance*, 39 (3): 575-592.

Myers, S.C. (2001): Capital Structure. Journal of Economic Perspectives, 15 (2): 81-102.

Myers, S.C. and N.S. Majluf (1984): Corporate Financing and Investment Decisions when Firms have Information that Investors do not have. Journal of Financial Economics, 13: 187-221.

Öztekin, Ö. and M.J. Flannery (2012): Institutional determinants of capital structure adjustment speeds. *Journal of Financial Economics*, 102: 88-112.

Palacín-Sánchez, M.J., L.M. Ramírez-Herrera and F. di Pietro (2013): Capital structure of SMEs in Spanish regions. *Small Business Economics*, 41: 503-519.

Palacín-Sánchez, M. and F. Di Pietro (2013): Are Regional Institutional Factors Determinants of the Capital Structure of Smes? *ERSA Conference Papers 2013*.

Paxton, P. (2007): Association Memberships and Generalized Trust: A Multilevel Model Across 31 Countries. *Social Forces*, 86 (1): 47-76.

Psillaki, M. and N. Daskalakis (2009): Are the determinants of capital structure country of firm specific? *Small Business Economics*, 33: 319-333.

Rabe-Hesketh, S. And A. Skrondal (2008): *Multilevel and Longitudinal Modeling using Stata*. College Station, TX: Stata Press (Second Edition).

Rajan, R.G. and L. Zingales (1995): What Do We Know about Capital Structure? Evidence from International Data. *Journal of Finance*, 50 (5): 1421-1460.

Ramalho, J.S. and J.V. da Silva (2009): A two-part fractional regression model for the financial leverage decisions of micro, small, medium and large firms. *Quantitative Finance*, 9 (5): 621-636.

Robinson, R.V. and E.F. Jackson (2001): Is Trust in Others Declining in America? An Age-Period-Cohort Analysis. *Social Science Research*, 30 (1): 117-145.

Simerly, R.L. and M. Li (2000): Environmental dynamism, capital structure and performance. A theoretical integration and an empirical test. *Strategic Management Journal*, 21 (1): 31–49.

Sogorb-Mira, F. (2005): How SME Uniqueness Affects Capital Structure: Evidence from a 1994-1998 Spanish Data Panel. *Small Business Economics*, 25 (5): 447-457.

Steenbergen, M.R. and B.S. Jones (2002): Modeling Multilevel Data Structures. *American Journal of Political Science*, 46 (1): 218-237.

Titman, S. and R. Wessels (1988): The Determinants of Capital Structure Choice. *Journal of Finance*, 43 (1): 1-19.

Uslaner, E.M. (2003): Varieties of trust. European Political Science 2 (3): 43-49.

Irving Fisher Committee on
Central Bank Statistics

BANK FOR INTERNATIONAL SETTLEMENTS

IFC-ECCBSO-CBRT Conference on *"Uses of Central Balance Sheet Data Offices' information"*

Co-organised by the IFC, the European Committee of Central Balance Sheet Data Offices (ECCBSO) and the Central Bank of the Republic of Turkey (CBRT)

Özdere-İzmir, Turkey, 26 September 2016

Towards a more comprehensive understanding of corporate leverage ratios[1]

Nicolas Griesshaber, European Central Bank

[1] This presentation was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

Nicolas Griesshaber
European Central Bank
Directorate General Statistics

Towards a more Comprehensive Understanding of Corporate Leverage Ratios

Using firm-level data from Central Balance Sheet Data Offices to disentangle the role of firm, sector and region specific characteristics

Joint IFC/ECCBSO/CBRT Conference on the "Uses of Central Balance Sheet Data Offices Information"

26 September 2016

Overview

Understanding capital structures is primary goal at the ECB

- **Financing choices** of **non-financial corporations** (***NFCs***) can have important "*repercussions for the stability and performance of the wider economy*"

  ECB structural issues report on Corporate Finance and Economic Activity in the Euro Area (ECB 2013: 13)

- Central role for transmission of monetary policy:

  Financing structure of firms affects how monetary policy operates

➢ Comprehensive understanding of the underlying determinants of NFCs' financing policies & their impact on the access to additional funds of high importance

  ➢ Requires harmonised financial micro information on NFCs

  ➢ Necessitates a more encompassing analytical approach

Existing evidence

- Following the study of Rajan & Zingales (1995), a vast body of empirical research on the determinants of firms‘ capital structure has developed
  - ➢ *Strong focus on firm characteristics (profitability, growth opp., size, asset tangibility)*
- Additional focus on the role of industry as well as institutional and country factors

  (e.g.McKay & Phillips 2005; de Jong et al. 2008; Psillaki & Daskalakis 2009; La Rocca et al. 2011; Degryse et al. 2012; Öztekin & Flannery 2012; Kühnhausen & Stieber 2014)
- Recently, characteristics related to the local environment received some attention

  (see La Rocca et al. 2010, Palacín-Sánchez et al. 2013 on Spanish and Italian regions, respectively)
  - ➢ Analytical framework beyond single country setting missing to date
- More encompassing frameworks that fully account for the different levels and their relative importance are rare
  - ➢ Exception: Multi-level study by Kayo & Kimura (2011)

Research Focus

Disentangle the effect of firm, sector and regional specific characteristics on NFC capital structures (i.e. leverage)

Main Contributions:

- Uses new firm-level dataset of harmonised balance sheet information of NFCs from six EA countries
- Considers the role played by firms' more local environment
- Accounts for hierarchical structure in the data

Accounting for firms' respective environment

- Previous studies found sign. variation in capital structures across sectors of activity
  - Managers orient themselves along industry benchmarks
  - Companies likely exposed to common forces
  - Industries differ in their population of firms
  - ➢ Considerable part of variation in leverage ratios should be due to industry differences

- Regional environment can also matter (research so far focused on country-context)
  - Institutional contexts & financial sectors can differ between local regions
  - Economic forces and social factors likely to vary across local environments
  - ➢ Regional forces should be relevant with respect to firms financing decisions

- Ability to access any financial market reduces relevance of regional divergences
  - Larger firms have access to wider financial markets; small companies restricted to more immediate environment
  - ➢ Relevance of firms' particular environments should differ depending on size of firms

Using data from Central Balance Sheet Data Offices (CBSOs)

- Bank for the Accounts of Companies Harmonized database (BACH)
  - Non-consolidated accounting information for 11 countries
  - Meso-aggregated in each country by sector and firm size
  - Harmonised templates to increase comparability across countries

➢ 6 countries agreed to provide annual micro data
  - BE, ES, FR, IT, PT and SK
  - More than 3.2 million companies
  - Annual data from 2009 to 2013 (from 2008 for BE, SK; 2004 for PT)

- Obtained as part of an ECB pilot exercise on the value of centralised collection of NFC micro data, which aims to evaluate
  - the characteristics of such data
  - its value in comparison to data from commercial providers (i.e. Bureau van Dijk's Amadeus database)
  - its analytical value for ECB purposes (monetary policy; macro prudential; financial stability; micro supervisory)

Data Adjustments & Final Sample

- Restriction to cross-section data – Pooled for 2011-2013 (latest record available)
  - Panel data diverse and unbalanced; covers only short period
  - Capital structure expected to be rather stable across shorter period
- Main industry sections are distinguished
  - based on Statistical Classification of Economic Activities in the EC (NACE, rev. 2)
- Regions are distinguished based on Nomenclature of Territorial Units for Statistics (NUTS; level 2)
  - Derived from postal code and region information in the BACH data

Data Adjustments & Final Sample

- Final Sample of 1,969,284 NFCs across
  - 6 countries
  - 17 Sectors
  - 87 NUTS 2 regions
  - 1,460 region sector combinations

Dependent Variables

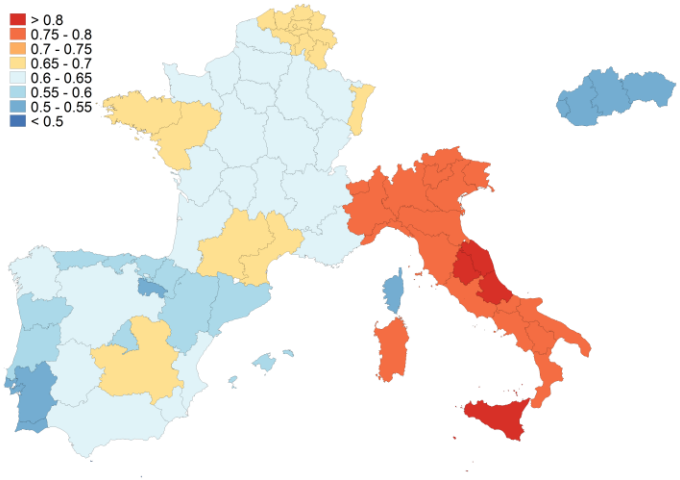
- Firm leverage = Ratio of total debt to assets

- further analysis will also distinguish between different forms of financial debt:
  - *Short- vs. Long-term debt (over total assets)*

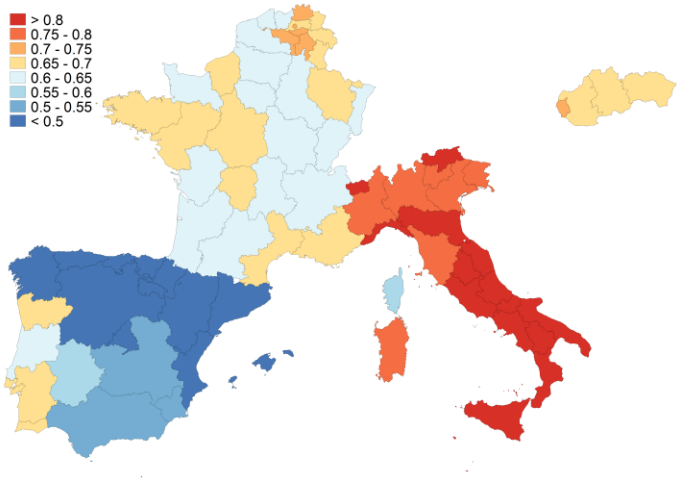
Regional median leverage by firm size

(Leverage = Total liabilities / Total assets; NUTS 2 level)

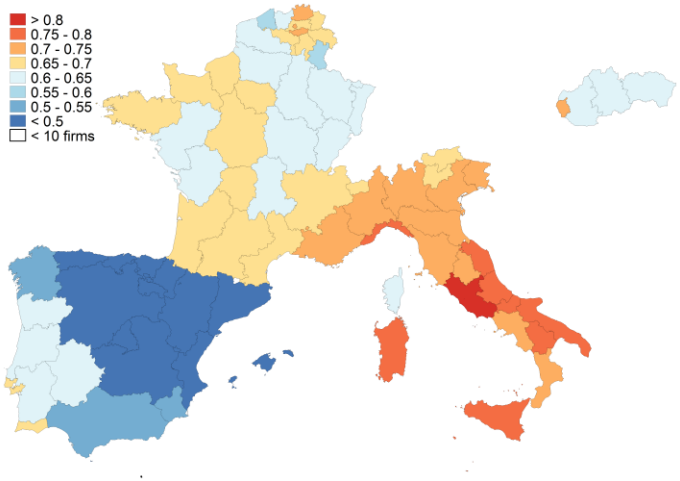
Micro firms: Total assets < 2 million €



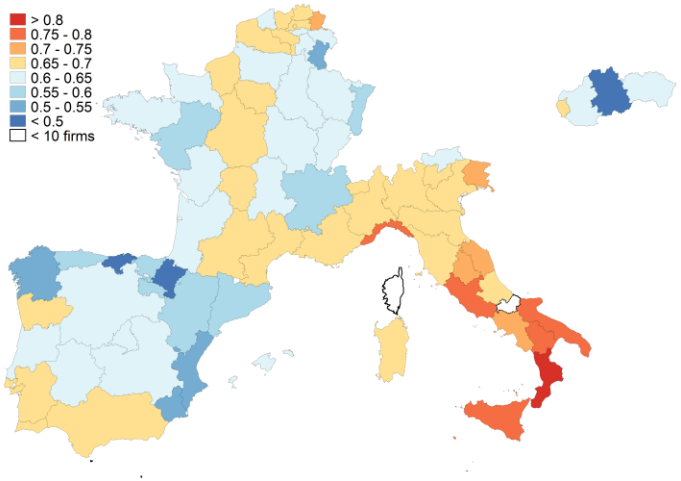
Small firms: 2 - 10 million € in total assets



Medium firms: 10 - 43 million € in total assets



Large firms: Total assets > 43 million €



Main Explanatory Variables

Type	Variable	Expected effect
Firm specific	Firm size (Log of Total Assets)	(+)
	Firm age (Log of Years since Incorporation)	(-)
	Profitability (Net Operating Profit / Total Assets)	(-)
	Tangibility (Tangible / Total Assets)	(+)
	Liquidity (Cash & Cash Equivalents / Total Assets)	(-)
Industry specific (based on NACE rev. 2)	Sector Growth (Median Growth in Turnover)	(-)
	Concentration (Herfindahl-Hirshman index)	(+,-)
Region specific (distinction based on NUTS classification; level 2)	Log of GDP 2012 (at current prices, from Eurostat)	(+)
	Population Density (from Eurostat)	(+)
	Industry Structure (sum of sq. ratio of regional industry to region turnover)	(+,-)
	Trust (% of people with high generalised trust; European Social Survey)	(-)
Industry by Region	Regional Industry Concentration (Herfindahl-Hirshman index)	(+,-)

Estimation Method

- Estimation has to account for the hierarchical structure in the data

- Cross-classified multilevel estimations are employed

  ➢ Allowing intercepts to vary across business sectors, regions as well as their interaction

(see Kayo & Kimura 2011 for a similar approach)

$$Lev_{ijk} = \text{Function}(\text{Size, Age, Profitability, Tangibility, Liquidity, Industry growth, Industry concentration Regional GDP, Regional population density, Regional industry structure, Regional trust, Regional industry concentration}) + \boldsymbol{\delta_{0j0}} + \boldsymbol{\zeta_{00k}} + \boldsymbol{\vartheta_{0jk}} + \varepsilon_{ijk}$$

δ_{0j0} - Sector specific error term

ζ_{00k} - Region specific error term

ϑ_{0jk} - Interaction term (sector x region specific error term)

(subscrips i for firm, j for industry and k for region)

Variance Decomposition - Leverage

(Empty crossed random-effects model; including interaction)

Dep. Variable: Leverage	All firms	Micro	Small	Medium	Large
Fixed Part					
Constant (β_{000})	0.599***	0.600***	0.602***	0.596***	0.603***
Number of Firms	1,969,284	1,627,649	262,105	61,171	18,359
Number of Sectors	17	17	17	17	17
Number of Regions (Nuts 2)	87	87	87	87	87
Random Part:					
Variance Decomposition (in % of total)					
Sector-level (δ_{0j0})	1.4%	1.1%	2.0%	4.2%	6.0%
Region-level (ζ_{00k})	6.7%	6.1%	12.7%	8.5%	3.4%
Sector x Region (ϑ_{0jk})	2.2%	2.1%	3.2%	4.1%	2.7%
Firm-level (ε_{ijk})	89.7%	90.7%	82.1%	83.2%	87.9%

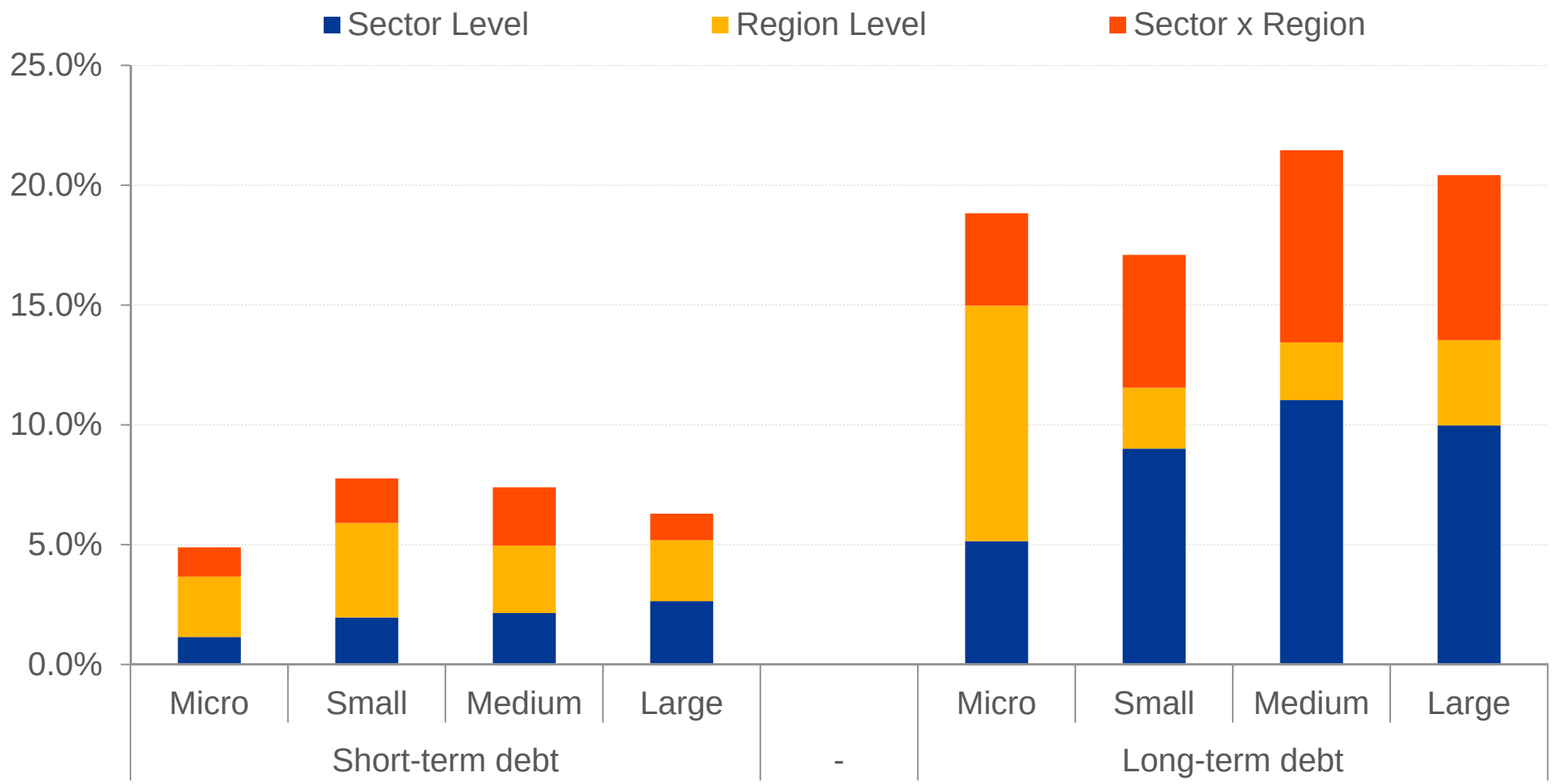
The Determinants of Leverage

(Crossed random-effects models including explanatory variables; sign. level: < 5%)

Dep. Variable: Leverage	All firms	Micro	Small	Medium	Large
Firm level					
Log of Total Assets	(+)	(+)	(–)	n.s	(+)
Log of Firm Age	(–)	(–)	(–)	(–)	(–)
Profitability	(–)	(–)	(–)	(–)	(–)
Tangibility	(+)	(+)	(–)	(–)	(–)
Liquidity	(–)	(–)	(–)	(–)	(–)
Industry Level					
Concentration	(–)	n.s.	n.s.	n.s.	(–)
Median growth (in turnover)	n.s.	n.s.	n.s.	n.s.	n.s.
Region Level					
Log of GDP (2012)	(+)	(+)	(+)	(+)	(+)
Population Density	(–)	n.s.	n.s.	n.s.	n.s.
Industry Structure	(–)	(–)	n.s.	n.s.	n.s.
Level of Generalised Trust	n.s.	n.s.	n.s.	(–)	n.s.
Regional Industries					
Industry Concentration by Region	(–)	n.s.	(–)	n.s.	n.s.
Number of Firms	1,969,284	1,627,649	262,105	61,171	18,359

Short- vs. Long-Term Debt Ratios

(Variance decomposition based on empty crossed random-effects model)



Note: Graph displays variances of level specific error components (in % of total variance); Residual variances due to firm-level differences

The Determinants of Leverage

(Crossed random-effects models including explanatory variables; sign. level: < 5%)

	Short-Term Debt				Long-Term Debt			
Dep. Variable: Leverage	**Micro**	**Small**	**Medium**	**Large**	**Micro**	**Small**	**Medium**	**Large**
Firm level								
Log of Total Assets	(–)	(–)	(–)	(–)	(+)	(–)	n.s	(+)
Log of Firm Age	(–)	(–)	(–)	(+)	(–)	(–)	(–)	(–)
Profitability	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)
Tangibility	(–)	(–)	(–)	(–)	(+)	(+)	(+)	(+)
Liquidity	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)
Industry Level								
Concentration	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Median growth (in turnover)	(–)	n.s.	n.s.	(–)	n.s.	n.s.	n.s.	n.s.
Region Level								
Log of GDP (2012)	n.s.	n.s.	(–)	(–)	(+)	(+)	(+)	n.s.
Population Density	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Industry Structure	(+)	(+)	(+)	(+)	(–)	(–)	(–)	(–)
Level of Generalised Trust	(+)	n.s.	n.s.	(+)	(–)	(–)	(–)	(–)
Regional Industries								
Industry Concentration by Region	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Number of Firms	1,627,649	262,105	61,171	18,359	1,627,649	262,105	61,171	18,359

Main findings and implications

- Major part of variation in corporate leverage ratios related to the firm level
- Yet, both sector and regional differences seem to be of some relevance
  - ➢ Relative importance varies depending on the size of firms

➢ Important to understand nature, extent and origin of differences between firms' respective environments and their importance for NFCs access to finance

Implications for Future Research

- Adding time-series dimension (covering both pre- and post-crisis data)
  - ➢ Pilot data only partially suited (limited time span; unbalanced character)
- Widen country coverage to enable generalisations to the wider EA
  - Further allows to better distinguish role of regions from wider country context
- Explore alternative region & sector characteristics that play a role
  - ➢ Further investigate the possible existence of cross-level interaction effects

Thank you very much!

Questions & Comments

are welcome