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The determinants of SME capital structure across the lifecycle

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Abstract: *While differences in capital structure between large and small firms have been extensively researched, relatively less empirical evidence is available explaining cross country differences in the capital structure of SMEs over the life cycle. This is an important gap as many of the theoretical predictions on financing requirements and access can be linked to firm age. In this paper, we explore the determinants of SME capital structure across the age distribution of firms using firm-level panel data for 15 European countries. Our key findings demonstrate the existence of a non-linear relationship between age and capital structure that differs markedly across countries. We also find that firm level collateral and liquidity play a role in determining the age-debt relationship. Finally, we find that the age-debt relationship depends on the country level financial structure with more stock market financing reducing firm leverage disproportionately for young firms while foreign bank lending and bank concentration both increase firm leverage across the lifecycle.*

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1 Introduction

It is widely acknowledged that small firms behave differently to large enterprises regarding external financing (Rajan & Zingales, 1995). Their capital structures are often much more weighted towards owners-equity and internal financing due to difficulties accessing external debt and equity (Beck & Demirguc-Kunt, 2006, Beck et al., 2008). Such difficulties often arise due to information asymmetries, collateral constraints and other financial market imperfections that drive a wedge between the internal and external cost of capital. These concerns have increased in prevalence for European SMEs given the severe financial crisis in the late 2000s, which had an adverse effect on credit availability and bank lending, in particular for small firms (Wehinger, 2014, Holton et al., 2013, 2014). In this regard, understanding the financial management and capital structure decisions of SMEs is critical to understanding the financial impact on their growth prospects (Vanacker & Manigart, 2010).

It has also been documented that SMEs finance their activities differently across their lifecycle (Berger & Udell, 1998, 2006) with different levels of debt and equity being more prevalent at different points across the age distribution. A number of studies have explored whether differences in capital structure can be explained by variation in firm-level factors (Hall et al., 2004, Mateev et al., 2013) or by structural differences between countries (Daskalakis & Psillaki, 2008, Psillaki & Daskalakis, 2009). Despite this, few studies have considered the differences in the age-debt relationship across firms and counties. Notable exceptions include Michaelas et al. (1999), Chittenden et al. (1996) and La Rocca et al. (2011) who showed that financing is related to the lifecycle of the firm in their analyses of SMEs in several European countries. However, to date, no study has combined a cross-country estimation setting with an exploration of the firm-level and country-level determinants of the link between firm age and capital structure. This paper

aims to address this gap in the literature.

Using firm-level panel data for 15 countries over the period 2005-2012, we explore the determinants of SMEs capital structure across the age distribution of firms allowing the age-capital structure relationship to be non-linear in nature (as in La Rocca et al. (2011)). We then assess whether the patterns in the pooled cross-country sample are common across each country or whether country heterogeneity can be identified. Finally, we assess how the age-capital structure relationship is affected by firm and country level heterogeneity. Collateral availability and liquidity are the chosen indicators of firm level heterogeneity, while country level heterogeneity is proxied using a selection of financial system structure characteristics. Our contribution is therefore fourfold. First, we use a broader sample than existing studies (Giannetti, 2003, Hall et al., 2004) exploring cross country differences in the age-capital structure relationship. Second, we control for the sample selection bias inherent in studies that focus solely on the extensive margin of the debt-equity ratio by following a Heckman approach on our panel of firms. Third, we explore whether collateral availability and liquidity impact the non-linear relationship between age and capital structure. And fourth, we explore the link between age, capital structure and financial system development.

Our key findings show the existence of a negative but non-linear relationship between age and debt when all countries are pooled. However estimating country-specific regressions, we find substantial variation and indeed, a positive relationship in some instances. We delve further into the drivers of these heterogeneous results by examining the links between firm age and other firm level and country specific characteristics. The estimates suggest that the negative relationship between age and debt can be significantly linked to a lack of internal resources of younger firms and also to a heavier reliance on collateral to access bank debt. At the country level, we find that younger firms are more affected

by the quality of the banking sector as they have less access to alternative sources of capital. This suggests that cross country differences in firm capital structure are partially explained by heterogeneity of firm-level collateral and liquidity constraints as well as differences in banking market structure.

This paper is structured as follows. In Section 2 the main theories behind financing behaviour of SMEs, and several hypotheses to be tested are described. Section 3 describes the empirical models estimated and the data and variables used. Results are presented in Section 4, and Section 5 provides some final concluding comments.

2 Financing behaviour of SMEs

It is a general finding in the empirical corporate finance literature that external funding sources available to SMEs are different from those generally used by larger firms or corporations. While the latter have the possibility of issuing corporate debt or equity onto capital markets (López-Gracia & Sogorb-Mira, 2008), external financing sources for small firms are almost exclusively reduced to acquiring debt from lending institutions. An alternative option is to fund investment though the use of internal resources (La Rocca et al., 2011). Moreover, large firms are usually listed and their financial information is publicly available. However, information on small firms' economic data is scarce, not detailed or directly unavailable, leading to information asymmetries between firm managers/owners and debt issuing institutions. This generates difficulties accessing external credit, which is almost entirely reliant on the availability of collateral (Chittenden et al., 1996).

Several theoretical frameworks that accommodate financing behaviour of small firms have been proposed. The pecking order theory is considered to be the most widely ap-

plicable framework to small firm financing (Myers, 1984, Myers & Majluf, 1984). This theory builds on the premise that information asymmetries drive a wedge between the internal and external costs of capital. The theory suggests that small firms make financing choices in a hierarchical fashion, first using internal finance sources (when/until available) as opposed to external sources due to the relative cost differences (Berger & Udell, 1998, López-Gracia & Sogorb-Mira, 2008, La Rocca et al., 2011, European Central Bank, 2013). Other theories also found in the literature are the trade-off theory or the agent theory (Jensen & Meckling, 1976). The trade-off theory proposes that, when seeking their optimal capital structure, firms consider the advantages and disadvantages of additional debt, which leads to debt reaching an optimal point for each firm (López-Gracia & Sogorb-Mira, 2008). According to this theory firms make decisions in an incremental rather than a hierarchical way (Vanacker & Manigart, 2010). Finally, the agency theory proposes that the fixed cost of firms' debt acquisition transactions causes additional difficulties for small firms, which face higher monitoring and management costs of debt (Chittenden et al., 1996), resulting in a preference for internal funding resources.

2.1 Size vs. age

The relation between firm size and financing has been widely analysed in the literature (Beck et al., 2008). However, the relative importance of different financing sources used by firms across their lifecycle has received less attention. The literature on age and financing structure posits that younger firms face additional difficulties when accessing external financing which ease as the firm ages (Berger & Udell, 1998, 2006). These challenges come about due to a number of factors including collateral availability, liquidity, a track record and opaque survival prospects. The age of the firm can therefore determine the lenders cost and the availability of funds (Petersen & Rajan, 1994). Moreover, age

can be considered a proxy for increased reputation or reduced information asymmetry at different stages of a firm's lifecycle (Berger & Udell, 1998, La Rocca et al., 2011). In practice however, there usually is an overlap between age and size (i.e. young firms tend to also be micro/small while older firms are more evenly distributed across the size spectrum), therefore it is possible that previous less comprehensive analyses have wrongly attributed to size some of the effect of firm age on capital structure as noted in Lawless (2014).

In general, the literature focuses around two contrasting theories (López-Gracia & Sogorb-Mira, 2008): a) a negative relationship between age and debt (pecking-order theory) and b) a positive relationship between age and debt (trade-off theory). Some authors propose that younger firms are likely to be less leveraged than older firms, since they are thought to rely more heavily on internal sources of financing (La Rocca et al., 2011) or on loans from the owner or family members (Petersen & Rajan, 1994). They suggest that as firms become older, problems of information asymmetry abate due to increased reputation, credibility and tangible assets, which may grant easier access to long-term debt (Berger & Udell, 1998, La Rocca et al., 2011). Accordingly, age can be expected to have a positive effect on leverage, due to older enterprises facing lower borrowing costs leading to higher levels of debt for older firms (López-Gracia & Sogorb-Mira, 2008). Alternatively, a negative relation between firm age and debt could also be hypothesised, since older firms are able to retain profits or access external market equity financing easier than younger firms, avoiding using debt (Hall et al., 2004, López-Gracia & Sogorb-Mira, 2008, La Rocca et al., 2011). For all these reasons, we do not hypothesise any a priori effects of age on firm debt (H1a,b; Table 1).

Table 1: Hypotheses tested

	Hypothesis	Description
H1a	Age is positively related to debt	The access to external bank financing is easier for more mature firms (trade-off theory)
H1b	Age is negatively related to debt	Younger firms have a higher reliance on debt, as they are not able to retain internal resources (pecking order theory)
H2	The effect of age on debt displays country specific differences	
H3a	The effect of age on debt is likely to vary depending on firms' collateral availability	Younger firms are likely to have higher reliance on collateral
H3b	The effect of age on debt may be different depending on firms' liquidity levels	With higher liquidity levels, there might be less need of external finance, but only for mature firms
H4a	The effect of age on debt is affected by stock market capitalisation	Mature firms might get less indebted when stock markets are well developed in a country
H4b	The effect of age on debt is affected by bank concentration	More competitive banking sectors result in higher debt availability for younger firms
H4c	The effect of age on debt is affected by the presence of foreign banks	Younger firms have more debt when foreign banks are lending money in a country

It is clear from the discussion above that the relation between debt and firm age needs to be tested empirically. Previous empirical analyses on this subject found mixed results in several European countries. Chittenden et al. (1996) and Michaelas et al. (1999) estimated a negative relationship between age and debt ratios for SMEs in the UK, while in their analysis of Spanish SMEs, López-Gracia & Sogorb-Mira (2008) also found age to be negatively related to debt. In a more recent paper, La Rocca et al. (2011) evaluated whether the lifecycle is a relevant factor in small firm financing, and found that the effect of age was positive for Italian SMEs. Finally, Serrasqueiro & Nunes (2012), Serrasqueiro & Caetano (2015), Matias & Serrasqueiro (2017) uncovered a negative effect of age on debt for Portuguese firms.

2.2 Lifecycle and capital structure in an international context

One potential explanation for variation in observed capital structures and its determinants across countries is the degree of financial development and the relative availability of bank and non-bank financing (González & González, 2008). Previous literature concluded that assuming a homogeneous effect of firm level characteristics on leverage across countries is unrealistic (De Jong et al., 2008). Therefore, we perform our analysis in a cross-country setting in order to explicitly explore potential differences of the effect of age (and other firm level and macroeconomic characteristics) on capital structure (H2, Table 1). Noticeable cross-country differences in debt structure of firms exist, and important determinants of firm financing decisions (such as institutional factors and taxation systems, growth opportunities or different macroeconomic conditions) are very likely to also present country-specific variation, leading to differences in SMEs financing decisions across countries.

The majority of previous empirical analyses explored the relationship between age and debt using data for a single country. Consequently, important differences in the data and methodologies they used preclude making direct cross country comparisons of the effect of age on capital structure. Only Giannetti (2003) and Hall et al. (2004) performed comparative analyses while also exploring the effects of age. Giannetti (2003) used a sample of eight European countries for the period 1993-1997 and found mixed results of age (and age squared) across countries. A linear negative effect was uncovered for France, the Netherlands and the UK; while in Portugal the effect was found to be positive although at a decreasing rate. Hall et al. (2004), using a sample of eight European countries in 1995, also found differing effects depending on the country considred (the effect of age on short term debt was negative in Italy, Spain and the UK, while the effect on long term debt was negative/positive in the UK/Spain respectively). Finally, European

Central Bank (2013) explored the determinants of capital structure using data for several European countries using more recent data for the years 2000 and 2010. They found that age had a positive effect on debt using the pooled dataset, however they did not estimate country specific regressions. Therefore, our analysis complements previous literature by estimating uniform models using homogeneous and updated data for selected European countries, which allows to establish reliable comparisons of the age-capital structure relation across countries.

2.3 Firm and cross-country heterogeneity

Given the expected cross-country differences of the determinants of capital structure, we focus on exploring whether the differing effects of firm age in particular can be explained by firm level or by cross-country heterogeneity.

2.3.1 Firm-level factors

In terms of firm level heterogeneity, there is a lack of empirical evidence on whether the effect of age on capital structure varies depending on certain firm characteristics. We chose to focus on these two characteristics because of the well established liquidity and collateral constraints that SMEs often face in accessing bank financing. We hypothesise that the effect of firm age on debt will change depending on firm liquidity and the availability of collateral. First, given the extent that younger firms are more informationally opaque, we expect them to have higher dependence on collateral in order to obtain higher levels of debt (H3a; Table 1). Second, given the additional difficulties younger firms face when accessing external finance, we hypothesise that if higher liquidity is available to them, they would resort less to external sources of financing (H3b; Table 1). In other words, the extent to which liquidity affects decisions regarding debt is likely to be more

important for younger firms, since financing investment though external funds is riskier than using internal resources.

2.3.2 Country-specific factors

Relatively few studies have explored the relation between country specific heterogeneity and firms' capital structure across their lifecycle. There is some evidence of institutional factors (Giannetti, 2003) and banking system characteristics (Beck et al., 2004, Ryan et al., 2014) affecting firm financing differently depending on their size. However, little evidence exists regarding different effects across the age distribution. González & González (2008) argued that the information asymmetries and agency costs that are understood to determine the financing choices of SMEs across their lifecycle present differences depending on countries' financial development and the characteristics of their banking systems. In order to provide some new empirical evidence, we test the relationship between bank concentration, share of foreign bank assets and stock market capitalisation and firm level debt decisions at different stages of the firm lifecycle.

The relationship between the development of stock markets and the capital structure of SMEs is unclear a priori. Equity markets have a significant informational role, therefore in countries where such markets are well developed, information asymmetries between investors and firms may be reduced to a certain extent (Demirgüç-Kunt & Maksimovic, 1996). Although the information aggregation role of the market is likely to be more significant for large firms, smaller firms might still benefit from spill-over effects (Beck et al., 2009). In addition, in the absence of developed stock markets SMEs might miss on financing opportunities appropriate for large scale growth projects unlikely to get the required financing through the banking sector (Demirgüç-Kunt & Maksimovic, 1996). Therefore, we expect that in countries with developed stock markets, funding di-

versification options would imply that firms will need to rely less on bank financing as they mature (H4a; Table 1).

We explore the effects of the banking system on capital structure using two indicators, bank concentration and the presence of foreign banks. Two competing theories are typically proposed in the literature when considering the relationship between bank competition and credit access, the market power theory and the information theory. According to the first, increased market power resulting from higher bank concentration, leads to lower loan supply at higher interest rates (Beck et al., 2004). According to the second, higher bank concentration may incentivise banks to invest in gathering information by establishing close relationships with borrowers over time, facilitating the availability of credit (Petersen & Rajan, 1995, González & González, 2008). The information theory might be suitable to explain the relation between bank concentration and firm age and financing choices. Lenders in less competitive banking systems might choose to establish long-term relationships with young borrowers, since they can benefit form firms' expected surpluses as they get older (Petersen & Rajan, 1995). Therefore we expect that less competition in the banking sector would benefit the credit applications of younger firms (H4b; Table 1). The presence of foreign banks is understood to benefit SMEs both directly and indirectly (Beck et al., 2009). First, foreign banks might have greater expertise and technical capabilities and are therefore able to finance large and small firms equally (de la Torre et al., 2010, Beck et al., 2011). Second, more foreign banks can increase competition in the banking sector, therefore even if they focus on lending to larger firms, local banks might choose to focus on the neglected SMEs sector to improve their market share (Beck et al., 2009). We would expect a similar relationship with firm age, and therefore hypothesise that a larger presence of foreign banks eases the access of younger firms to debt (H4c; Table 1).

3 Models estimated and data

3.1 Data and variables

In this analysis, we use the Amadeus dataset[1] spanning 8 years of data (2005-2012) across fifteen European countries[2]. Several data cleaning criteria in line with standard good practice were followed prior to estimation. Firms which had less than 3 consecutive observations were dropped, resulting in an average number of consecutive observations per firm of 5.3 years. This makes the panel strongly unbalanced. Outliers, defined as observations which were located above/below the 99%/1% percentiles of each variable, were also removed from the sample. In compliance with the definition of SME by the European Commission, firms with more than 250 employees or a turnover superior to € 50 million were dropped. We also excluded firms belonging to the financial and insurance sectors (according to the NACE Rev. 2 classification).

Our assessment of the determinants of firm capital structure across their lifecycle takes into account two different aspects of firm debt. First, some firms have no debt, which leads to a left-truncation of the debt-to-total funds distribution. Hence standard estimation procedures on this distribution would not be suitable. Second, once firms take some debt, they then face the choice of what level of indebtedness is appropriate. This two stage decision making must be measured in our data and accounted for in the estimation approach. Therefore, two different dependent variables are defined. For the case of the debt uptake decisions, a binary variable that equals 1 for firms that have debt and

[1]Bureau Van Dijk compiles this harmonized firm level data that includes accounting information from several countries. The data is based on balance sheets and income statements.

[2]Belgium (BE), Bulgaria (BG), Czech Republic (CZ), Germany (DE), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Croatia (HR), Italy (IT), Poland (PL), Portugal (PT), Sweden (SE) and the United Kingdom (UK). The observations are not evenly distributed across countries or years, see Appendix A. The choice was made based on the data availability (i.e. a reasonable number of observations to estimate the country-specific regressions).

0 for firms without debt is constructed. In order to model debt decisions, we use the ratio of total debt to total capital (total debt plus shareholders funds) as dependent variable, similar to Jõeveer (2013*b*)[3]. Table 2 shows the average debt dummy and debt ratios for each country. Clear differences in debt ratios can be appreciated across countries.

3.1.1 Firm-specific variables

Several firm specific and industry specific factors affecting debt structure have been typically identified in the literature. *Age* is the main variable of interest in this analysis. It describes the financial cycle with respect to the age of a firm. Both age and age squared are included, in order to account for possible non-linearities in the relationship between the firm lifecycle and debt. The possibility of a non-linear relation has only been explored in Giannetti (2003) and La Rocca et al. (2011) so far.

Another important determinant of firm leverage is *firm size*. Larger firms usually have more assets and stable clash flows, which eases their access to external funds from banks, as they are likely to be considered less risky borrowers (Rajan & Zingales, 1995, López-Gracia & Sogorb-Mira, 2008, La Rocca et al., 2011). Firm *liquidity* is included in the regression in order to capture the role of internal resources as substitutes for external financing (Hall et al., 2004). A variable controlling for *profitability* is also included, which intends to control for the strategic behaviour where firm managers prefer to keep retained profits and instead use debt to finance investment because debt interest may shield firms from taxation (Michaelas et al., 1999, Sogorb-Mira, 2005). *Tangibility* is also controlled for in the estimations. Tangible assets are susceptible to be used as collateral and therefore reduce the costs of acquiring external debt (Chittenden et al., 1996).

[3]Rajan & Zingales (1995) offers an extensive discussion of the different possible specifications for leverage ratios. They considered the debt to capital ratio to have the advantage of providing a better representation of past financing decisions, as opposed to other commonly used specifications such as debt over total or net assets.

Another regressor included is firm growth, defined as firm specific *output differential*, which can be interpreted as the effect of future business prospects on firm debt (Hall et al., 2004, European Central Bank, 2013, Kühnhausen & Stieber, 2014). To account for industry specific differences affecting firm leverage, both *industry dummies* and the intra-sector *growth opportunities* are included in the regressions. Finally, *year and country fixed effects* are included in order to control for differences in institutional factors and macroeconomic conditions[4]. Average values for these variables in each country are provided in Table 2. In general, important heterogeneity can be observed across countries for all firm characteristics.

Table 2: 2005-2012 averages

	Debt dummy	Debt ratio	Profitability	Liquidity	Collateral	Growth opp.	Age	Output diff.	Micro	Small
BE	0.667	0.608	0.027	0.091	0.291	0.078	24.247	0.007	0.109	0.547
BG	0.571	0.808	0.051	0.117	0.377	-0.643	10.995	-0.038	0.694	0.249
CZ	0.535	0.667	0.024	0.162	0.334	0.149	10.741	-0.026	0.125	0.417
DE	0.885	0.735	0.042	0.088	0.353	-0.089	21.335	0.029	0.311	0.358
EE	0.89	0.773	0.035	0.119	0.519	-0.332	9.711	-0.014	0.354	0.415
EL	0.79	0.524	0.011	0.089	0.316	0.02	19.232	-0.017	0.481	0.42
ES	0.655	0.685	0.006	0.107	0.362	-0.177	15.919	-0.031	0.697	0.222
FI	0.847	0.854	0.048	0.116	0.459	0.073	16.742	0.031	0.827	0.153
FR	0.806	0.544	0.053	0.193	0.333	0.143	15.178	0.02	0.826	0.135
HR	0.622	0.739	0.029	0.084	0.359	-0.08	12.963	-0.012	0.555	0.312
IT	0.731	0.733	0.008	0.066	0.276	-0.11	18.168	-0.001	0.558	0.303
PL	0.766	0.6	0.052	0.062	0.443	0.317	16.53	-0.01	0.046	0.344
PT	0.724	0.677	-0.004	0.118	0.288	-0.052	14.526	-0.002	0.906	0.079
SE	0.495	0.816	0.062	0.104	0.265	0.208	18.784	0.09	0.011	0.081
UK	0.944	0.714	0.047	0.112	0.31	-0.35	23.891	0.009	0.138	0.524
Total	0.721	0.661	0.022	0.122	0.323	-0.043	15.913	-0.003	0.685	0.217

Note: Averages provided refer only to observations with positive debt, except for the debt dummy.

Firm characteristics included in the regressions were carefully selected to avoid multicollinearity issues[5]. These variables are included in the regression either in logs or as

[4]Note that since some of these variables are time invariant they are automatically dropped from the fixed effects (FE) regressions. In regressions with country-level variables, we remove country*time fixed effects as otherwise these variables would not be identified. We do however always include country and time fixed effects.

[5]The correlation coefficients for all variables are provided in Appendix C

ratios to total assets (see Table 3 for details). By normalizing by total assets a greater comparability of firms with different sizes is also achieved. Lagged values of the control variables have been included in the regressions to avoid potential endogeneity issues. Finally, some data feasibility adjustments were made in an attempt to further homogenise samples across countries. Growth opportunity was limited to 100%; the leverage, liquidity and tangibility ratios were limited to include observations between 0 and 1; and the profitability ratio was limited to values between -1 and 1. All monetary variables are deflated using the appropriate country specific annual price indices taken from the Eurostat database. In addition, adjustments for the differences in currency in Bulgaria, Czech Republic, Croatia, Poland, Sweden and the UK were also made using Eurostat exchange rates.

3.1.2 Country-specific variables

A number of previous studies have identified significant effects of country specific characteristics on capital structure (Hall et al., 2004, De Jong et al., 2008, Fan et al., 2012).

In order to asses the health of the banking system in each country, we include a variable capturing the effect of *bank concentration* (Jõeveer, 2013*a*). Bank concentration captures the effects of market power in the banking sector (Berger & Udell, 1998). We also include the *share of total bank assets held by foreign banks* (Jõeveer, 2013*a*), as an additional indicator of how competitive the banking sector is in each country. This share can also be interpreted as an indicator of the quality of the banking system (Jõeveer, 2013*a*). Our working hypothesis is that differences in bank competition can alter the degree to which firms across their lifecycle can access bank debt.

We are also interested in considering the impact of the systemic availability of non-bank debt financing and whether this will affect capital structures. To do this, the ratio

of the *stock market capitalisation to GDP* is included in this analysis as a proxy measure of the development of the equity markets in each country (De Jong et al., 2008, European Central Bank, 2013, Jõeveer, 2013*b*). This variable measures the capacity of stock markets to provide risk diversification opportunities for firms' looking to invest and grow (Demirgüç-Kunt & Maksimovic, 1996). Finally we also control for overall *financing availability* by including the value of all external funding sources to GDP in the regression. This variable accounts for the financial resources provided to the private sector.

The country level macroeconomic variables included in the analysis have been obtained from the Global Financial Development Database by the World Bank (World Bank, 2017), since this type of information is not included in the Amadeus dataset[6]. Descriptive statistics for the macroeconomic indicators used are provided in Appendix B. Again, heterogeneity among countries and also variation across time can be observed.

Table 3 provides the definition for all independent variables included in the regressions.

Table 3: Variable definition

Name	*Definition*
Amadeus	
Debt ratio	Share of total debt on shareholders funds (i.e. capital plus debt)
Debt dummy	Equals 1 for observations where debt is present; and equals 0 otherwise
Age	Natural log of firm age, calculated the difference between the year and the date of incorporation
Micro categ.	Size category dummy constructed based on the EC classification (i.e. turnover/total assets of less or equal than €2,000). Medium firms are the reference category

[6]This list of macroeconomic indicators is not exhaustive, and the inclusion choice was made based on statistical significance and economic relevance of said indicators.

Small categ.	Size category dummy constructed based on the EC classification (i.e. turnover/total assets of less or equal than €10,000). Medium firms are the reference category
Profitability	Total firm profits to total assets
Collateral	Tangible assets to total assets
Liquidity	Cash stock to total assets
Output diff.	Yearly differential of the natural log of total firm output
Growth opp.	Yearly differential of the natural log of total firm output to differential of the natural log of average output in each sector
Sector dummies	Dummies for sector categories defined according to the NACE Rev.2 classification by the EC. HTM is the reference sector
Year dummies	2006 is the reference period
Regional dummies	NUTS 1, 2 or 3 statistical regions (depending on the country); for country specific regressions only
World Bank	
Bank concentration	Share of assets of three largest commercial banks on total commercial banking assets (World Bank, 2017)
Stock capitalisation/GDP	Total value of all listed shares in a stock market as a percentage of GDP (World Bank, 2017)
Foreign bank assets share	Percentage of the total banking assets that are held by foreign banks. A foreign bank is a bank where 50 percent or more of its shares are owned by foreigners (World Bank, 2017)
Financing availability/GDP	Sum of private credit by deposit money banks and the total value of all listed shares to GDP (World Bank, 2017)

3.2 Estimation strategy

In order to test the relations described in H1 to H4 in Table 1, a series of panel data regressions are estimated. A notable contribution from our research is the treatment of sample selection bias that may be present in estimates in previous studies that model the debt-to-total funds relationship. As many firms do not have any debt (28% of the total observations approximately), this suggests a selection into having debt as an important determinant of the capital structure.

A traditional approach to the zero debt firms issue has been to estimate a censored regression such as the Tobit model (Rajan & Zingales, 1995, Bharath et al., 2008, European Central Bank, 2013), or ignore this issue altogether. By following this approach,

prior research has assumed that a firm's decision to use some type of financing is influenced by the same factors as those that influence its decision on how much of this type of financing to use (Cook et al., 2008). However, when the decision to use debt is influenced by different factors than the decision of how much debt to use, selection bias may arise (Strebulaev & Yang, 2013, Kieschnick & Moussawi, 2018). Selection issues can often occur in the area of corporate finance, and arises when the model to be estimated refers only to a sub-section of firms of the whole population, who select themselves into a certain category (Li & Prabhala, 2008). If self-selecting firms are not random subsets of the population the usual linear estimators applied only to the subsets of firms are not consistent. Credit constraints due to financial market frictions may prevent some firms from accessing any debt and these factors may be correlated with many of the firm controls used in the debt-to-total funds relationship. This suggests a two-stage relationship needs to be modelled to determine the hurdle by which firms have to jump to access any debt.

The econometric treatment of selection bias was offered in the seminal work by Heckman (1979). He proposed a two-step approach, where the first step consists of the estimation of a probit for the participation decision using all observations in the sample, after which the inverse Mills ratio (IMR) is computed based on the the fitted probit results[7]. On a second step, an OLS regression is estimated using only observations with observed positive outcome, including the IMR as an explanatory variable. However the estimation of this model in a panel data framework (such as ours) presents some challenges. Wooldridge (1995) suggests estimating a probit using cross-sections of data for each of the T years included in the sample, and obtain T specific IMR. These then would be included in a second step OLS regression pooling all data. This approach is unap-

[7]The IMR is defined as the cumulative density function divided by the density function (Verbeek, 2008).

pealing for our research for two reasons. First, it relies on the assumption that the period specific disturbances are uncorrelated with the next period disturbances (Li & Prabhala, 2008). Second, pooling data in the second step makes the identification of the effect of age problematic, as no time variation is exploited in the estimation. Therefore, our proposed methodological approach is as follows.

Step 1 - Dynamic probit

As the first-step we estimate a dynamic random effects probit using all observations. The lagged dependent variable works as the exclusion restriction, necessary in selection models, since it contains a large amount of information on whether or not the firm is indebted and the structural reasons why it does without having to parameterise it. Excluding this variable from the second stage is also reasonable given the IMR will capture the selection factors. The dynamic probit is defined as:

$$y_{it}^{*} = \beta X_{it-1} + \beta I_{it-1} + \rho y_{it-1} + \delta_t D_t + \delta_c D_c + c_i + u_{it} \tag{1}$$

Where $y_{it} = 1(y_{it}^{*} > 0)$, X_{it} is a vector of time varying explanatory variables, I_{it} is a vector of industry specific variables, y_{it-1} is the lagged dependent variable, and D_t and D_c are sets of time and country dummies. Note that in what follows the initial period is referred to as *t=1*. In order to estimate equation (1) the initial conditions problem, defined as the correlation between the unobserved individual heterogeneity term c_i and the lagged dependent variable y_{it-1}, needs to be taken into account because these models assume that all independent variables are exogenous (Wooldridge, 2005).

A popular approach to deal with this issue was suggested by Wooldridge (2005). He proposes to model the individual unobserved heterogeneity conditional on the initial period y_{i1} and the values of the time varying X_{it} variables excluding the initial period. How-

ever, this approach does not work well for unbalanced panel data (Wooldridge, 2005). Alternative specifications have been more recently proposed (Rabe-Hesketh & Skrondal, 2013). A simplification of this approach, consisting on including individual specific means of the time varying variables in X_{it} has been applied in previous analysis, however Rabe-Hesketh & Skrondal (2013) demonstrated that this solution faces some difficulties when the panel is not very long. Rabe-Hesketh & Skrondal (2013) found evidence that excluding the initial time period from the within means reduces potential bias therefore, this is the approach followed here [8]:

$$c_i = \alpha_0 + \alpha_1 y_{i1} + \alpha \bar{z}_i^{+'} + a_i \tag{2}$$

where $\bar{z}_i^{+'} = \frac{1}{T-1}\sum_{t=2}^{T} z_{it}$. The IMR is computed after equation (1) is estimated.

Step 2 - Fixed effects regression

The second step regression uses only observations with positive debt ratios, and includes the IMR computed in the previous step. We use bootstrapped standard errors to account for the fact the IMR is estimated in a previous regression. The FE estimator is considered more appropriate than a random effects (RE) approach if unobserved individual time invariant factors that are correlated with the independent variables of interest are present (Verbeek, 2008). In this empirical analysis, FE is considered a more suitable estimator because some unobservable firm specific factors (such as improved performance through increased experience) are likely to be correlated with age. Therefore, the second step regression is defined as:

[8] Rabe-Hesketh & Skrondal (2013) proposed yet another specification that includes the within means (except the first time period) plus the values of the initial periods of all time varying variables. This approach as well as the one proposed by Wooldridge (2005) were both attempted, however convergence issues (likely due to the number of parameters) where present.

$$y_{it} = \alpha_i + \beta X_{i,t-1} + \beta I_{i,t-1} + \beta D_t + \beta D_c + \varepsilon_{it} \quad (3)$$

In equation (3) the X_{it} vector includes firm specific regressors, I_{it} includes industry specific variables. D_t, and D_c represent year and country dummies.

The estimation strategy is as follows. The specification in equation (3) corresponds to the baseline model. H1a,b described in Table 1 are tested by estimating equation (3) using the pooled sample, and looking at the estimates for the age variables included in vector X_{it}. In order to test H2, the model in equation (3) is estimated using the sub-samples corresponding to each of the countries included in the analysis instead of the pooled sample. H3 is tested by re-estimating equation (3) including interactions of the age variables with collateral and liquidity. Finally, to test H4 we include the country level variables in equation (3), together with interactions between each of the macroeconomic indicators and firm age.

4 Results

4.1 Overall findings

The first column in Table 4 displays the estimates obtained using a RE probit model (step 1 of the estimation approach described), while the second column displays the estimates of the FE regression (step 2 of the estimation approach).

Table 4: Regression estimates - Pooled sample

	Probit (RE)[9]	FE reg.

[9] As described in Section 3.2 means of the time varying independent variables, and the lagged and initial values of the dependent variable were included in the RE probit, but are not reported.

Age	-0.295***	-0.039***
	(0.015)	(0.007)
Age^2	-0.002	0.007*
	(0.002)	(0.003)
Profitability	0.085***	-0.027***
	(0.016)	(0.003)
Liquidity	0.090***	-0.041***
	(0.016)	(0.002)
Collateral	-0.089***	0.108***
	(0.017)	(0.003)
Output diff.	0.038***	0.010***
	(0.005)	(0.001)
Growth opp.	-0.001***	-0.000***
	(0.000)	(0.000)
Small (D)	-0.079***	-0.043***
	(0.006)	(0.001)
Micro (D)	-0.279***	-0.082***
	(0.006)	(0.002)
IMR		-0.013***
		(0.001)
Year dummies	Yes	Yes
Country dummies	Yes	Dropped
Sector dummies	Yes	Dropped
Year*Country dummies	No	Yes
Observations	2,288,806	1,654,709

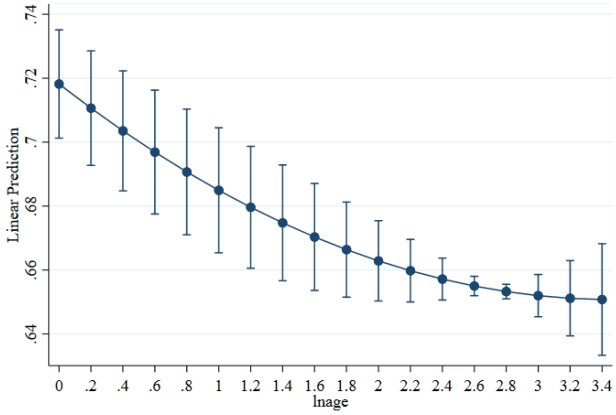
Standard errors in parentheses (bootstrapped for FE reg.).

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

The effect of age on firms' decision to acquire debt (column 1 in Table 4) and on the decision of how much debt to have (column 2) is similar, with the exception of the age squared term. The effect of age on debt ratios is negative, although the positive squared term indicates that the relationship becomes less negative as firms get older. In relation to the hypotheses set in Table 1, the estimates point to the rejection of H1a in favour of H1b. Figure 1 displays the marginal effects of age (at the means). It shows how the negative effect of age becomes less pronounced as firms become older. This result suggests that mature firms have lower reliance on debt, as they are likely to be able to retain and use more internal resources (Chittenden et al., 1996, Michaelas et al., 1999). Conversely,

younger firms make more extensive use of debt. This finding has been reoccuring in the literature. For example, using a similar dataset to ours, European Central Bank (2013) also found that younger firms were more reliant on external financing than older firms. A negative effect of age was also identified in Chittenden et al. (1996), Michaelas et al. (1999) or López-Gracia & Sogorb-Mira (2008).

Figure 1: Marginal effects of age - FE regression



These findings are in line with the pecking order theory (López-Gracia & Sogorb-Mira, 2008), implying that firms' capital structure decisions are determined by the level of firms' internal resources and cash stocks rather than the agency costs or the relative benefits of acquiring debt (González & González, 2008). The estimates also provide indirect indication of the importance of information asymmetry affecting SMEs debt use (Berger & Udell, 1998). The estimates suggest that although age could be a proxy measure of reduced information asymmetry problems, this does not seem to be the case for the SMEs analysed, as mature firms resort to debt to a lesser extent than younger firms.

The estimates obtained for the rest of regressors are broadly in line with previous empirical research. The size dummies have negative coefficients, indicating that smaller firms have lower debt ratios than the reference category which is medium firms, resulting

in a positive effect of size (Rajan & Zingales, 1995, López-Gracia & Sogorb-Mira, 2008, La Rocca et al., 2011). Liquidity has a negative effect on debt, suggesting that higher cash stocks make acquiring debt unnecessary for firms (Hall et al., 2004, Chittenden et al., 1996, Michaelas et al., 1999, European Central Bank, 2013), suggesting that SMEs are more likely to use internal resources when available. Growth opportunities have a negative effect on debt, indicating that firms with higher growth prospects are likely to take more risks. This negative effect may arise from difficulties in acquiring debt on favourable conditions due to perceivced risk attitudes (Psillaki & Daskalakis, 2009), or from reduced need for debt due to better growth prospects (López-Gracia & Sogorb-Mira, 2008). Collateral has a positive effect on debt, indicating that when firms have higher fixed assets the cost of acquiring debt is reduced (Chittenden et al., 1996).

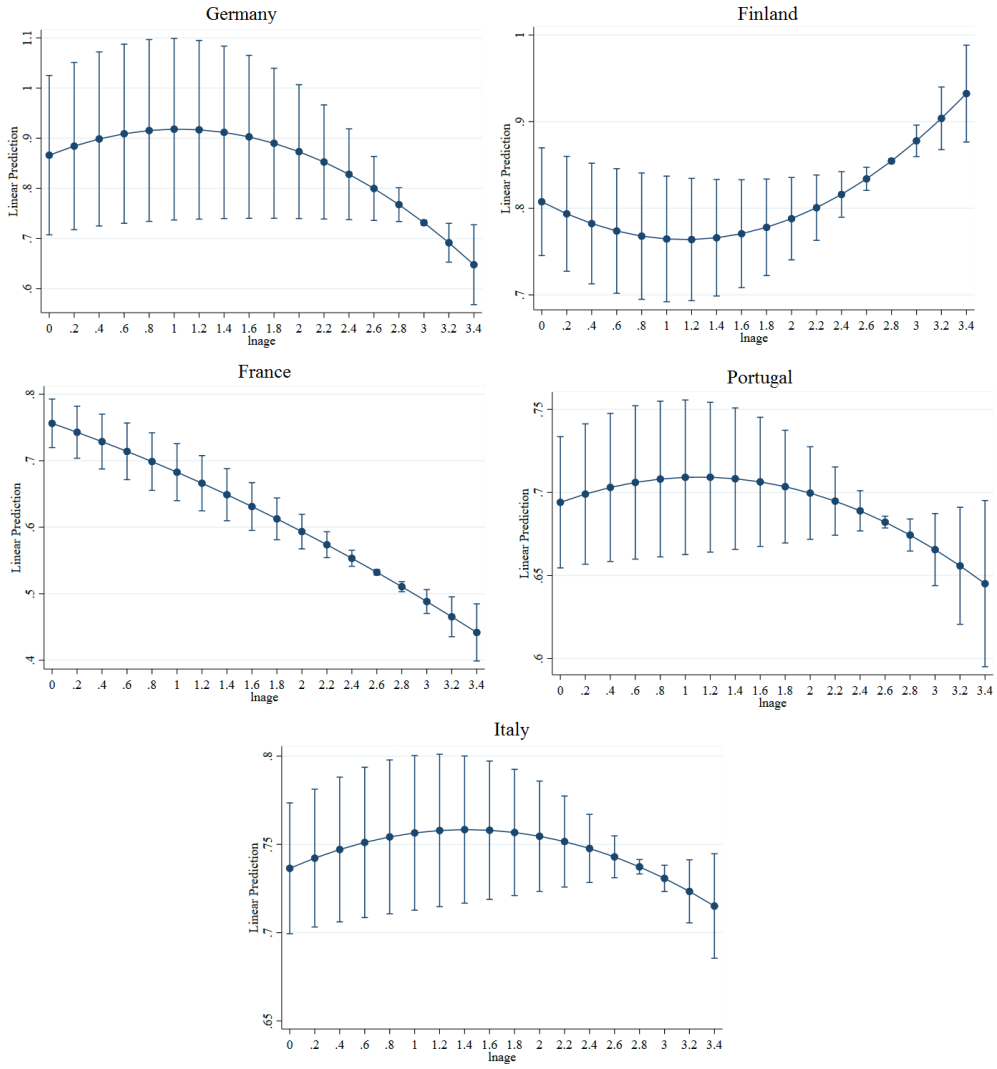
A regression including size weights was also estimated as a robustness check. Due to the inclusion criteria used in Amadeus, it is likely that micro firms are under represented in the sample (Jõeveer, 2013*b*), therefore a series of weights are built using Eurostat firm size data. The effect of age maintains its significance and direction[10].

4.2 Country-specific regressions

Cross-country differences in the effect of age on debt use were identified through the estimation of country specific regressions. The effect of age was statistically significant in nine out of the fifteen countries included in the analysis. The heterogeneous estimates therefore confirm Hypothesis 2 in Table 1. Figure 2 displays the marginal effects (at the means) of age for selected countries. The coefficients of the FE regressions are provided in Appendix D[11].

[10]Estimates are not reported here to save space but are available upon request.
[11]The estimates for the rest of countries are available upon request.

Figure 2: Marginal effects of age - By country



Age has a positive relationship on leverage for Finnish SMEs, indicating that firms at an earlier stage of their lifecycle appear to be less reliant on external funding as opposed to later stages. The opposite effect is found for firms in Germany, Italy, France and Portugal. In these countries, firms are more reliant on debt at earlier stages of their lifecylce. Despite the important methodological and data differences, the results obtained

for France and Portugal are in line with those obtained by Giannetti (2003). The results obtained for the relationship between age and leverage for Italy also compare to recent estimates in La Rocca et al. (2011). Overall the estimates presented in this analysis indicate very heterogeneous effects of age on debt ratios of SMEs in different countries in Europe. Such variation in effects is likely to be linked to differences across countries in both firm level characteristics and country specific macroeconomic conditions, both of which are explored next.

4.3 Lifecycle and firm characteristics

Table 5 provides the estimates obtained for the interactions between age and collateral and liquidity, in columns 1 and 2 respectively. Note that in both regressions the IMR obtained from the first stage is also included, and is statistically significant.

Table 5: FE reg. estimates - Age and firm characteristics

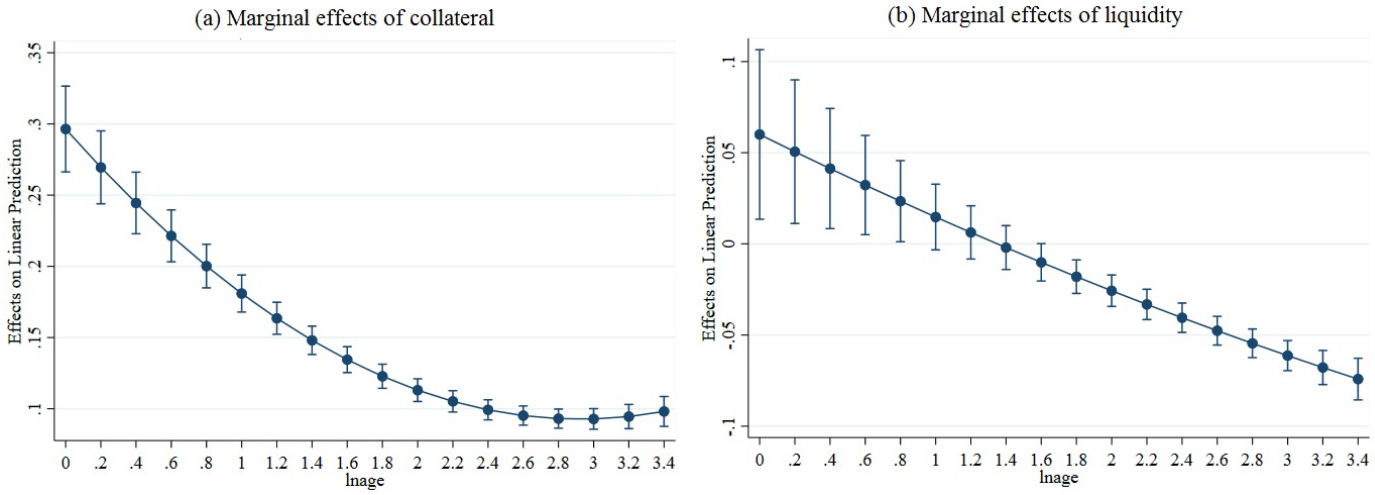
	Age*Collateral	Age*Liquidity
Age	0.017*	-0.031***
	(0.009)	(0.008)
Age^2	-0.006*	-0.005
	(0.003)	(0.003)
Liquidity		0.062***
		(0.024)
Age*Liquidity		-0.048**
		(0.024)
Age^2*Liquidity		0.002
		(0.004)
Collateral	0.295***	
	(0.015)	
Age*Collateral	-0.139***	
	(0.013)	
Age^2*Collateral	0.024***	
	(0.003)	
Control variables	Yes	Yes
Year dummies	Yes	Yes

Sector dummies	Dropped	Dropped
Country dummies	Dropped	Dropped
Country*Year dummies	Yes	Yes
Observations	1,654,709	1,654,709

Bootstrapped standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

By including the interacted terms, we aim to test whether the relationship between age and debt is dependent on these firm characteristics. The estimates overall confirm the expectations set out in Table 1. For the case of collateral, the coefficients in Table 5 show that the effect of collateral on debt levels is reduced as firms become older, confirming H3a in Table 1. Moreover, the effect is non-linear, implying that this reduction becomes less pronounced at later stages of the firm's lifecycle. The effect is also highly statistically significant. Figure 3a plots the marginal effects of collateral at different values of firm age. These findings support the hypothesis that mature firms have lower reliance on collateral to obtain debt. Overall, this result suggests that although SMEs are generally thought to be reliant on collateral to access bank credit, the extent of this requirement varies depending on firm age, with younger firms facing higher constraints.

Figure 3: Age and firm characteristics



The interaction between liquidity and age is also statistically significant and negative. Figure 3b displays the marginal effects of liquidity at different ages, indicating that the relative influence of liquidity on debt is reduced as firms mature, as hypothesised in H3b in Table 1. Overall, the findings suggest the use of debt decreases when firms have the capacity to retain higher internal resources, and that older firms are generally more capable of doing so, as suggested by the baseline model.

4.4 Cross-country explanatory factors

In this section we explore the interaction between structural characteristics of the financial sector and the age-capital structure relationship. The estimates obtained in the FE regressions including country-level indicators are displayed in Table 6. The first column displays the results of the baseline model including the country-specific indicators, and the next three columns show the results obtained for the interactions of age and the structural financial factors. The IMR obtained from the first stage is included in all regressions, and is statistically significant.

Table 6: FE reg. estimates - Age and country-varying indicators

	No int.	Bank conc.	Stock cap./GDP	Frgn. bank assets
Age	-0.035***	-0.083***	0.063***	-0.049***
	(0.007)	(0.018)	(0.011)	(0.008)
Age^2	0.004	0.013***	-0.021***	0.007**
	(0.003)	(0.004)	(0.004)	(0.003)
Bank conc.	0.084***	0.006	0.080***	0.080***
	(0.006)	(0.032)	(0.005)	(0.005)
Stock cap./GDP	-0.063***	-0.063***	0.086***	0.060***
	(0.007)	(0.007)	(0.016)	(0.006)
Frgn. bank assets	0.094***	0.092***	0.093***	0.070***
	(0.011)	(0.011)	(0.011)	(0.018)
Age*Bank conc.		0.078**		
		(0.026)		
Age^2*Bank conc.		-0.017***		

		(0.005)		
Age*Stock cap./GDP			-0.123***	
			(0.012)	
Age^2*Stock cap./GDP			0.024***	
			(0.002)	
Age*Frgn. bank assets				0.072***
				(0.015)
Age^2*Frgn. bank assets				-0.021***
				(0.004)
Control variables	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Country dummies	Dropped	Dropped	Dropped	Dropped
Sector dummies	Dropped	Dropped	Dropped	Dropped
Observations	1,654,709	1,654,709	1,654,709	1,654,709

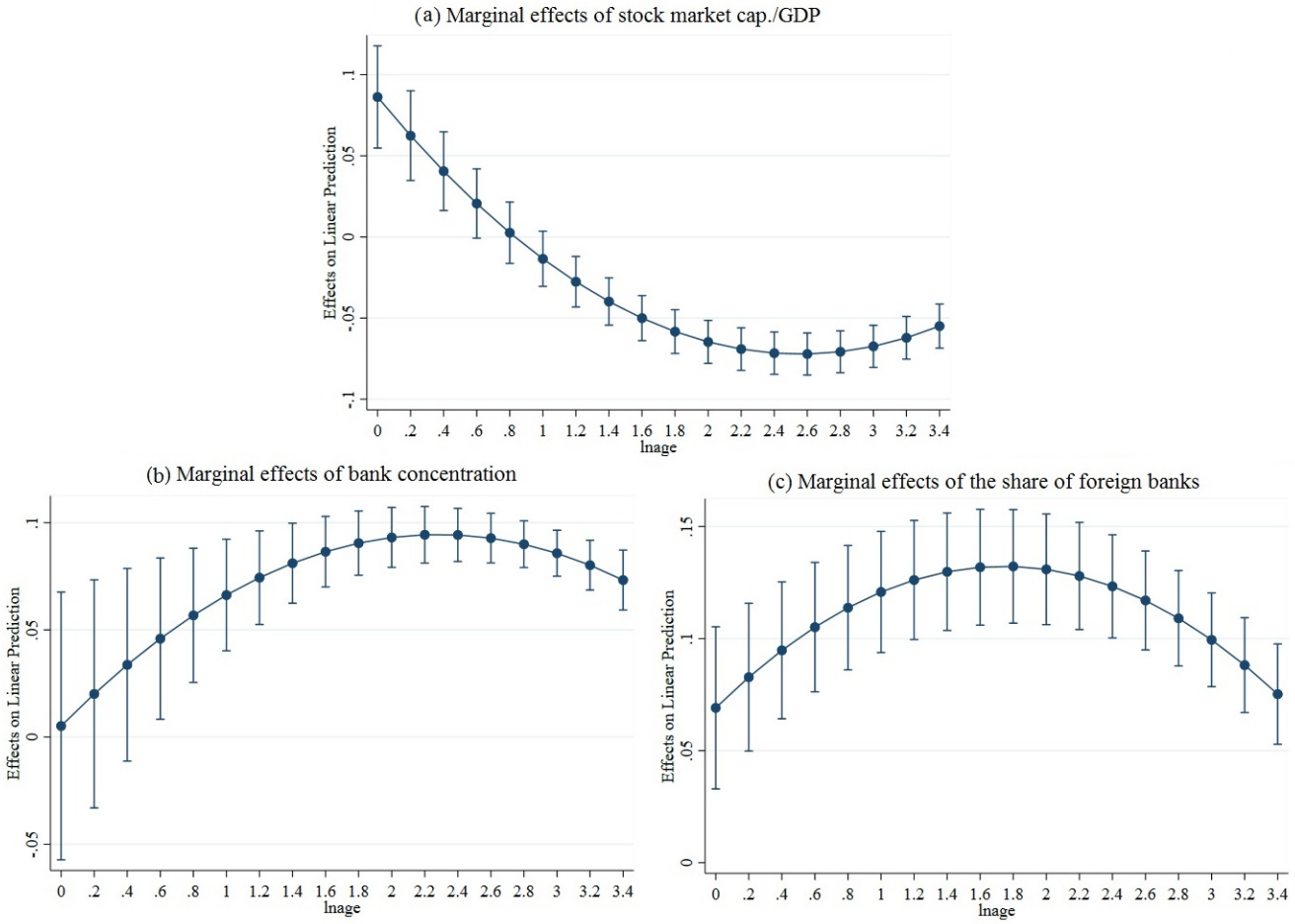
Bootstrapped standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

The effect of all macroeconomic indicators is statistically significant. The estimates confirm the importance of the effects banking sector characteristics on SMEs capital structure. Bank concentration has a positive relationship with debt, as identified in Petersen & Rajan (1995), González & González (2008) or Jõeveer (2013*a*). This finding is in line with the information-based theory, which suggests that higher bank concentration helps reduce information asymmetry problems by improving the flow of information on borrowers between banks, resulting in higher lending (Petersen & Rajan, 1995, Carbo-Valverde et al., 2009). A higher presence of foreign banks in a country's economy also has a positive effect on debt. This finding is at odds with the general idea that foreign banks tend to focus on financing large firms, due to their focus on transaction lending rather than relationship lending (Berger & Udell, 2006) and their preference for hard information (Beck et al., 2011). Some analyses have challenged this idea recently however, and noted that the presence of foreign banks could also benefit SMEs through diversified financing products or loans based on guarantees (de la Torre et al., 2010) or through increased competition in the sector (Beck et al., 2009). The effect of the stock capitalisation to GDP ratio on leverage is negative. This result is in line with estimates in European

Central Bank (2013) and Jõeveer (2013*b*), and it indicates that, in countries where stock markets are better developed, the reliance of firms on bank finance might be reduced.

Figure 4, which displays the marginal effects (at the means) of the structural financial indicators at specified ages, and the estimates in columns (2) to (4) in Table 6 are broadly in line with the hypothesis set out in Table 1 regarding the interconnected effects of age and macroeconomic indicators.

Figure 4: Age and banking structure indicators



The interaction between age and stock market capitalisation is negative, while the

interaction with the age squared term is positive, and statistically significant in both cases. This suggests that, as hypothesised in H4a in Table 1, firms might face less difficulties obtaining alternative external finance through stock markets as they mature, resulting in lower debt. The marginal effects of stock capitalisation on debt ratios at different levels of age displayed in Figure 4a show an interesting pattern. During the initial stages of the lifecycle, the marginal effects of the stock market capitalisation on debt ratios are positive, and they only turn negative as firms get older. Indeed, older firms actually reduce debt ratios in countries with high stock market capitalisation which suggests debt-equity substitution for this subset of firms. These effects decline sharply with age but taper off as firms mature. One potential explanation is that younger firms find it difficult to benefit from stock market financing and still require debt financing, but as firms become older and information asymmetries decline they are better able to take advantage of non-bank financing. Moreover, the fact that younger firms have a higher use of debt in high stock market capitalisation countries might be due to greater competition for older firms, which makes debt providers target funds to younger firms. This would be consistent with lower credit constraints and better credit access for younger firms in countries with higher shares of non-bank financing.

The interaction between age and bank concentration is positive and statistically significant, indicating that in countries with more bank concentration indebtedness increases as firms age, which is in line with Petersen & Rajan (1995). Therefore, the estimates support hypothesis H4b in Table 1, suggesting that higher bank concentration and the resulting close relationships between lenders and debt holders proposed by the information theory would mitigate problems of information asymmetry, benefiting loan application of older firms. These estimates suggest that more concentrated banking systems do not provide enough financing for young firms. This would be in line with findings in Ryan

et al. (2014) which suggest that more concentrated systems limit credit access for younger SMEs. According to Figure 4b, middle aged firms appear to benefit the most.

In terms of the findings for foreign bank assets, the estimates suggest that indebtedness increases across the age distribution as the share of foreign banks increase. This is likely a loosening of domestic financing constraints as foreign banks bring new capital into the economy and build new relationships. The marginal effects displayed in Figure 4c suggest that middle aged firms also benefit the most.

5 Conclusions

In this analysis we provide a comprehensive assessment of the effects of firm age on the capital structure of European SMEs in selected countries using and updated panel dataset covering the period 2005-2012. We focus on firm age as there is a clear gap in the literature, since cross-firm and cross-country heterogeneity has not been explored before, therefore contributing to the age-capital structure debate. Age is also closely related to the relative use of internal resources versus external finance for SMEs, which is likely to have been affected by the recent financial difficulties arising from the 2009 crisis.

Using the pooled sample, we uncover a negative non-linear effect of age on debt, suggesting that younger firms are more leveraged. This is likely to be linked to the higher capacity of mature firms to retain a higher level of internal resources. However, one of the main contributions of our paper relates to the comparative framework used in the analysis, which includes 15 different European countries. Since we use a homogeneous methodology and data across countries, we are able to get comparable results of the effect of age on firm level debt ratios. We find that the result obtained using the pooled dataset did not hold when performing country specific regressions. For example, younger SMEs

in Finland were found to have higher debt.

Another important contribution are the heterogeneous results uncovered in the country specific regressions, by accounting for the combined effects of age and several firm level and country specific characteristics. For both the firm specific and country specific heterogeneity, the estimates showed the great significance of the non-linear effects of firm age when interacted with selected firm characteristics and macroeconomic indicators. We provide further insights into the relationships of firm age and collateral and liquidity levels. The effect of these firm level characteristics on capital structure presented differences depending on the stage of the firm's lifecycle. The estimates suggest that the negative relation between age and debt relates to the lack of internal resources of younger firms. Younger firms are also relatively more reliant on collateral to access bank debt than mature firms. We also identified a disparity of effects of country specific financial indicators at different stages of the firm's lifecycle. The estimates suggest that firms might face less difficulties obtaining financing though stock markets as they mature in countries where these markets are more capitalised, indicating that the effect of financing diversification opportunities on capital structure depends not only on the level of development of stock markets, but also on firm's age. The interaction of age and bank system characteristics suggested that middle-age firms benefit more from increased credit access arising from higher bank concentration and presence of foreign banks. This positive effect, however, declines after firms reach later stages of their lifecycle.

The results outlined in this analysis have important policy implications. First, younger firms were identified to have more difficulties accessing external funding due to higher reliance on collateral and liquidity. Considering the importance of these firms for job creation (Lawless, 2014) and the overall evolution of the economy (European Central Bank, 2013), our estimates offer support for the idea of designing policies focused on

younger firms. Second, given the reliance of SMEs on bank finance, particularly in the early stages of their lifecycle, the development and promotion of alternative and less risky sources of external funding would be highly desirable, since it would allow to diversify capital structures.

Some of the limitations of this analysis relate to the need to focus on banking finance due to data and space constraints. For this reason we have not considered alternative sources of financing that are typically used by some SMEs (such as venture capital, family loans, etc.). Moreover, we have not accounted for the effect of different taxation regimes, which is other macroeconomic factor typically found to influence firm debt. These constitute promising areas for further research. An interesting extension of this analysis would be to apply a dynamic panel data estimator in order to account for the dynamic nature of firms' debt decisions (Gungoraydinoglu & Öztekin, 2011). Finally, since we have only explored the effects on total firm debt, further research could also distinguish between different effects of age and firm and macroeconomic characteristics on long and short term debt.

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Appendices

A Distribution of observations by year and country

	2005	2006	2007	2008	2009	2010	2011	2012	Total
BE	4869	5274	5775	5883	6126	6270	5771	4391	44359
BG	3416	4308	7223	9887	12594	14705	13549	11686	77368
CZ	7576	10533	14038	15281	17119	17981	14642	6632	103802
DE	9	193	1126	3372	5047	5513	4753	1936	21949
EE	2863	3397	3873	4076	3015	2364	37	27	19652
EL	7864	8548	9119	9495	9979	10374	9351	5412	70142
ES	44901	49878	55763	47643	112119	111285	104000	29544	555133
FI	3598	4299	5417	5892	6835	6830	5743	4300	42914
FR	65309	75853	91437	97272	110858	101936	78042	35771	656478
HR	14457	16285	18775	19425	21114	22103	19559	16907	148625
IT	34775	42575	74488	86891	110156	102397	97319	49443	598044
PL	1648	2189	2817	3119	3355	2683	1832	357	18000
PT	316	744	89468	98539	105717	90347	72346	54362	511839
SE	1032	1175	1271	1285	1184	1179	1045	907	9078
UK	2253	2743	3411	3744	4264	4833	4343	2738	28329
Total	194886	227994	384001	411804	529482	500800	432332	224413	2905712

Number of observations by year and country reported.

B Descriptive statistics - Macroec. variables

	Bank concentr.	Stock cap./GDP	Foreign bank assets	Financing/GDP
BE	75.936	61.831	30.589	122.01
BG	45.62	19.196	77.218	80.62
CZ	65.143	24.277	83.25	67.77
DE	76.688	38.839	11.415	130.75
EE	95.725	22.519	99.139	100.24
EL	62.98	43.08	11.402	133.76
ES	64.879	84.697	2	246.35
FI	95.553	75.396	83.696	155.99
FR	62.633	75.528	5.785	164.67
HR	55.476	49.255	90.195	111.82
IT	53.272	32.066	5.62	117.3
PL	37.918	33.297	75.146	74.55
PT	84.625	37.613	23.954	188.8
SE	95.768	100.68	0	215.47
UK	57.398	113.764	14.879	290.99
2005	61.354	63.463	17.8	143.37
2006	59.77	72.884	19.265	159.47
2007	65.404	74.605	21.102	175.51
2008	66.269	56.055	21.555	163.48
2009	66.567	47.476	19.293	166.6
2010	66.651	53.474	19.623	171.32
2011	64.597	46.064	18.49	165.71
2012	66.532	39.378	24.041	154.8
Total	65.207	55.541	20.054	164.99

Country and year averages of macroeconomic indicators (all observations).

C Spearman correlation coefficients

	Debt/funds	Age	Profitability	Liquidity	Collateral	Output diff.	Growth opp.
Debt/funds	1						
Age	-0.005*	1					
Profitability	-0.123*	-0.077*	1				
Liquidity	-0.335*	-0.078*	0.320*	1			
Collateral	0.227*	-0.008*	-0.102*	-0.198*	1		
Output diff.	0.020*	-0.101*	0.264*	0.059*	-0.008*	1	
Growth opp.	0.007*	-0.014*	-0.010*	-0.009*	0.009*	0.043*	1

	Debt/funds	Bank concentr.	Stock cap./GDP	Foreign bank assets	Financing/GDP
Debt/funds	1				
Bank concentr.	-0.037*	1			
Stock cap./GDP	-0.046*	0.085*	1		
Foreign bank assets	0.017*	0.150*	-0.552*	1	
Financing/GDP	-0.015*	0.483*	0.667*	-0.466*	1

D Country specific FE regression estimates

	Germany	Finland	France	Italy	Portugal
Age	0.100*	-0.076***	-0.078***	0.033*	0.040**
	(0.057)	(0.023)	(0.014)	(0.018)	(0.016)
Age^2	-0.048**	0.033***	-0.001	-0.013*	-0.017**
	(0.024)	(0.015)	(0.007)	(0.007)	(0.008)
Profitability	-0.049**	-0.022***	-0.017***	-0.079***	-0.031***
	(0.024)	(0.012)	(0.006)	(0.010)	(0.006)
Liquidity	0.011	-0.053***	0.020***	-0.120***	-0.021***
	(0.027)	(0.012)	(0.007)	(0.009)	(0.007)
Collateral	0.109***	0.074***	0.296***	0.067***	0.042***
	(0.026)	(0.010)	(0.009)	(0.007)	(0.007)
Output diff.	0.016***	0.010***	0.023***	0.008***	0.007***
	(0.005)	(0.002)	(0.002)	(0.001)	(0.001)
Growth opp.	-0.000	-0.000*	-0.000***	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Small (D)	-0.023**	-0.023**	-0.057***	-0.034***	-0.031***
	(0.010)	(0.015)	(0.008)	(0.003)	(0.009)
Micro (D)	-0.058***	-0.053***	-0.118***	-0.062***	-0.065***
	(0.014)	(0.016)	(0.009)	(0.004)	(0.009)
IMR			0.011***	-0.032***	-0.017**
			(0.004)	(0.004)	(0.008)
Regional dummies	Dropped	Dropped	Dropped	Dropped	Dropped
Sector dummies	Dropped	Dropped	Dropped	Dropped	Dropped
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	14,329	28,218	421,213	350,442	294,413

Bootstrapped standard errors in parentheses (for regressions including the IMR). Robust standard errors in regressions without IMR. $^{*}p < 0.10$, $^{**}p < 0.05$,$^{***}\ p < 0.01$.

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