The financial life cycle of European SMEs before, during and after crises periods

Maurizio La Rocca[1]
Raffaele Staglianò[2]
Marc Deloof[3]

[1]University of Calabria (Italy), corresponding author, m.larocca@unical.it
[2]University of Messina (Italy)
[3]University of Antwerp (Belgium)

Abstract

This paper contributes to the financial life cycle literature studying the effect of firm age on European SMEs' debt policies in 28 European countries. It investigates whether the global financial crisis and the European sovereign debt crisis shape SMEs' financial life cycle in comparison to pre- and post-crises periods. Our pre-crises findings show a high use of debt in the early-stages of their life cycle and decreasing over time. During the crises we observe that the negative age-debt relationship becomes weaker compared to pre-crises periods. After the crises we observe a gradual return to the pre-crises patterns, but with a lower extent for younger and more informationally opaque SMEs. Moreover, we interestingly find that the pre-, during and post-crises patterns differ according to level of financial development of the country in which a SME operates.

Keywords: SMEs, Capital Structure, Financial Life Cycle, Financial Crisis, Global Financial Crisis, Sovereign Debt Crisis

JEL classification codes: G32; G21

1. Introduction

The variety of benefits and costs related to the use of debt significantly affects corporate value, especially during periods of credit contractions (Machokoto, 2020). The way firms manage their debt policies has traditionally been studied following two main theoretical models. On one hand, according to the trade-off theory, firms are in search of an optimal debt/equity mix (e.g., Kraus and Litzeberger, 1973). This approach suggests that firms with a consolidated business tend to use more debt. These firms have stable profits, working capital and cash flows, for which the financial flexibility is relatively less important to them, having lower costs of distress and less informational opacity (Berger and Udell, 1998). On the other hand, according to the pecking order theory (e.g., Myers and Majluf, 1984) and the extent of relevance of asymmetric information, firms follow a hierarchical order of preferences in financing choices: they first prefer to use internally generated cash, then debt and lastly equity. However, the degree of informational opacity changes over time and drives the financial life cycle (Kaplan and Stromberg, 2003). Early stage firms gain growth opportunities and are less likely to generate cash, for which they could rely on external finance (Deloof and Vanacker 2018). In contrast, mature firms report higher levels of cash holdings and have less external financial needs, suggesting a higher use of internal finance (Bulan and Yan, 2009).

Notwithstanding a large body of literature, studies testing the trade-off and the pecking order theories do not fully explain all the broad patterns of corporate financial choices (e.g. Fama and French, 2005; Hadlock and Pierce, 2010). One potential reason of controversial evidences could be related to the existence of a *pro-tempore* optimal capital structure or a *pro-tempore* pecking order that is changing along the life cycle of the firm. Consequently, when analysing the financing policies of SMEs, the financial life cycle theory could provide explanations of deviations from the trade-off and the pecking order theories in light of a firm's age that linked to information opacity and financial constraint (Rauh, 2006; Fee et al., 2009).

A huge body of literature highlights that the firm's life cycle is an important driver of SMEs financing policies that evolve over time according to the firm changing its characteristics (Berger and Udell, 1998; Hirsch and Walz, 2011; La Rocca et al., 2011; Sánchez-Vidal and Martín-Ugedo, 2012; Serrasqueiro and Nunes, 2012). Starting from the financial life cycle theory subsequent studies emphasize that each particular phase of a business life cycle is characterized by a different financial need and changing debt varying over time. Consequently, the optimal debt/equity mix or the order of preferences in financial choices can evolve through the phases of the life cycle (La Rocca et al., 2011).

In this literal framework, a key aspect to consider is that previous studies have largely examined the financial life cycle of SMEs during stable economic conditions or homogenous credit environments (Deloof and Vanacker, 2018). However, empirical studies suggest both that the financing problems of SMEs are exacerbated during turmoil and financial crisis (Casey and O'Toole, 2014; Zubair et. al., 2020; Poeschl, 2023) and that the institutional context plays a key role (Zhu et al., 2023; Saona et al., 2020; La Rocca et al., 2019). For instance, Zubair et al. (2020) interestingly show that the financial crisis influences the effect of financing on investment decisions of small firms, while Fasano et al. (2022) demonstrate that institutions and macro-economic conditions

affect firms' financial behaviours especially for SMEs and during crisis periods, indicating that the institutional environment in which SMEs operate matters.

According to past literature and taking inspiration both from the contribution of Zubair et al. (2020), who study the role of debt and internal finance for SMEs during crisis periods, and the work of La Rocca et al. (2011), who examine the effect of age on the choice between debt and internal finance, we contribute to the studies on the effect of age on the financing of SMEs by providing three novelties. First, differently from previous studies on this topic (e.g. La Rocca et al., 2011) we study the SMEs' financial life cycle using a large multi-country sample, accounting for the diversity of institutional contexts where SMEs operate, allowing a better generalization of empirical results. Second, we investigate how two financial crises (i.e. the 2008-2010 global financial crisis (GFC) and the 2011-2013 sovereign debt crisis (SDC)) have affected the financing policy along the life cycle of SMEs. Third, we study whether the crises' effect changed depending on the degree of development of the financial system of a country. Encouraged by the contribution of Zubair et al. (2020), we focus on SMEs' financial life cycle before, during and after the financial crises to see the consequences on the financial life cycle due to economic downturns.

Studying the financial behaviour of SMEs throughout their life cycles and during times of crisis could yield significant insights with important implications for firms, Governments, and financial institutions. This analysis could offer recommendations for tailoring financial policies based on a firm's life-cycle stage and the broader macroeconomic context. Moreover, it would acknowledge the pivotal role of debt in facilitating economic recovery during turbulent situations.

The paper is structured as follow. The second section describes theoretical framework on the financial life cycle and develops our hypotheses. The third section reports data and methodology. The fourth, fifth and sixth section present the results. The paper ends with the conclusions and a discussion of the implications.

2. Literature review: Theory and empirical evidence

There are two main theoretical approaches that explain the corporate financial policies during the life cycle. A first traditional perspective (reputation effect argument) suggests that young firms first use owners' equity (including venture capital and angel investments) or retained earnings and, then, external debt during the maturity phase (Fluck, 2000; Kaplan and Stromberg, 2003). This is because young firms have a low debt capacity due to the absence of past experience and the lack of a historical track record of information available from their balance sheets. In this context, banks are not inclined to serve young and informationally opaque SMEs (Berger and Udell 1998). On the contrary, along the maturity stage the use of debt will increase thanks to corporate track records and collaterals.

A second theoretical approach suggests a reverses formulation. Young firms could submit themselves to bank monitoring in order to obtain a certification of their quality and credibility in the product market (certification effect argument). Diamond (1991) argues that the lack of a track record and creditworthiness can be balanced by the submission to bank monitoring. In this way, firms can prove the quality of their business and banks can

support their competitiveness. As a result, firms in the early stages issue external debt, often providing shareholders' personal properties as collaterals (Diamond, 1991; Petersen and Rajan, 1994). Thus, young firms are basically externally financed while mature ones substitute debt with internally self-generated financial resources (Palacín-Sánchez, 2013; D'Amato 2020). Empirical evidence in the last thirty years supports the relevance of the certification effect (Diamond, 1991; Bolton and Freixas, 2000; Cassar, 2004; Cosh et al. 2009; La Rocca et al. 2011; Robb and Robinson, 2014; Hanssens et al. 2016; Deloof and Vanacker, 2018). Cosh et al. (2009) for instance suggest that the external source from which start-ups acquired the majority of their capital is banks. Deloof et al. (2019) point out that the financial market alleviates the financial constraint problems of start-ups, favouring their use of debt, while in later stages the firm will be able to auto-generate financial resources and the owner will be more inclined to re-inject self-generated financial resources into the firm. Similarly, Robb and Robinson (2014) observe that startups heavily depend on external debt, often in the form of bank financing and a significant number of startups secures debt by utilizing the personal financial resources of the entrepreneur. Deloof and Vanacker (2018) find that for a new firm insider financial resources are often not sufficient to sustain its growth, meaning that start-ups depend on external debt. Moreover, firms that leverage debt during their initial stages have a significantly higher likelihood of survival and reaching greater revenue levels (Cole and Sokolyk, 2018). The importance of debt for young firms has also been highlighted by Klein et al. (2019), evidencing that in recent years start-ups rely on external debt also in the form of digital financing instruments. All these authors, according to the certification effect argument, suggest the idea that during the first year the single most important source of funds is from bank debt, while during the maturity phase firms rebalance their capital structure. Thus, recent research on the topic suggests the relevance of debt financing for start-ups (Deloof et al., 2019), inspiring a potential idea of a decreasing pattern (as observed by La Rocca et al. 2011) throughout a firm's life cycle: a negative relationship between a firm's age and its use of debt.

In this literally context, we argue that historical, economic and institutional context could play a role in explaining financial policies during the life cycle. Yet, from previous studies it emerges a lack of consideration of such an external context in which an empirical investigation has been carried out. This research gap is surprising, as firms adapt their financing policies to the position of the economy, and macroeconomic factors could significantly influence firms' financial policies during their life (Hackbarth et al., 2006). In particular, a firm's financial behaviour is shaped by financial shocks in the institutional context (Holmstrom and Tirole 1997). The GFC crisis is a clear example of a credit shock that increased the risk of business failure (Martinez et al. 2019), as it has amplified asymmetric information problems and exacerbated the financing constraints of firms (Campello et al. 2010; Ivashina et al. 2010; Kahle and Stulz 2013), especially for SMEs (Psillaki and Eleftheriou 2014). As suggested by Deloof and Vanacker (2018) and Zubair et al (2020), during a financial crisis SMEs are expected to rely less on bank loans relative to pre- or post-crisis years. An interesting paper of D'Amato (2020) shed light on the negative impact of SMEs' age on financial debt at the time of the GFC because of high costs of debt and financial constraints. He points out that restrictions are higher for SMEs, more than large firms, during the financial crisis. As a result, credit-constrained SMEs during a recession period could rely more on other types of

external finance to sustain their investments, especially trade credit (Carbó-Valverde et al., 2016) and cash holdings (Zubair et al, 2020).

Although past literature mainly focused on the 2008-2010 GFC, at the time of very striking events and scandals (such as the Lehman Brothers' failure in the United States), several studies also paid attention to another, and immediately subsequent, relevant financial shock, i.e. the crisis of sovereign debt (Ferrando et al., 2017; Lane, 2012; Albertazzi et al. 2014). This crisis followed the GFC and centred on the 2011–2013 period where Euro-area members faced sovereign debt tensions. Albertazzi et al. (2014) found that an increased sovereign risk has relevant consequences on corporate financial policies. Their work evidenced that the increased spread between the yield on the 10-year Italian government bond and the corresponding BTP-Bund spread in Germany in 2011 has increased the cost of credit for firms, reducing the access to external finance. Ferrando et al. (2017) observed that SMEs in countries affected by SDC became more likely to be denied credit.

All these arguments suggest that the two crises substantially hindered the capacity of firms to secure credit, with SMEs experiencing the most profound consequences of credit restrictions (Castaldo et al., 2023). The GFC and the SDC thus generated financial constraints, particularly for SMEs that historically suffer from greater informational asymmetries (Berger and Udell, 1998), resulting in a reduction in the amount of debt used (Cowling et al., 2012). However, not just the amount of debt used changes *tout court* during and after a crisis period. Certainly, it is also important to understand whether, during and after the crises, financial decisions can change depending on the age of the firm. With this regard, we contribute to the extant literature by inquiring how the higher use of debt in the early stage of the life-cycle and the decreasing use in the late phases[1] observed by the all the above-mentioned contributions supporting the certification effect argument could be shaped in the presence of crisis situations. Considering that small businesses had a more difficult access to capital and are the most adversely affected from credit crunch, we suppose that during the GFC and the SDC, the negative age-debt relationship will be less pronounced. Therefore, we expect that the decreasing pattern observed by La Rocca et al. (2011) and also other authors is weaker for small businesses during crisis periods compared to pre-crisis periods.

H.1: The negative effect of age on SMEs debt polices shows a lower shape during crisis periods compared to pre-crisis periods.

Despite young enterprises are the ones that have been most affected by the crisis (Cowling et al. 2018), an interesting body of literature suggests that the obstacles to obtain debt in the crisis period did not discourage firms from seeking loans in a subsequent period (e.g. Mac an Bhaird, 2013). Brown and Lee (2019) studied the capital structure decisions and access to credit after the GFC, observing that SMEs sought external sources of funding. Despite after the crises firms have started to regain confidence in financial markets and have sought to obtain debt, financial downturns are naturally followed by a subsequent period of credit difficulties, because economies have not yet reached pre-crisis levels (Tang and Upper, 2010). These difficulties consistently continue to be

[1] which indicates a decreasing age-debt relationship pattern, as the one observed by La Rocca et al. (2011).

higher for informationally opaque young SMEs, which according to Vermoesen et al. (2013) were "ex ante more likely to be financially constrained". In such a context, financial markets tend to revert the credit conditions that preceded the crisis. This trend of returning to pre-crisis market conditions implies a loosening of financial constraints for firms, for which we expect that the age-debt relationship will show a gradual return to the pre-crisis patterns. However, we suppose that this return may not proceed in a similar vein for business with different levels of asymmetric information problems and, thus, different possibilities of access to financial markets. As evidenced by Mac an Bhaird (2013), the most financially troubled businesses are bearing the worst consequences of the credit crunch. After the GFC firms suffering from greater informational asymmetries experienced problems of financial constraints; in particular, for more informationally opaque firms bank credit restrictions persisted for a longer period (Driver and Muñoz-Bugarin, 2019; Riley and Rosazza-Bondibene, 2014). In support of this, Davis et al. (2013) observed that rejection of demands for loans to smaller firms (which face more informational problems than large ones) were higher from 2008 onwards than they had been since 2001. Considering that SMEs face relevant informational asymmetry issues, we expect that there will be a delay in returning to pre-crisis situations. Also, Fort et al. (2013) suggest that SMEs tend to be more affected by economic shocks compared to their larger counterparts. Therefore, in light of the lasting difficulties in accessing credit after the crises and considering that such difficulties are greater for SMEs, we suppose that the process to revert to pre-crisis patterns will be slow.

H.2: After the crises the age-debt relationship tends to return slowly to the pre-crises pattern.

The noteworthy contribution of Rajan and Zingales (1998) demonstrated that the financial development of a country significantly influences capital structure decisions. Well-developed financial institutions have indeed the potential to mitigate agency problems (Giannetti, 2003), but also other benefits are provided. Facilitating the enhancement of the banking system would lead to smoother business transactions, increased competition among banks, and consequently, a more efficient allocation of finance (Holmstrom and Tirole, 1997; Antzoulatos et al., 2016; Fan et al., 2012; Leary, 2009). Such an influence of financial institutions can be different according to the phases of a firm's life cycle (Hanssens et al. 2016; Deloof and Vanacker, 2018) and to the macroeconomic situation in which a firm operates (La Rocca et al., 2019). Thus, the impact of a crisis on the real economy raise the question if and how this effect is conditioned on the financial development of a country (Fornari et al. 2012). It is of interest to investigate whether and how the degree of development of a country's financial system could impact on the relationships investigated in our first and second hypotheses.

According to the asymmetric information theory, a well-developed financial system reduces the information gap between firms and financial intermediaries, thereby increasing the use of debt (Fasano and Cappa, 2022; Fasano and La Rocca, 2023). During turmoil periods, countries with a better developed financial system have superior capacity to reduce the asymmetric information gap and sustain businesses against negative contingencies (La Rocca et al., 2019). This kind of sustain has also been highlighted by Beck et al. (2008), according to whom firms those in nations with weaker institutions tend to utilize less external funding, particularly from banking sources.

Ge and Qiu (2007) point out that firms operating in countries with poorly developed financial system have difficulties to finance their activities using bank debt as the traditional channel of funding. This could indicate that in high financial developed contexts, young firms during a crisis could face less information opacity and could consequently have a better access to debt compared to their counterparts operating in low financial developed environments. Indeed, Demirgüç-Kunt et al. (2020) observe that in nations with "shallower financial markets and less developed financial infrastructure" the influence of the GFC was more severe.

Thus, the lower shape suggested in our first hypothesis could be milder for younger SMEs in high financially developed countries (or, vice versa, more heightened for younger SMEs in low financial developed countries). Following the same reasoning, after the crises the return to the pre-crises patterns of younger SMEs could be easier in those countries where the financial system is better developed. On the contrary, in low financially developed nations the heightener asymmetric information issues could potentially constraint such a return.

H.3: The effect of crisis on the financial life cycle is moderate by the degree of development in the financial system.

3. Data and methodology

3.1 Sample

We collected accounting data using the Amadeus database of the Bureau van Dijk. We selected only SMEs according to the European Commission's definition in terms of firms not exceeding 43 million euros in total asset and having less than 50 million euros in total annual revenues (Serrasqueiro and Nunes, 2012). The SMEs in our sample come from 28 European countries[2] during the 2004–2016 period. We left out observations whose accounting information were not available and we excluded financial sectors. To reduce the impact of outliers, we winsorized all the accounting variables based on the 1st and 99th percentiles of the distribution. Data on real GDP and countries' financial development are collected from the World Bank. The final sample consists of an unbalanced panel data of 199,854 SMEs for a total of 1,086,867 observations.

3.2 Model and variables

We use the ordinary least squares cluster technique with standard errors clustered at the country and industry level (OLS Cluster)[3] and the following baseline model.

$$\text{Debt} = f\,[\text{Age, Control variables}]$$

This approach further enriches the findings of previous studies because allows for controlling for observations that are correlated under two dimensions and because regressions correct the standard errors for the possible dependence of the residuals within clusters. The dependent variable is *Debt*, which is a proxy of the debt/equity

[2] The list of countries is reported in Table 2.

[3] We classified industries based on the NACE codes and we used the Mitchell Petersen's Stata routine cluster standard errors by two dimensions (available at https://www.kellogg.northwestern.edu/faculty/petersen/htm/papers/se/se_programming.htm).

mix (the so-called capital structure) and is calculated as the ratio of financial (or interest-bearing) long-term and short-term debt (excluding trade debt) scaled by total assets (La Rocca et al. 2011). The variable *Age* is calculated as the natural logarithm of the number of years since the date of firm foundation.

To test the hypotheses 1 and 2 we need to account for three sub-periods: 1) the pre-crisis period 2004–2007, (2) a crisis period that concerns both the GFC (2008–2010) and the SDC (2011–2013), (3) the post-crisis period 2014–2016. Thus, we used the baseline model with interactions of Age with a Dummy Crisis period, that is equal to 1 for observations in the period 2004–2013, and a Dummy Post-Crisis period, that is equal to 1 for observations in the period 2014–2016. This is the model applied.

Debt = f [Age, Dummy Crisis, Dummy Post-crisis, Age×Dummy Crisis, Age×Dummy Post-Crisis, Control variables]

At last, to verify the hypothesis 3, we applied the previous model for two sub-samples of high and low financial development countries according to the median value of domestic credit by bank to GDP. In particular, we used World Bank indicator computed as the ratio of domestic credit provided by banks as percentage of GDP.

In line with several empirical contributions in this field of research (e.g., La Rocca et al. 2011), we control for firm-specific variables that previous studies have demonstrated to be related with corporate debt. *ROA*, the ratio between earnings before interests and taxes (e.g. Yazdanfar and Öhman 2015). *Tangibility*, the ratio of property, plants and equipment to total assets (Saona et al. 2020). *Size*, the natural logarithm of total assets (Fasano and Deloof 2021). *Cash Holdings*, the sum of cash and cash equivalents scaled to total assets (Fasano and Deloof 2021). *Growth opportunities*, sales in a year (t) minus sales in the previous year (t−1) (La Rocca et al. 2011). To consider differences in economic development countries, we include GDP Growth, which is measured as the growth in real GDP at the national level from year (t−1) to year (t). Finally, we add time, industry and country fixed effects.

4. Descriptives and correlations

Table 1 analyses the descriptive statistics of the variables used in our regressions.

*** Table 1 here ***

The average level of debt in European SMEs is 19.1% and is in line with the main extant empirical papers in this field of research. In Table 2, we report the list of countries in our sample, indicating for each nation the mean level of debt.

Table 2 here

The results depict a substantial heterogeneity in the use of debt among countries. We also find a high heterogeneity at the country level in the use of debt before and after the two crisis periods investigated[4]. In Table 3 we scrutinize the use of debt differences at the industry level.

Table 3 here

[4] Tables are available upon request to the authors.

Table 3 shows that the level of debt used by SMEs varies a lot also across industries, as observed by recent contributions (e.g. Fasano et al. 2023). As an additional descriptive statistic, Table 4 reports the mean value of debt for the subsamples based on *Age* using a range of 5 years for each subsample.

Table 4 here

Figure 1 highlights the varying usage of debt between young and old SMEs (according to the 25 and 75 percentiles of the variable *Age*, respectively) during the pre-crisis period. During the crisis, young SMEs reduced their debt stock, whereas old SMEs increased theirs. However, in the post-crisis period, both types of SMEs decreased their debt stock within their capital structures. This suggests that the financial crisis shock had divergent impacts depending on the age of the SMEs, confirming the need of studying this phenomenon.

***Figure 1 here ***

Table 5 is related to hypothesis 3, concerning the moderating role of financial development at the country level.

Table 5 here

Using the median of the World Bank variable named domestic credit by bank to GDP, we considered the year pre-crisis (2007) to sort the samples in two sub-groups, high toward low of level financial development. We used the year pre-crisis to consider how the ex-ante financial development of a country was able to moderate the effect of crisis on our core relationship. This approach is similar to the one used by Deloof and Vanacker (2018 JBFA), who consider the bank dependence before the crisis.

Finally, Table 6 shows the correlation matrix among explanation variables.

Table 6 here

It is possible to notice a negative correlation between the variables *Debt* and *Age*. We further tested possible multicollinearity among our variables by using the variance inflation factors (VIFs). The maximum VIF in our model is 1.16, which is far below the generally accepted cut-off of 10 (Kutner et al. 2004). Therefore, no bias was detected in the significance of our results.

5. Empirical results

Table 7 column 1, 2 and 3 presents the results considering the continuous variable *Age* in relation to *Debt* for the whole period of analysis. Moreover, columns 4, 5 and 6 regard regression results based on the subsamples of pre-, during e post-crisis periods.

***Table 7 here ***

We find that European SMEs' age is negatively related to the use of debt. European SMEs tend to gradually decrease the use of debt throughout their life cycle. These results corroborate those observed by the many contributions that underline the importance of debt for start-ups, supporting the certification effect argument. Still, these results are particularly important, as they confirm that the findings of the work of La Rocca et al. (2011) persist more than ten years later even in a broader and more generalized European setting. To study the relationship between firm *Age* and *Debt* conditioned by two contiguous macro-economic financial shocks, namely the GFC and the SDC (overall period 2008–2013), column 2 show the whole sample regressions including

crisis and post-crisis dummies, while column 3 considers the interaction terms between *Age* with both crisis and post-crisis dummies.

Column 3 reports a negative significant effect for the variable *Age,* for the two dummies related to the crisis and post-crisis period, and for two positive interaction terms. It is noteworthy to observe what happens in the crisis period. The coefficient of the variable Age (-0.03) and of the interaction between Age and Dummy Crisis (0.030) is the same but with opposite sign. It results that the negative relationship between Age and Debt is reduced or better almost nulled during the financial crisis period. This result is confirmed also considering the lack of statistical significance for the coefficient of Age in the sub-sample of the crisis period.

To better understand results from the interaction model it is useful to plot a graph. To that end Figure 4 shows the relationship between *Age* and *Debt* for the three subsample periods.

*** Figure 4 here ***

Figure 4 displays that the pre-crises negative age-debt relationship during the GFC and the SDC (2008–2013 period) is strongly weaker, confirming our first hypothesis. In particular, young firms show greater use of debt in the early years, they do so to a lesser extent during the crises. SMEs during financial crises submit themselves to bank monitoring to obtain the necessary resources to fund their activities during difficult situations. Crisis periods make it difficult to internally generate cash resources, for which SMEs are interested in debt financing. Moreover, during turmoil periods we observe a different pattern compared to pre-crisis periods: the deep negative relationship between Age and Debt became almost flat.

Then, after the crises, despite financial difficulties persist, the pattern tends to be similar to the one pre-crisis. This demonstrates that post-crisis financial market restrictions decrease and favour the return to the pre-crisis age-debt relationship. Figure 4 shows the tendency to move back to the pre-crisis relationship, confirming our second hypothesis. As expected, the post-crisis SMEs financial restrictions make the return to the pre-crisis pattern of younger SMEs more difficult.

Concerning our third hypothesis, we test whether SMEs operating in countries with well-developed financial systems have different age-debt relationship pre-, during and post-crisis periods. Results, which are reported in Table 8 and Figures 5 and 6 confirm the substantial impact of the degree of the financial system as suggested in our third hypothesis.

***Table 8 here ***

*** Figure 5 and 6 here ***

Both in high and low financially developed countries we find the same pre-, during and post crises decreasing trend, but with relevant different patterns. The less sloping pattern observed in low financially developed countries indicate that the national financial context plays a role. In times of crisis young firms in high financially developed settings can opt out of using debt in the early stages more than young firms in low financially developed countries, for which the age-debt relationship is more sloping. This is because they are embedded in a

more evolved financial system that in case of necessity can support them. After the crisis, we observe that in both types of countries, there is a tendency to return to pre-crisis patterns, but to different extents. In fact, in more financially developed nations, it is easier to get closer to pre-crisis debt levels, while in less developed nations, this process finds more difficulties. In this case as well, the theory of informational asymmetries explains the results, as in the most financially developed nations, financial intermediaries have more information about their clients, favouring the return to pre-crisis levels of debt. However, it is noticeable that the overall amount of debt used is lower in more underdeveloped nations. This is because well-developed systems are able to mitigate asymmetric information problems more than the poorly-developed systems.

6. Robustness and further tests

To test the robustness of our findings[5], we provided many tests.

6.1 Robustness tests: different dependent variable

We re-run the main model using a different measure for the variable *Debt*, based on the natural logarithm of the total amount of debt. The outcome confirms our results.

6.2 Robustness tests: year-by-year analysis

Instead of using a regression with interactions in the whole sample, we test the effect of Age each year, from 2005 to 2016, to measure the changes in magnitude. We find a confirmation of our core results.

6.3 Robustness tests: sub-crisis periods

We also run separately the model for the financial crisis period (2008–2010) and for the sovereign crisis period (2011–2013), obtaining very similar results in both sub-crisis periods: It suggests, as a whole, that our findings characterize crisis periods of different natures.

6.4 Robustness tests: is there a changing effect of a non-monotonic relationship between Age and Debt?

To test as robustness if out results are affected by an eventual non-monotonic effect we re-run the regression of Table 7 and Table 8 introducing the squared term of Age (Age^2), as in La Rocca et al. (2011), and the relative interaction terms with the dummies crisis and post-crisis. We do not find any inverted U-shape relationship but just that the straight line becomes smoothly curvilinear. Thus, we find that imposing a non-monotonic model does not change the implications of our main results. The trends observed in our figure 4, 5 and 6 are confirmed, stating the validity of our hypotheses and implications.

6.5 Robustness test: the SDC in Greece, Ireland, Italy, Portugal and Spain

We investigate whether the debt-age relationship during SDC was exacerbated in those five euro area countries from which the crisis started. Indeed, as highlighted by Ferrando et al. (2019), the sovereign creditworthiness of Greece, Ireland, Italy, Portugal and Spain deteriorated significantly more than the other European countries. Thus,

[5] Robustness regression results as well as the following further tests are available in the supplemental materials.

we created a sub-sample of SMEs from these most affected countries and a sub-sample for others. The results in both sub-samples show a similar pattern as for the general model, confirming our results.

6.6 Further test: the role of industry's dependence on external finance

In this section, we test the role of industry specific factors, as firms encounter different debt choices, opportunities and constraints according to the industry setting where they are embedded (Harris and Raviv 1991; Deloof and Vanacker, 2018; Garay et al. 2019). Thus, the financial life cycle and the role of crisis periods can be conditioned by the degree of an industry's dependence on external finance (Cetorelli and Strahan 2006) and on the external financial resources that each single industry requires (Rajan and Zingales 1998). In line with Deloof and Vanacker (2018), we use the bank dependence variable measured as the median ratio of bank debt to total assets in 4-digit industry calculated in non-crisis years. Regression results suggest that the industry's dependence on external finance does not change the financial life patterns of SMEs and the effect of macroeconomic shocks on the financial life cycle.

7. Conclusions and discussion

Many single country studies suggest that a firm's life cycle is an important factor influencing SMEs' financing decisions. The present work investigates the debt policies of SMEs throughout their life cycle using for the first time a cross-country large dataset of 28 European countries.

In line with previous empirical contributions (e.g. Deloof and Vanacker 2018; Hanssens et al. 2016; Robb and Robinson 2014; La Rocca et al. 2011), we observe that young SMEs strongly rely on external debt, despite the cost of financing typically being high for such firms. However, the importance of debt for SMEs decreases as they age. It seems that young SMEs seek to obtain certification of their quality and acquire credibility in the product market by submitting themselves to monitoring by banks. Moreover, these firms rebalance their capital structure during the middle and old phases of their life. As the SME matures, internal self-generated financial resources substitute debt and the fraction of borrowing declines. This is due to a reduction in information opacity, monitoring becomes secondary as the track record signals both quality and reliability.

In addition, the paper investigates the impact of the 2008–2010 GFC and the 2011–2013 SDC on the financial policies of SMEs during their life stages. Specifically, we tested SMEs' financial behaviour pre-, during and post-crisis periods. The results highlight that at the time of the GFC (2008–2010) and the SDC (2011–2013), the debt-age relationship is less pronounced compared to the pre-crises pattern. After the crises, the age-debt relationship tends to return to pre-crises patterns, but with a lower extend for SMEs operating in high in comparison to low financially developed countries. Thus, the financial life cycle is shaped by the economic contingencies and SMEs are strongly influenced by the macroeconomic situation.

Our study also provides several suggestions for political guidelines. Although there are inevitably credit difficulties during crisis periods (Campello et al. 2010; Kahle and Stulz 2013), firms during downturn, such as the recent coronavirus emergency, should obtain financial resources through bank lending to ensure their upturn[6].

Governments and financial institutions are constantly seeking to develop concrete solutions for the financial constraint problems of small businesses, especially during crisis situations when financial decisions are crucial (Tavares et al. 2023). In doing so, they should carefully target their policies according to the stages of a SME life cycle, as the financial needs of a firm changes over time. In this context, this paper studied the financial behaviour of firms during crisis periods, hoping to provide insight to support firms achieving a rapid economic recovery. According to our findings, young European SMEs, which are those firms more subject to information opacity, debt got a higher relevance during two past financial crises. Thus, the past practice suggests that a value-enhancing use of debt could be an excellent route out of the crisis. With this purpose, governments and financial institutions should find the best form of credit to allow subsidized loans paying attention to the changing financial needs of SMEs during their life cycles. It is thus important to develop specific credit instruments for each phase of a business. From one side, bank support allows caught growth opportunity or to breath in period of negative contingencies. However, the interest to pay back to bank in a scheduled program can undermine any possibilities to enjoy long-run benefits of debt. The cost of capital for a young firm seeking credibility in the financial market is likely to be very high. For this reason, it is essential to obtain favourable financing conditions. Thus, governments and financial institutions should increase the availability of debt financing, especially for young and early-stage firms during crisis periods and support a campaign to raise awareness of the benefits related to the use of debt. From a firm-level point of view, managers of young SMEs in search of a confirmation of their quality should try to reduce the informational gap between their firm and financers. In line with the work of Cumming et al. (2019), our paper suggests the need for future research to investigate the issues associated with information asymmetries between entrepreneurs and financial stakeholders that vary over the life cycle of a firm. Future research that focuses on the relationship between debt and age should consider macroeconomic (institutional) conditions in which a firm is embedded, as well as qualitative and quantitative information concerning the supply of finance, the quality of legal institutions and enforcement, the legal origin and culture. The paper also provides direction for future studies that could investigate whether our findings based on the global financial and sovereign debt crises could apply to non-financial macro-economic crisis such as the recent Covid-19 pandemic situation.

[6] Foroni et al. (2020) and Fasano and Deloof (2021) suggest that the investigation of the GFC could be informative for the recent Covid-19 crisis, considering that there could be similarities between the two crises.

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Table 1 – Descriptives

	Mean	Median	SD	Min	25 perc	75 perc	Max
Debt	0.191	0.114	0.217	0.000	0.000	0.319	0.959
Age	2.384	2.303	0.903	0.693	1.792	2.890	5.100
ROA	0.061	0.046	0.143	-0.643	0.012	0.106	1.177
Size	7.607	7.732	1.432	0.888	6.670	8.574	11.228
Tangibility	0.264	0.185	0.250	0.000	0.054	0.419	0.941
Cash Holdings	0.110	0.048	0.148	0.000	0.010	0.150	0.812
Growth Opportunity	2.864	0.076	7.866	-0.953	-0.097	0.430	26.847
GDP Growth	1.132	1.293	2.683	-14.839	-0.005	2.507	25.163

n. observation: 1090254

Table 2 – Mean value of Debt for each country in the sample

n.	Country	mean	n.	Country	mean	n.	Country	mean
1	Austria	0.168	11	Hungary	0.189	21	Portugal	0.288
2	Belgium	0.175	12	Iceland	0.320	22	Republic of Moldova	0.161
3	Bosnia and Herzegovina	0.186	13	Ireland	0.323	23	Serbia	0.205
4	Croatia	0.218	14	Italy	0.184	24	Slovakia	0.110
5	Czech Republic	0.119	15	Latvia	0.238	25	Slovenia	0.282
6	Estonia	0.249	16	Lithuania	0.252	26	Spain	0.233
7	Finland	0.230	17	Luxembourg	0.088	27	Ukraine	0.066
8	France	0.115	18	Montenegro	0.187	28	UK	0.284
9	Germany	0.245	19	Netherlands	0.238			
10	Greece	0.231	20	Norway	0.214			

Table 3 – Mean value of *Debt* across industries.

Industry	Debt
Agriculture Forestryand Fishing	0.254
Mining and Quarrying	0.220
Food Drink and Tobacco Industry	0.258
Textile and Clothing B,Industry	0.184
Paper and Allied Products	0.235
Printing, and Publishing	0.230
Manufacture Refined Petroleum	0.237
Chemical and Pharmaceutical	0.229
Manufacture of Metal Products	0.203
ManufactureNon Metallic Products	0.221
Mechanical Electrics Electronics	0.182
Other Manufacturing	0.166
Water Sewerage Waste Management	0.265
Construction	0.203
ICT	0.139
Transportation and Storage	0.187

Table 4 – Mean value of Debt for age's group, in a range of 5 years.

	Age groups (range of years)										
	<5	5-10	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	+50
Debt	0.162	0.183	0.182	0.182	0.171	0.173	0.174	0.172	0.171	0.171	0.123

Figure 1 – Whole sample: Use of Debt for young and old SMEs pre-, during and post-crises.

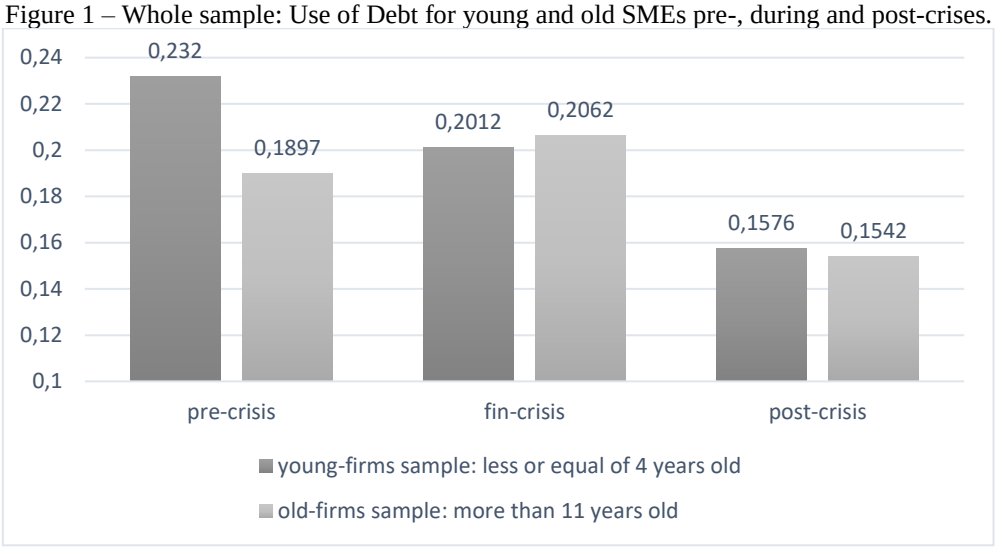

Figure 2 – *High* Finanial Development sub-sample: Use of Debt for young and old SMEs pre-, during and post-crises.

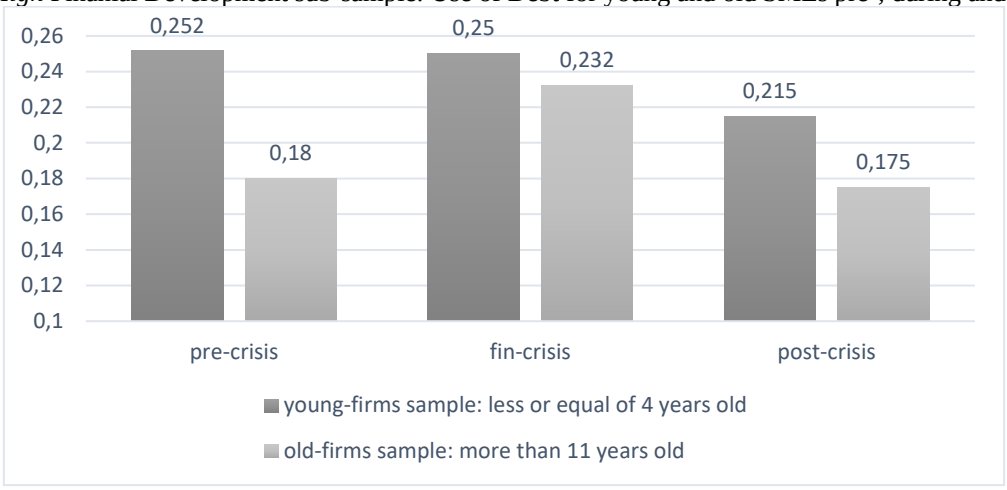

Figure 3 – *Low* Finanial Development sub-sample: Use of Debt for young and old SMEs pre-, during and post-crises.

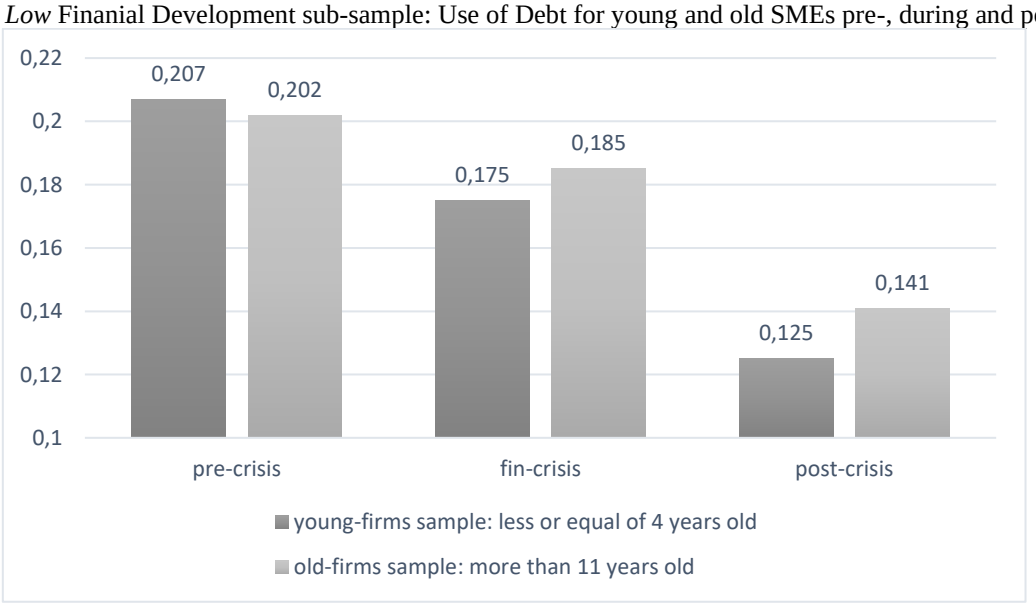

Table 5 – Countries sorted in two sub-sample of high and low financial development, according to median value in the pre-crisis year.

	High Financial Developed Countries		Low Financial Developed Countries
1	Austria	1	Belgium
2	Estonia	2	Bosnia and Herzegovina
3	France	3	Croatia
4	Germany	4	Czech Republic
5	Greece	5	Finland
6	Iceland	6	Hungary
7	Ireland	7	Italy
8	Luxembourg	8	Latvia
9	Netherlands	9	Lithuania
10	Norway	10	Montenegro
11	Portugal	11	Republic of Moldova
12	Spain	12	Serbia
13	United Kingdom	13	Slovakia
		14	Slovenia
		15	Ukraine

Table 6 – Correlation matrix

	1	2	3	4	5	6	7	8	VIF
Debt	1.00								
Age	-0.08	1.00							1.11
ROA	-0.15	0.04	1.00						1.07
Size	0.18	0.12	-0.06	1.00					1.06
Tangibility	0.27	0.05	-0.08	0.07	1.00				1.07
Cash Holdings	-0.27	0.05	0.24	-0.19	-0.23	1.00			1.16
Growth Opportunity	-0.02	0.15	0.02	-0.05	-0.01	0.02	1.00		1.03
GDP Growth	-0.04	0.25	0.08	0.01	0.07	0.08	0.08	1.00	1.08

Notes: Correlations greater than 0.03 or lower than -0.03 are statistically significant at the 0.05 level or lower.

Table 7: Financial life cycle, capital structure and crisis: main regression results.

	(1) Whole sample	(2) Whole sample	(3) Whole sample	(4) Pre-crisis period	(5) Crisis period	(6) Post-crisis period
Age	-0.019***	-0.015***	-0.030***	-0.034***	-0.001	-0.012***
	(0.003)	(0.002)	(0.005)	(0.005)	(0.003)	(0.002)
Dummy Crisis period		0.002	-0.065***			
		(0.002)	(0.012)			
Dummy Post-Crisis period		-0.022***	-0.067***			
		(0.003)	(0.012)			
Age × Dummy Crisis			0.030***			
			(0.006)			
Age × Dummy Post-Crisis			0.018***			
			(0.004)			
ROA	-0.110***	-0.111***	-0.112***	-0.209***	-0.096***	-0.088***
	(0.007)	(0.007)	(0.007)	(0.010)	(0.006)	(0.006)
Size	0.020***	0.020***	0.020***	0.023***	0.021***	0.015***
	(0.005)	(0.005)	(0.005)	(0.009)	(0.006)	(0.002)
Tangibility	0.177***	0.176***	0.176***	0.139***	0.193***	0.172***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.030)	(0.018)
Cash Holdings	-0.255***	-0.252***	-0.251***	-0.260***	-0.278***	-0.220***
	(0.017)	(0.017)	(0.017)	(0.012)	(0.023)	(0.014)
Growth_opp	0.000**	0.000***	0.000***	0.001***	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth	-0.001***	-0.001***	-0.001***	0.002	0.000***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
R^2	0.199	0.200	0.202	0.197	0.203	0.203
Observations	1086867	1086867	1086867	254400	437489	394978

Notes: For the descriptive statistics of the variables, see Table 1. Year, country, industry fixed effects and period dummies are included in the model. Robust standard errors clustered by countries and industry are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Figure 4 – Effect of age on debt pre-, during and post-crises

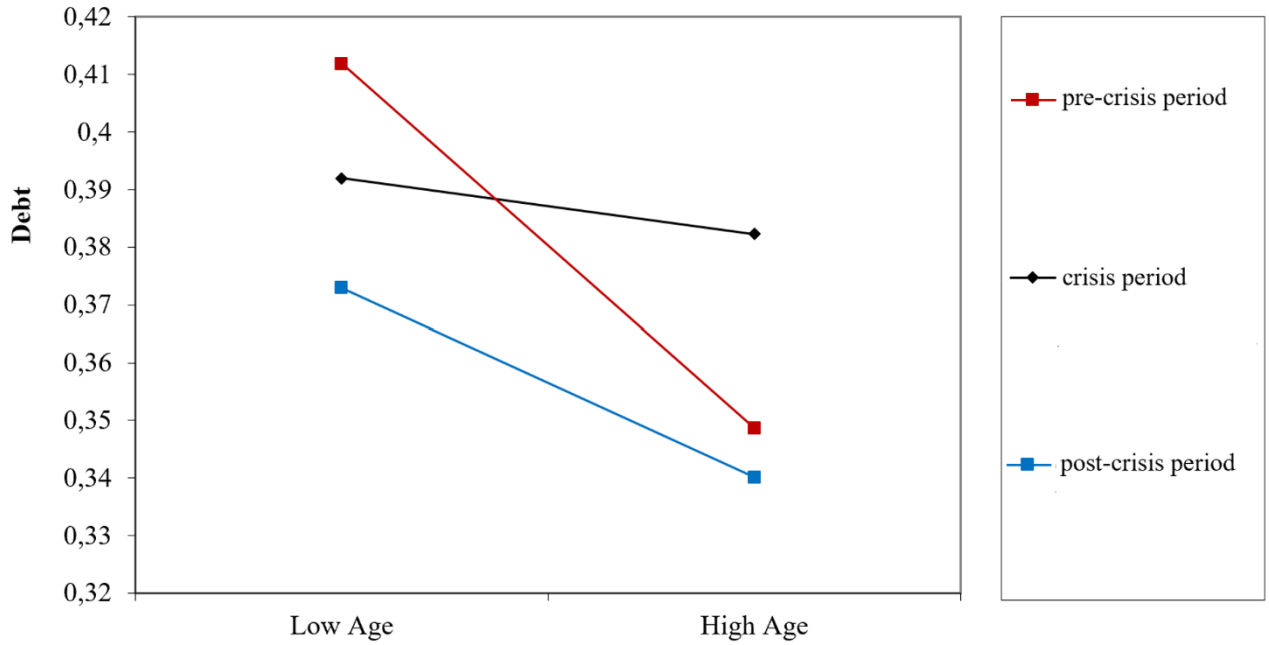

Table 8 – The role of countries' financial development (**Hypothesis 3**)

	(1) Whole sample High Financial Development	(2) Whole sample High Financial Development	(3) Pre-crisis sample High Financial Development	(4) Pre-crisis sample High Financial Development	(5) Crisis sample High Financial Development	(6) Crisis sample High Financial Development	(7) Post-crisis sample High Financial Development	(8) Post-crisis sample High Financial Development
Age	-0.043***	-0.011**	-0.047***	-0.013***	-0.014***	0.008***	-0.023***	-0.001
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
Dummy Crisis period	-0.046***	-0.057***						
	(0.014)	(0.015)						
Dummy Post-crisis period	-0.040***	-0.064***						
	(0.012)	(0.014)						
Age × Dummy Crisis	0.028***	0.020***						
	(0.006)	(0.007)						
Age × Dummy Post-Crisis	0.014***	0.009						
	(0.003)	(0.005)						
ROA	-0.154***	-0.087***	-0.231***	-0.187***	-0.119***	-0.084***	-0.134***	-0.067***
	(0.010)	(0.006)	(0.012)	(0.013)	(0.010)	(0.007)	(0.012)	(0.005)
Size	0.023***	0.017***	0.031***	0.009***	0.021***	0.020***	0.013***	0.017***
	(0.009)	(0.003)	(0.011)	(0.002)	(0.008)	(0.005)	(0.005)	(0.002)
Tangibility	0.226***	0.132***	0.162***	0.104***	0.251***	0.146***	0.249***	0.123***
	(0.036)	(0.018)	(0.036)	(0.011)	(0.043)	(0.026)	(0.027)	(0.015)
Cash Holdings	-0.252***	-0.243***	-0.227***	-0.329***	-0.276***	-0.271***	-0.247***	-0.203***
	(0.023)	(0.014)	(0.016)	(0.013)	(0.035)	(0.016)	(0.022)	(0.013)
Growth_opp	0.001***	0.000	0.002***	0.000	0.002***	0.000	0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth	-0.000	-0.001***	0.003	0.004**	0.001***	0.000	0.001	-0.005***
	(0.000)	(0.000)	(0.003)	(0.002)	(0.000)	(0.000)	(0.002)	(0.001)
R^2	0.237	0.165	0.225	0.173	0.235	0.161	0.256	0.161
Observations	471918	614949	146363	108037	175679	261810	149876	245102

Notes: For the description of the variables, see Table 1. Year, country, industry fixed effects and period dummies are included in the model. Robust standard errors clustered by countries are reported in brackets. ***: denotes significance at the 1% level; **: denotes significance at the 5% level; *: denotes significance at the 10% level.

Figure 5 – Crisis and financial life cycle in ***high*** **financially** developed countries.

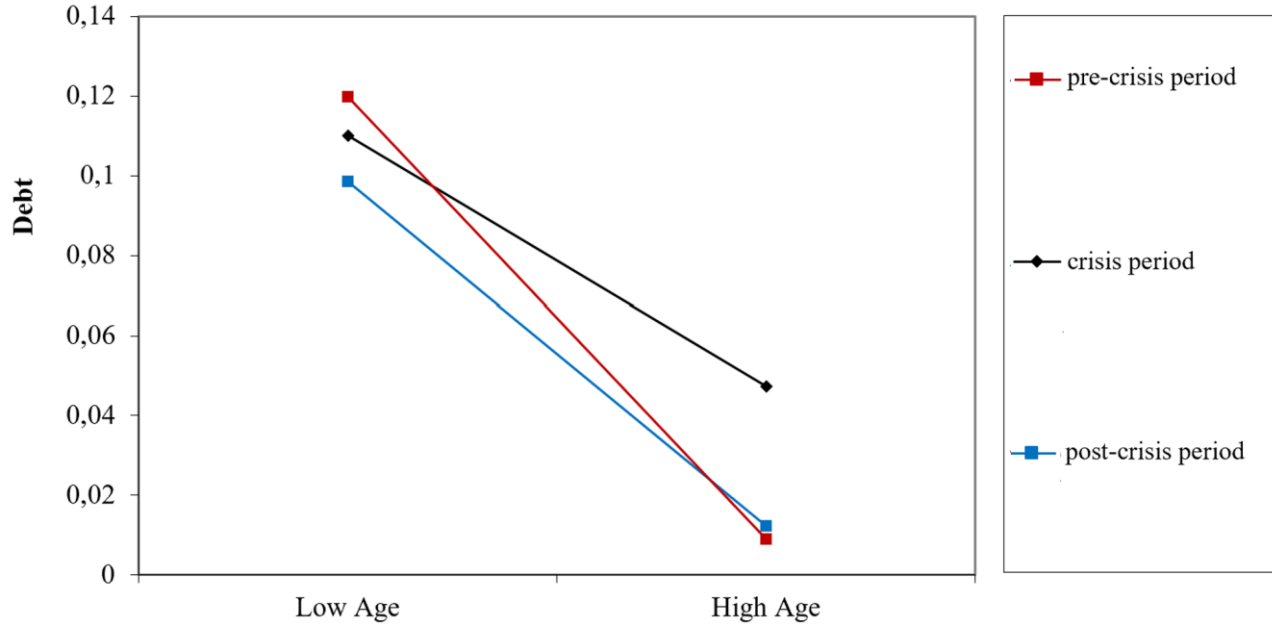

Figure 6 – Crisis and financial life cycle in ***low*** **financially** developed countries.