

# Financial situation indicators of Portuguese firms: Do size, age and sector matter?

**Fábio Albuquerque**  
Banco de Portugal

**Paulo Soares Esteves**  
Banco de Portugal

**Cloé Magalhães**  
Banco de Portugal

July 2018)

## Abstract

The Great Recession raised a more uncertain, complex and dynamic environment explaining why firms are increasing attention to their financial situation. However, the evaluation of this situation is complex, and a large number of indicators can be found in the literature. This paper considers three indicators to assess the Portuguese firms' financial situation: the capital ratio; the bank loans to liabilities ratio, and the commercial gap ratio. The objective is to understand how these indicators are related to firms' age, size and economic activity sector. This may help to understand the firm financial situation and also to identify some structural effects underlying the overall aggregates evolution. (JEL: D22, G30, G33)

---

## Introduction

The assessment of firms' financial situation is crucial both at an individual and at a macroeconomic level. The analysis at the firm level allows us to understand the heterogeneity underlying their operating, financing and liquidity position. At a macroeconomic level, this assessment may help policy makers to conduct and implement suitable policies in order to strengthen the economy against adverse shocks. This issue became even more relevant during the recent years. From the Great Recession emerged an environment more uncertain, complex and dynamic, explaining the increasing attention to firms' vulnerability to future macroeconomic shocks, as well as to changes in firms' decisions concerning savings and dividends policy in order

---

Acknowledgements: The authors would like to thank the Central Balance Sheet Division of the Banco de Portugal for their strong collaboration concerning the use and interpretation of the database. In particular, a special thanks to Paula Casimiro, Carla Ferreira and Mário Lourenço for their insights during the preparation of the paper. Finally, we would like to thank to Sónia Félix for very useful comments and suggestions. The opinions expressed in the article are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

E-mail: fhalbuquerque@bportugal.pt; pmesteves@bportugal.pt; clmagalhaes@bportugal.pt

to improve their financial stance [on this issue see Banco de Portugal (2017a) and Chen et al. (2017)].

The analysis of firms' financial situation is complex, and a large number of indicators can be found in the literature in order to assess it. In this paper, we consider three indicators to assess the Portuguese firms' financial situation: the capital ratio; the bank loans to liabilities ratio, and the commercial gap ratio.

The analysis performed in this paper relates these indicators to the firms' age, size, and economic activity sector, in order to understand the structural characteristics that should be taken into consideration when analyzing the firms' financial situation indicators. Portuguese firms are substantially heterogeneous in what concerns size and age. These two variables are frequently used as a proxy to measure asymmetric and opaque information and, therefore, are key determinants of the corporate funding structure. New firms are usually smaller, but are an important driver of innovation<sup>1</sup>, income, and job creation. However, they fail at a significant rate, even though larger new firms have higher survival probabilities.<sup>2</sup> Also, the funding structure depends on the sector of economic activity in which the firm is operating in, reflecting differences on the investment horizon, the degree of economies of scale, or the required amount of sunk costs. Therefore, knowing the effects of the composition of Portuguese firms concerning age, size and economic activity sector is important not only to understand the macroeconomic indicators concerning firms' situation, but also their evolution.

The paper is organised as follows. In the next section we present the motivation underlying the choice of these financial indicators. Section 3 evaluates how these indicators are related to the firms' age, size and economic activity sector.<sup>3</sup> This analysis is performed in two steps. In section 3.1, we use the Central Balance Sheet Database of Banco de Portugal to describe the evolution of these indicators for the Portuguese economy. Additionally, we use aggregate data from the Bank for the Accounts of Companies Harmonized (BACH) database<sup>4</sup>, to provide a comparison with other European countries. Finally, using more detailed information for the last available year of the Central Balance Sheet Database, we analyze the heterogeneity underlying these indicators at the size, age and economic activity sector level. Section

---

1. See Acemoglu et al. (2013).

2. See Félix (2017) for a recent analysis of firm creation and survival in Portugal.

3. Banco de Portugal (2017b) presents very detailed information concerning the structure of Portuguese non-financial corporations (NFC).

4. BACH is a database of aggregated and harmonized accounting data of non-financial incorporated enterprises of 10 European countries (plus three in a near future), based on national accounting standards (individual annual accounts). Information on the methodology and the coverage of national samples may be obtained on the BACH website (<https://www.bach.banque-france.fr/?lang=en>).

3.2 presents an econometric framework to estimate the effect of age, size and economic activity sector on the financial indicators. Section 4 summarizes the main conclusions.

### **Assessing firms' financial situation**

How to assess the financial situation of firms is not straightforward. The financial indicators are frequently chosen from the perspective of assessing the robustness of firms to future shocks. Since Altman's (1968) seminal contribution, the concept of financial vulnerability is linked to the research on models predicting firms' bankruptcy. However, the choice of indicators is subjective in these rating evaluation models, and both iterative algorithms [e.g. Imbens and Rubin (2015)] and expert analysis are frequently used to find the set of indicators that best predict the firms' default [Antunes et al (2016)]<sup>5</sup>. The three financial indicators considered in this paper are some of those often used in these models, allowing a perspective on the firms' use of own funds, the firms' recurrence to banks for external funding and the liquidity needs that arise from the firms' operational activity. We do not claim that these indicators are more suitable than others to assess the financial situation of Portuguese firms. Moreover, the objective is not to explain the evolution of these indicators or to address any special theory concerning the reasons why these indicators are frequently used. Even though these three indicators may provide an incomplete picture of the firms' financial situation, they comprise the financing through equity, bank loans and trade credits, which are the issues that analysts frequently focus on when evaluating the firms' situation.

The capital ratio indicates the percentage of total assets that is financed by equity. This is a common indicator to assess the firms' leverage and dependency on external funding. It is widely accepted that higher levels of indebtedness increase the firms' vulnerability, particularly for less profitable companies. The capital ratio may be also understood as a proxy for the firms' savings and dividends policy. Altman (1968) identified the ratio between retained earnings and total assets as a relevant factor to predict firms' bankruptcy. Additionally, according to the pecking order theory (Myers, 1984), firms prefer to resort to their own funds rather than to other sources of funding. Based on this, it is expected that firms retain profits throughout their lifecycle, in order to accumulate equity and be less dependent on external funds. This process also allows firms to reduce costs and maintain the control of the firm by the current shareholders.

The bank loans to liabilities ratio measures the firms' recourse to banks for external funding. Even though 45% of Portuguese firms do not resort

---

5. The authors present a review of the recent academic literature on this topic as well as applications for other countries.

to financial debt, banks are the most relevant creditors for firms that use financial debt. This is particularly relevant for micro, small and medium-sized enterprises (SMEs) that, in general, have no access to the financial markets [Banco de Portugal (2017b and 2018)]. Low levels of the bank loans to liabilities ratio can be understood as evidence of restrictions in the access to bank credit, limiting the capacity of firms to invest and grow. However, it can also signal the firms' preference for other sources of funding, such as equity or debt securities. This means that the interpretation of this indicator is not straightforward and its analysis should be complemented with information on other funding sources. Instead, high levels of this ratio imply that companies rely heavily on the banking system as source of external funding, which may increase their vulnerability in a context of credit constraints or increasing interest rates. In Portugal, the financial crisis affected the access of younger and smaller firms to bank loans significantly more [Antunes and Martinho (2012) and Farinha and Félix (2015)].

The commercial gap ratio is the ratio between trade credits and trade debts. It is an important indicator of the firms' financial situation as trade credits are a source of funding that is in general used by all firms, in contrast to bank loans. When credit from suppliers is insufficient to cover the credit granted to customers, leading to a commercial gap ratio under 100%, firms must resort to other funding sources to finance their operational activity. The commercial gap ratio may pressure short-term liquidity requirements and the dependence of firms on other sources of funding. This effect is expected to be stronger for smaller firms, which are expected to have lower market power, and to be dependent on the sector of economic activity [Ng et al. (1999)].

Several authors have analyzed the substitution effect between trade credit and bank credit, especially during a crisis period. In fact, Nielsen (2002) and Petersen and Rajan (1997) find evidence that firms resort more to trade credit when bank loans are not accessible, which is more likely to occur in the case of smaller firms [Bias and Gollier (1997)]. Love et al. (2007) argue that the financial vulnerability of firms may affect the trade credit granted to their customers, in particular during crisis periods, and McGuinness and Hogan (2016) point out that the financially vulnerable Irish SMEs increased trade credits from suppliers and reduced trade credit to customers during the recent crisis. Additionally, there is evidence that larger and financially robust firms, and firms with higher levels of liquidity are able to redistribute credit to financially constrained SMEs. Petersen and Rajan (1997) and Rodríguez-Rodríguez (2008) show that firms with access to bank loans grant more trade credits than others, acting as an intermediate between banks and firms with limited access to bank loans.

## Data and descriptive analysis

The Central Balance Sheet Database (CBSD) of Banco de Portugal collects accounting data on enterprises. We consider the information underlying the Sector Tables, which is available since 2010<sup>6</sup>. This information is comprised of a comprehensive set of economic and financial indicators by sector of economic activity and size class, including also an international comparison based on the BACH database.

### *Descriptive analysis*

This subsection presents a descriptive analysis of the evolution of the financial ratios under analysis over the period between 2010 and 2016 using information from the CBSD of Banco de Portugal. Additionally, it is presented an international comparison based on the BACH database for 2015.

*Evolution over the recent years.* Figure 1 presents the evolution from 2010 to 2016 for the capital ratio, the bank loans to liabilities ratio and the commercial gap ratio based on weighted means.

Since 2014 the percentage of assets that is financed by equity increased, reflecting an effective growth of equity during this period. This is in line with the increasing savings by non-financial corporations documented in Banco de Portugal (2017a)<sup>7</sup>. In what concerns the bank loans to liabilities ratio, it decreased over the sampling period, reflecting an effective reduction of loans granted to firms as a result of the strong banking deleveraging. Nevertheless, the reduction of loans granted to companies reflects the contribution of the intensive margin, since the extensive margin - i.e. firms starting to borrow from the banking sector - provided a positive contribute in the most recent period [(Banco de Portugal (2017c)]. Finally, the commercial gap ratio remained stable during this period. It is important to highlight that this indicator is always below 100%, meaning that trade credits give a negative contribution to the firm's short-term funding.

---

6. The Sector Tables are targeted at the general public and available in BPStat | Statistics online [see Banco de Portugal (2014)]. In 2010, the accounting standards were changed, as the Official Chart of Accounts (Plano Oficial de Contabilidade, in Portuguese) was replaced by the Accounting Standards System (Sistema de Normalização Contabilística, in Portuguese). This change had an impact on the basic information of the Central Balance Sheet Database, as underlying accounting concepts were redesigned.

7. More details on equity developments, namely at the sectoral level, is available in Banco de Portugal (2017b) and in the Sector Tables.

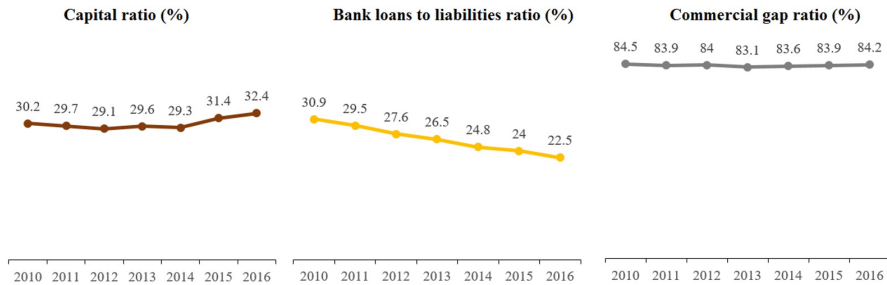


FIGURE 1: Financial situation indicators of Portuguese NFC

Source: Banco de Portugal.

*International comparison.* Figure 2 presents an international comparison for these three indicators using the weighted means from BACH data for 2015<sup>8</sup>. In what concerns the capital ratio, Portugal has the lowest figure, despite the recovery registered in the most recent years. Banco de Portugal (2017d) emphasizes that this difference does not arise from differences in the cross-country samples of firms.

On the other hand, despite the decrease observed since 2010, Portuguese firms still show some dependence on banks as source of external funding - bank loans account for 24% of the firms' liabilities. The bank loans to liabilities ratio for Germany and France is slightly above 16%.

In what concerns the commercial gap ratio, in most countries of the sample, including Spain, Portugal and Italy, the commercial credit contributes more significantly to a negative net short-term funding. Portugal shows a relative worse position when compared to other countries, namely Poland, Czech Republic and Slovakia.

*Information disaggregated by firms' age, size, and sector of economic activity.* Using micro data from the CBSD of Banco de Portugal it is possible to compute a large set of financial indicators for non-financial corporations and analyze the underlying heterogeneity according to the firm's age, size and economic activity sector. This allows us to shed light on the observable differences in the financial structure of firms according to these dimensions<sup>9</sup>. In this analysis, we

8. Final data for 2016 are not available to all countries under assessment yet. In this case, 2015 was used instead (2014 for CZ; 2013 for SK). Further, using the average values for the period from 2010 to 2015 leads to the same main conclusions. Because countries have different levels of coverage, some composition effects might be verified, in particular in what concerns the smaller firms. However, the results are robust to the exclusion of the smaller firms.

9. An analysis exploring the influence of age and size characteristics on funding structure is presented in Antão e Bonfim (2008) for the period from 1990 to 2017 and in Barbosa e de Pinho (2016) covering the period from 2006 to 2012.

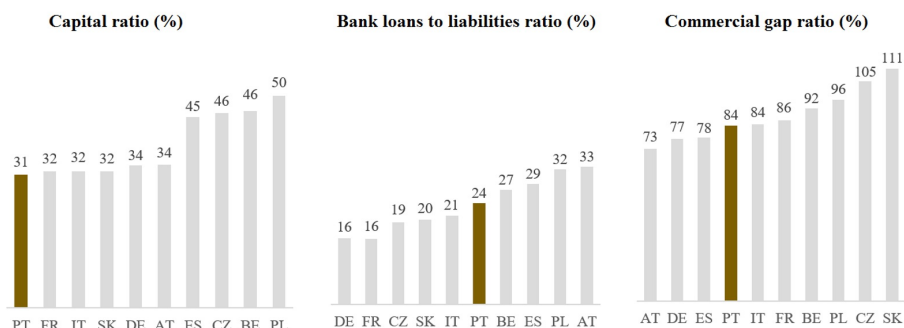


FIGURE 2: Financial situation indicators: International comparison - 2015

Source: BACH database.

define firm's age as the difference between the current year and the founding year and classify it into four categories: up to 5 years old; from 6 to 10 years old; from 11 to 25 years old; over 25 years old. The classification of firms into size categories follows the EC Recommendation of 6 May 2003<sup>10</sup>. Companies were classified into four groups: micro-companies; small companies; medium-sized companies; large companies. The classification is based on the number of employees, turnover and total assets of each enterprise. In this paper, the sector of economic activity classification follows the Portuguese classification of economic activities (CAE-Rev.3), which corresponds to the Eurostat classification (NACE Rev2).

The distribution of the financial ratios under analysis by quartiles is provided in Figures 3, 4, and 6, as these measures are more robust to the presence of outliers in comparison with the average values. Figure 3 presents the quartile distribution of the capital ratio. The first result to highlight is the number of firms with negative equity (28%). This situation is concentrated in younger and, especially, in micro firms. Moreover, the universe of micro firms encompasses two different patterns: more than 30% of firms have negative equity, while 25% of firms have a capital ratio above 67%. This strong heterogeneity should be taken into consideration when estimating the determinants of the capital ratio.

10. According to this Recommendation, microenterprises are defined as enterprises that employ fewer than ten employees and has annual turnover and/or balance sheet total does not exceed €2 million. A small enterprise is defined as an enterprise which employs fewer than 50 employees and has annual turnover and/or annual balance sheet total does not exceed €10 million. A medium-sized enterprise have less than 250 employees and has an annual turnover below €50 million or an annual balance sheet total below €43 million. A large enterprise are the remaining ones.

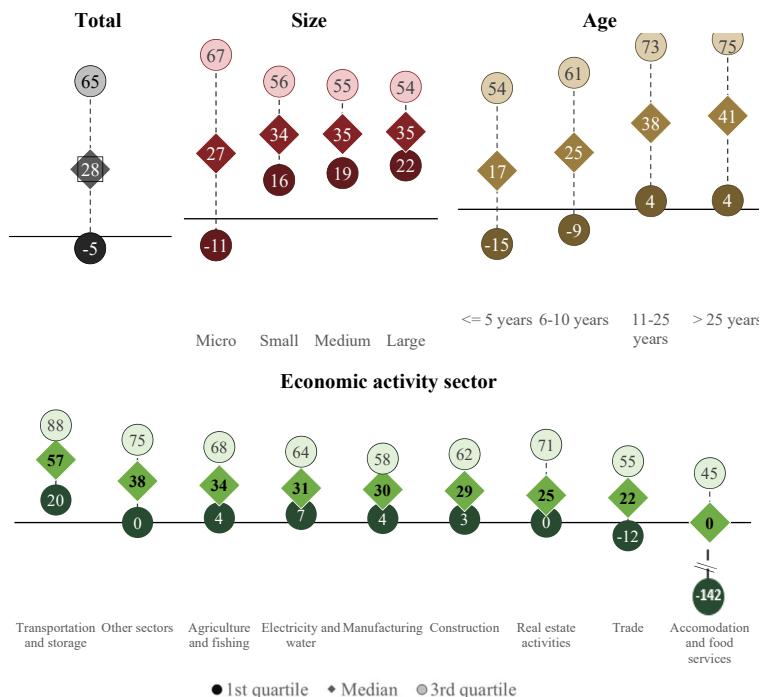


FIGURE 3: Capital ratio: quartile analysis - 2016

Source: Banco de Portugal.

Note: Capital ratio = equity / total assets.

The capital ratio exhibits a positive correlation with firm's age, while the relation with firm's size is not obvious, in particular when the micro firms are excluded from the analysis. These results are in line with the ones presented in Barbosa and de Pinho (2016). The analysis by sector of activity shows considerable heterogeneity. On one hand, transportation and storage is the sector where assets are more funded by equity, as the ratio is comparatively higher in all quartiles. On the other hand, half of the firms (based on the median) have negative equity in the accommodation and food service activities.

Figure 4 reproduces this analysis for the bank loans to liabilities ratio. The first message to retain is that more than half of the Portuguese non-financial firms do not resort to bank loans, as the median is zero for this ratio. This is transversal to the micro and the large firms. In what concerns age, Figure 4 suggests a non-linear relation at the third quartile. Considering the startups (less than 5 years old), bank loans represent less than 7% of the firms' liabilities for 75% of these firms.



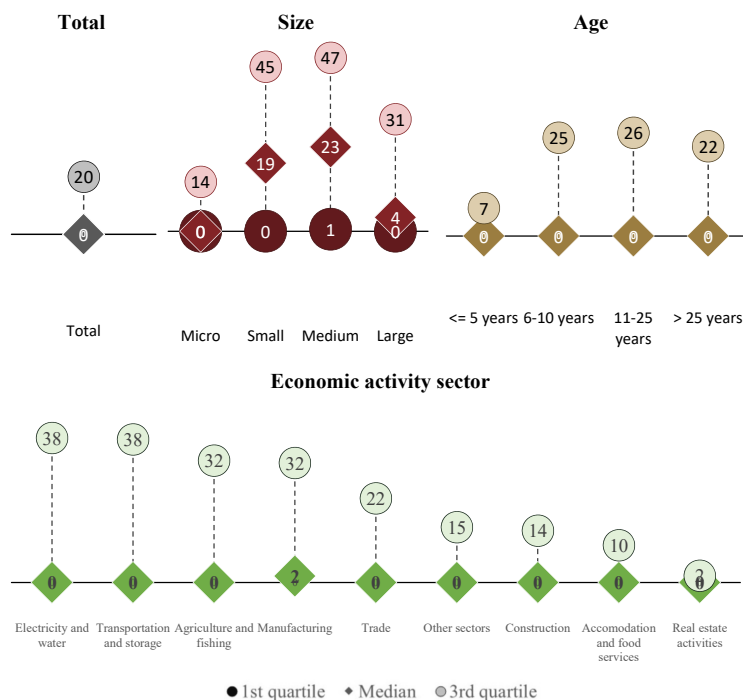


FIGURE 4: Bank loans to liabilities ratio: quartile analysis - 2016

Source: Banco de Portugal.

Note: Bank loans to liabilities ratio = bank loans / liabilities. The liabilities include all funding sources except equity.

Regarding the economic activity sector, the first highlight is that more than half of the firms do not borrow from banks, with the exception of the manufacturing sector. Nevertheless, despite this common characteristic, some important differences emerge at the third quartile. For instance, in the electricity and water and in the transportation and storage sectors, bank loans represent more than 38% of total liabilities for 2% of the firms. In contrast, bank financing is less important in real estate activities, in which bank loans represent less than 2% of firms' liabilities for 75% of the firms.

As previously mentioned, the interpretation of the bank loans to liabilities ratio is not straightforward and therefore should be complemented with information on other funding sources. Figure 5 provides a more in-depth analysis of the firm's funding sources (in percentage of the total liabilities). In comparison with small and medium firms, micro firms rely more on

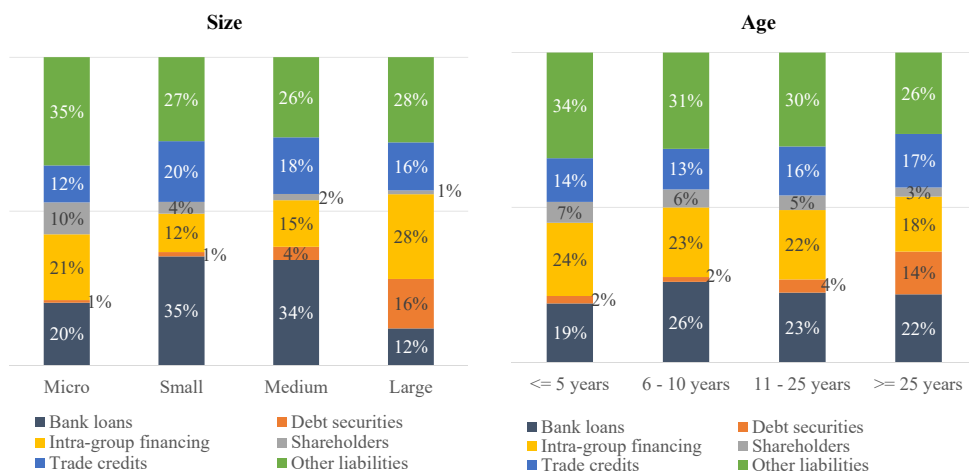


FIGURE 5: Funding sources - 2016 (% of liabilities)

Source: Banco de Portugal.

shareholders and intra-group financing<sup>11</sup>, while large enterprises resort more to debt securities and intra-group financing. Therefore, the lower weight of bank loans in micro and large firms embodies a difference between the importance of shareholders funding for microenterprises and the relevance of debt securities for large companies. Additionally, micro firms resort less to trade credits in comparison with the remaining size classes.

The analysis of the funding structure according to the firms' age classes suggests that bank loans are less important to young firms (less than 5 years old). Furthermore, shareholders and intragroup financing tend to decrease for older firms.

It is worthwhile to stress the relevance of the financial markets as a source of funding for the largest and oldest enterprises – representing 16% and 14% of the liabilities, respectively - while debt securities show a residual weight in the remaining size and age classes.

Figure 6 presents the quartile distribution of the commercial gap ratio. Although credits granted by suppliers represent an important share of the firms' liabilities, the commercial gap ratio is not, in general, a source of net short-run funding. The median value of this ratio is around 45%, which is substantially below the aggregate value (84%). This difference can be explained by the fact that larger firms tend to have higher values of this ratio. In what concerns the quartile distribution of the commercial gap ratio

11. Intra-group financing is part of the firm's financial debt and therefore it is a liability with associated costs, in contrast to shareholders' debt.

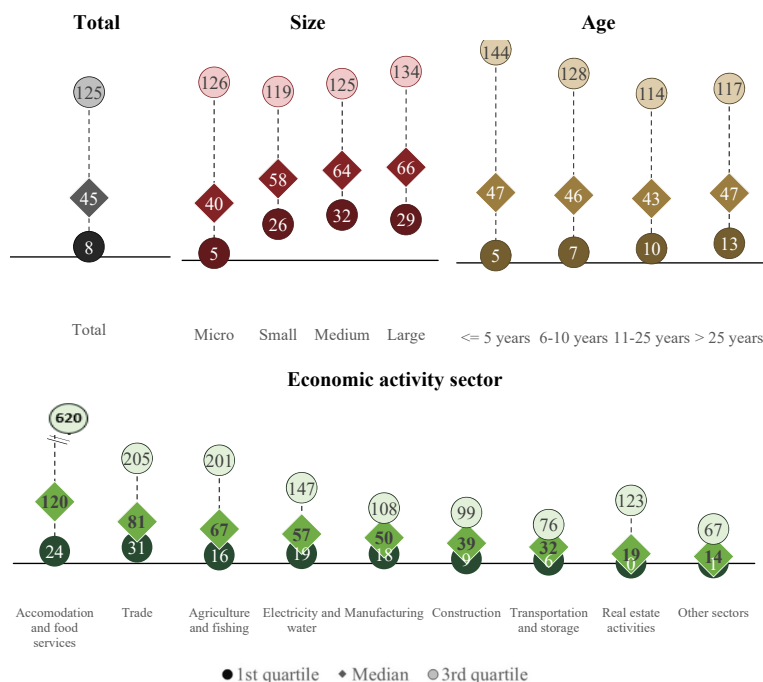


FIGURE 6: Commercial gap ratio: quartile analysis - 2016

Source: Banco de Portugal.

Note: BCommercial gap ratio = trade credits / trade debts.

according to the firms' age, the median value is similar across the different age classes, although there is a clear reduction of the interquartile range as firms get older.

The analysis of the sectorial differences raise some remarkable findings. Only in the accommodation and food services trade credits represent a net source of funding for most of the firms, and this might be related to the particular characteristics of this economic activity sector, suggesting that for a relevant set of firms a part of the turnover is received mostly instantly: for the median firm, trade credits are 20% higher than trade debts. The trade sector has the second highest figures for the median firm, which indicates that some firms within this sector also present a similar pattern. This may be related to the fact that those firms sell more directly to final consumers, while firms more in early stages of the value chain benefits less from trade credit. In contrast, in the real estate activities sector, 25% of firms do not have credit granted by suppliers, while for the median firm it corresponds only to 19% of the credit granted to customers.

## *Econometric analysis*

*Econometric framework.* The previous section pointed out that the distribution of firms' capital ratio, bank loans to liabilities ratio and the commercial gap ratio differs across size and age classes, as well as across economic activity sectors. However, these firms' characteristics may be correlated. In this section, the effect of the firms' size, age and economic activity sector on the financial ratios under analysis is estimated simultaneously, allowing to control for the correlation between these effects.

The data underlying this analysis corresponds to the annual Central Balance Sheet Database for the 2010-16 period. The analysis excludes the extreme 1 per cent observations (in both sides of the distribution) to limit the impact of outliers in the results. Firms with negative equity were also excluded, as the factors underlying this situation are outside the scope of this analysis. The sample corresponds to an unbalanced panel comprised of 938,513 observations and 208,370 firms. The model for the bank loans to liabilities ratio also excludes firms with no bank loans, resulting in an unbalanced panel with 866,344 observations and 192,372 firms.

The purpose of this formulation is to capture the correlation between the three ratios under analysis and firms' age, size and economic activity sector; we do not intend to infer causal relations from the present analysis. As the firms' age, size, and economic activity sector are rarely changing variables<sup>12</sup>, in the sense that their variance is mostly between firms, rather than changes in the same firm across time, a two-step approach was used to estimate the effect of those characteristics on the firms' structural level of the financial ratios under analysis.

In the first step, we obtain the firm fixed effects  $\theta_i$  which capture the heterogeneity of the ratios under analysis arising from the firms' permanent characteristics, using a fixed effects model, as presented in equation (1):

$$y_{it} = \alpha + \sum_{m=1}^M \beta_m x_{m,it} + \theta_i + \delta_t + u_{it} \quad (1)$$

The dependent variable  $y_{it}$  assumes three different outcomes: the capital ratio, the bank loans to liabilities ratio, and the commercial gap ratio of firm  $i$  in year  $t$ . We include a set of regressors  $X$  to control for the firms' financial situation, accounting for the firms' economic activity, profitability, liquidity, operating cycle, cost of debt, and financial pressure. In equation (1),  $x_{m,it}$  is the regressor  $m$  for firm  $i$  in year  $t$ , and  $\beta_m$  is the corresponding coefficient. As

---

12. A variable is rarely changing if the within variance is very low, compared to the between and overall variance. Table 1, presented in the Appendix, provides the between, within, and overall standard deviations for all the variables considered in the analysis.

the component  $\sum_{m=1}^M \beta_m x_{m,it}$  is included for control purposes only, we will not analyze the estimates of these coefficients<sup>13</sup>. We also include time fixed effects  $\delta_t$  to capture the effect of the macroeconomic environment on these ratios.

In the second step, an OLS estimator is used to decompose  $\delta_i$  into the part explained by age, size and economic activity sector, and the unobserved component. As these variables are not strictly time-invariant, this estimation was performed using a representative value for each firm. Therefore,  $S_{ki}$  is the mode of the sector dummy for firm  $i$ ,  $age_i$  and  $size_i$  are, respectively, the average values for age and total assets for firm  $i$  over the sampling period.

In this step, two alternative formulations were considered: the linear-log model presented in equation (2) and the quadratic model presented in equation (3)<sup>14</sup>:

$$\hat{\theta}_i = \gamma_0 + \sum_{k=1}^9 \gamma_{ki} S_{ki} + \gamma_{10} \ln(age_i) + \gamma_{11} \ln(size_i) + \varepsilon_i \quad (2)$$

$$\hat{\theta}_i = \gamma_0 + \sum_{k=1}^9 \gamma_{ki} S_{ki} + \gamma_{10} age_i + \gamma_{11} age_i^2 + \gamma_{12} size_i + \gamma_{13} size_i^2 + \varepsilon_i \quad (3)$$

The purpose of these alternatives is to test the monotonicity of the effect of size and age on the firm fixed effects. The first specification includes the logarithms of age and total assets, assuming that the effect of these variables is always positive or negative, even though marginally decreasing when age or size increases. The second specification considers a quadratic relationship between age or total assets and the ratios under analysis; this corresponds to the hypothesis that as age or size increases, the relation between these variables and the dependent variable reverts at some point. The AIC was used to choose one of the formulations.

*Empirical results and discussion.* The detailed estimation outputs are presented in Tables 2, 3 and 4 in the Appendix. In each one of those tables, column (1) provides the results for equation (1), column (2) provides the results for the second step presented in equations (2) or (3), and column (3) presents the results of the pooled OLS estimator.

The estimates are overall statistically significant at 1% significance level. The results point to a linear-log relation in the case of the capital ratio and

13. All of the models were also estimated excluding these additional regressors. The results are virtually the same.

14. As the objective is to have a continuous relationship with age and size, the previous classes were replaced by continuous variables.

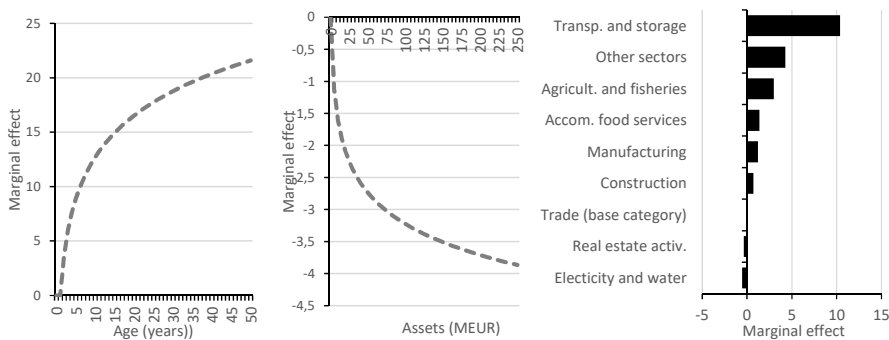


FIGURE 7: Capital ratio: marginal effect of age, size and sector of economic activity on the firm fixed effects

Note: Results from column (2) of Table 2 in Appendix.

the commercial gap ratio models (as described in equation (2)). In the bank loans to liabilities ratio model we find a quadratic relation (as described in equation (3)). Figures 7, 8, and 9 synthesize the main results for the coefficients presented in column (2) of Tables 2, 3 and 4.

In what concerns the capital ratio, presented in Figure 7, we find a positive relation between the firms' fixed effect and age, which is stronger for younger firms; the marginal effect decreases for older firms. This effect is, on average, 13 pp higher in a firm that has been active for 10 years than in a startup, but the expected difference between a firm active for 20 years and a firm active for 10 years is only 4 pp. This positive relation between age and the firm fixed effects for the capital ratio is consistent with the hypothesis that firms prefer equity to external funding and retain earnings throughout their lifecycle to accumulate own funds. Additionally, this results suggest that firms with a higher capital ratio have higher survival rates.

The relation between the firm fixed effect and size is estimated to be negative. The results suggest that a firm with the same age, the same financial situation, and operating in the same economic activity sector, is expected to have less equity as size increases. The marginal effect is more pronounced for smaller than for larger firms.

The estimated coefficients on sectorial differences point out a higher proportion of equity in the funding structure of transportation and storage firms, when compared to firms in the remaining economic activity sectors. In contrast, firms operating in the real estate activities and electricity and water resort more to external debt for funding, on average. In the accommodation and food services activities, the average capital ratio stands in a middle position when compared with other activities; this may be related to the

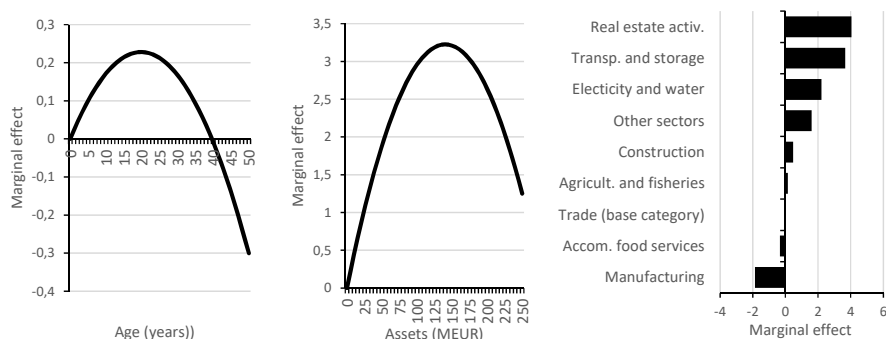


FIGURE 8: Bank loans to liabilities ratio: marginal effect of age, size and sector of economic activity on the firm fixed effects

Note: Results from column (2) of Table 3 in Appendix.

exclusion of firms with negative equity when estimating the model, affecting more than half of firms of this sector.

The results for the bank loans to liabilities ratio presented in Figure 8 suggest that the firm fixed effects for this ratio are estimated to be higher to older and bigger firms but decrease from some intermediate value onwards, suggesting higher values for the bank loans to liabilities ratio in the intermediate classes of size and age. Moreover, the firm fixed effects are expected to be higher for firms active for around 20 years. Very mature firms (active for more than 40 years) are estimated to have a smaller fixed effect than startups with similar characteristics.

The firm fixed effects for the bank loans to liabilities ratio increases with firms' size. For the largest firms, this relation becomes negative. This is consistent with the fact that bank loans weight less on the funding structure of both smaller and larger firms, as presented in Figure 5.

The estimated differences in the firm fixed effects for the bank loans to liabilities ratio arising from the sector of economic activity may reach 6 pp. In the manufacturing sector, the firm fixed effect is lower than in the remaining activities, on average, while in real estate activities and in transportation and storage sectors the firm fixed effects are expected to be higher.

The estimation results regarding the commercial gap ratio are presented in Figure 9. The firm fixed effects for the commercial gap ratio in the accommodation and food services sector are higher on average than in the remaining activities. In contrast, transportation and storage, electricity and water and manufacturing are the economic activities that present the lowest firm fixed effects. The firm fixed effects for this ratio increase with firms' size, suggesting a higher market power of larger firms when dealing with suppliers

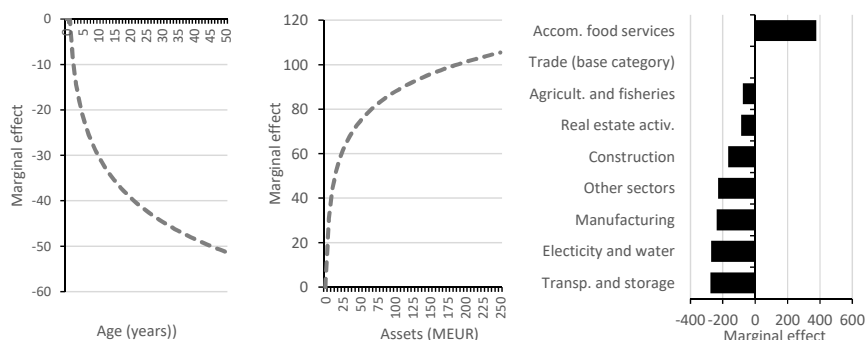


FIGURE 9: Commercial gap ratio: marginal effect of age, size and sector of economic activity on the firm fixed effect

Note: Results from column (2) of Table 4 in Appendix.

and customers. The importance of the commercial gap ratio also appears to be higher for younger firms. This can be related to the fact that startups may resort more to trade credits to increase their funding.

## Conclusions

From the Great Recession emerged an environment more uncertain, complex and dynamic, explaining the increasing attention to the study of the firms' vulnerability to future macroeconomic shocks. During the most recent period, the Portuguese firms' financial position has been improving. Nevertheless, Portuguese firms still present lower levels of equity, higher shares of bank loans and some short-time liquidity constraints, as trade credits obtained from their suppliers are, in general, insufficient to cover the credits granted to costumers.

In this paper, we argue that the financial indicators that are commonly used to characterize the firms' financial situation depend on firms' structural characteristics. Resorting to three financial ratios, covering the use of own funds, bank loans, and trade credits and debts, we find significant differences according to the firms' size, age and sector.

The results point out that younger firms tend to have lower levels of both capital ratio and bank loans to liabilities ratio. The proportion of intra-group financing and shareholders in the firms' total liabilities is higher for younger firms. These firms also have a higher commercial gap ratio. The results suggest that as firms age, equity increases (mainly due to retained earnings), as well as the use of financial debt. In the intermediate age classes, firms rely more substantially on bank loans for external funding, while more mature firms



have other alternatives of funding, such as debt securities. The estimates for the firm fixed effects of the bank loans over liabilities ratio is consistent with this result.

In what concerns the firm's size, the capital ratio is higher for smaller firms. The results also suggest that small firms rely less on banks for external funding, and have a smaller commercial gap ratio. As firms' size increase, firms resort more to external debt. While small and medium-sized firms have a higher proportion of bank loans in their liabilities' structure, large firms obtain a relevant proportion of debt from alternative sources such as debt securities and intra-group financing. The commercial gap ratio is also higher for larger firms on average, as they have more negotiating power vis-à-vis customers and suppliers.

The economic activity sector also plays an important role when analyzing these financial indicators. It is crucial to consider the heterogeneity underlying the sectors of economic activity to understand these indicators. Firms in the transportation and storage activities resort more to equity, and firms in the accommodation and food services activities are able to obtain funding through trade creditors, while in the remaining activities net trade credits give a negative contribute to short-term funding. The bank loans to liabilities ratio is also considerably heterogeneous across sectors of economic activity. Firms in the transportation and storage and in the real estate activities show a higher ratio than firms in the remaining activities.

## References

- Acemoglu, D., U. Akcigit, H. Alp, N., Bloom and W. R. Kerr (2013), "Innovation, reallocation and growth" (No. w18993). National Bureau of Economic Research.
- Altman, E. (1968) Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance*, 23, 589-609.
- Antão, P. and D. Bonfim (2008), "Capital structure in the Portuguese corporate sector", Banco de Portugal Financial Stability Report, 187-206.
- Antunes, A. and R. Martinho (2012), "Access to credit by non-financial firms", Banco de Portugal Financial Stability Report, May 2012, 159-176.
- Antunes, A., H. Gonçalves and P. Prego (2016), "Firm default probabilities revisited", Banco de Portugal Economic Studies, 2 (2), April 2016, 21-45.
- Banco de Portugal (2014), "Sector tables and enterprise and sector tables – Methodological notes", Banco de Portugal Central Balance Sheet Studies, 19, November 2014.
- Banco de Portugal (2017a), "Saving and investment dynamics of Portuguese firms", Banco de Portugal Economic Bulletin, Special Issue, June 2017, 45-63.
- Banco de Portugal (2017b), "Sectoral analysis of non-financial corporations in Portugal 2011-2016", Banco de Portugal Central Balance Sheet Studies, 30, December 2017.
- Banco de Portugal (2017c), "Developments in loans granted to non-financial corporations by resident credit institutions: extensive margin vs. intensive margin", Banco de Portugal Economic Bulletin, Box 4, October 2017, 35-38.
- Banco de Portugal (2017d), "Profitability of Portuguese and European enterprises 2006-2015", Banco de Portugal Central Balance Sheet Studies, 29, September 2017.
- Banco de Portugal (2018), "Financing decisions of Portuguese companies: stylized facts and recent developments", Banco de Portugal Economic Bulletin, Special Issue, May 2018, 111-129.
- Barbosa, L. and P. S. de Pinho (2016), "Structure of corporate funding", Banco de Portugal Economic Studies, 2 (1), January 2016, 1-30.
- Biais, B. and C. Gollier (1997). "Trade Credit and Credit Rationing", *The Review of Financial Studies*, 10(4), 903-937.
- Chen, P., L. Karabarbounis and B. Neiman (2017), "The global rise of corporate saving", *Journal of Monetary Economics*, 89, forthcoming.
- Farinha, L. and S. Félix (2015), "Credit rationing for Portuguese SMEs", *Finance Research Letters*, 14, 167-177.
- Félix, S. (2017), "Firm creation and survival in Portugal", Banco de Portugal Economic Studies, 3 (1), January 2017, 31-42.
- Imbens, G. W. W. and D. B. Rubin (2015). "Causal inference in statistics, social and biomedical sciences", Cambridge University Press.

- Love, I., L. A. Preve and V. Sarria-Allende (2007). "Trade credit and bank credit: Evidence from recent financial crises". *Journal of Financial Economics*, 83(2), 453-469.
- McGuinness, G., and T. Hogan. (2016), "Bank credit and trade credit: Evidence from SMEs over the financial crisis", *International Small Business Journal*, 34(4), 412-445.
- Myers, S. C. (1984), "The capital structure puzzle", *Journal of Finance*, 39 (3), 575-92.
- Ng, C., J. Smith, J. and R. Smith (1999), "Evidence on the Determinants of Credit Terms Used in Interfirm Trade", *The Journal of Finance*, 54(3), 1109-1129.
- Nielsen, J. H. (2002), "Trade Credit and the Bank Lending Channel", *Journal of Money, Credit and Banking*, 34 (1) 226-253.
- Petersen, M. A. and R. G. Rajan (1997), "Trade credit: Theories and evidence", *Review of Financial Studies*, 10, 661-691.
- Rodríguez-Rodríguez, O. M. (2008), "Firms as credit suppliers: an empirical study of Spanish firms", *International Journal of Managerial Finance*, 4 (2), 152-173.

## Appendix

Variable	Description	Mean		Std. Dev	Std. Dev / Overall Std. Dev (%)
Variables included in the set of regressors X					
Capital ratio	Equity / total assets	33.6	overall	22.0	100%
			between	21.6	98%
			within	9.8	45%
Commercial gap ratio	Trade creditors / trade debtors	209.8	overall	752.8	100%
			between	820.3	109%
			within	457.2	61%
Bank loans over liabilities	Bank loans / liabilities	30.8	overall	24.3	100%
			between	22.2	91%
			within	13.6	56%
Bank loans over liabilities (only positive values)	Bank loans / liabilities (if bank loans > 0)	33.3	overall	23.6	100%
			between	21.4	91%
			within	13.3	56%
EBITDA over financial debt	EBITDA / financial debt	135.9	overall	469.5	100%
			between	466.8	99%
			within	339.9	72%
Financial pressure	EBITDA / interest paid	21435.1	overall	198779.0	100%
			between	235057.2	118%
			within	141060.5	71%
Cost of debt	Interest paid / financial debt	8.1	overall	13.3	100%
			between	11.9	90%
			within	10.0	75%
Gross margin	EBITDA / income	9.8	overall	24.6	100%
			between	26.2	106%
			within	16.3	66%
Assets turnover	Total assets / turnover	194.7	overall	439.5	100%
			between	514.1	117%
			within	226.6	52%
Current liabilities over assets	Current liabilities / total assets	47.7	overall	25.1	100%
			between	24.1	96%
			within	14.3	57%
Cash and deposits over assets	Cash and deposits / total assets	11.8	overall	15.5	100%
			between	15.6	100%
			within	8.1	52%
Days accounts payables	Trade creditors * 365 / (Purchases and services and external supplies)	133.2	overall	356.9	100%
			between	370.9	104%
			within	235.8	66%
Days accounts payables	Trade creditors * 365 / (Purchases and services and external supplies)	133.4	overall	166.3	100%
			between	156.5	94%
			within	97.4	59%
Inventory turnover	Inventories / (Purchases and services and external supplies)	258.7	overall	1775.0	100%
			between	2154.1	121%
			within	970.0	55%
Fiscal benefits of debt	Amortizations and depreciations / EBITDA	35.1	overall	66.9	100%
			between	51.9	78%
			within	54.5	81%
Collateral	Tangible fixed assets / total assets	25.6	overall	23.6	100%
			between	23.1	98%
			within	8.6	37%
Continuous variables included in the set of regressors Z					
Age	Number of years of activity	14.6	overall	12.2	100%
			between	11.5	94%
			within	2.4	20%
Total assets	Total assets in million euros	3.3	overall	90.2	100%
			between	60.5	67%
			within	19.9	22%
				N° observations	938,513
				N° of units	208,370
				Average n° of years per unit	4.50

FIGURE A.1: Characterization of the dependent and independent variables

VARIABLES	Step 1 - Fixed effects estimator (1)	Step 2 – OLS on fixed effects (2)	Pooled OLS (3)
EBITDA over financial debt	0.00292*** (0.00005)		0.00637*** (0.00006)
Financial pressure	1.00e-06*** (4.31e-08)		1.05e-06*** (1.07e-07)
Cost of debt	0.0587*** (0.00143)		0.0845*** (0.00167)
Gross margin	0.0490*** (0.00116)		0.0348*** (0.00129)
Assets turnover	0.000423*** (0.00009)		-0.000147 (0.0001)
Current liabilities over assets	-0.317*** (0.00144)		-0.526*** (0.00144)
Cash and deposits over assets	0.0684*** (0.0019)		0.168*** (0.00191)
Days accounts payables	-0.00135*** (0.00008)		-0.00198*** (0.0001)
Days accounts receivables	-0.00414*** (0.00018)		0.000872*** (0.00021)
Inventory turnover	-0.00000323 (0.00002)		-0.000338*** (0.00002)
Fiscal benefits of debt	0.00164*** (0.00021)		-0.00208*** (0.00031)
Collateral	-0.110*** (0.0022)		-0.122*** (0.00171)
2007	0.643*** (0.0365)		0.434*** (0.0483)
2008	1.187*** (0.0449)		0.478*** (0.0551)
2009	1.974*** (0.0508)		0.727*** (0.0594)
2010	1.335*** (0.058)		-0.851*** (0.0643)
2011	2.472*** (0.0621)		-0.169** (0.0678)
2012	3.528*** (0.0664)		0.492*** (0.071)
2013	4.035*** (0.0699)		0.107 (0.0728)
2014	4.361*** (0.074)		-0.903*** (0.0757)
2015	5.420*** (0.0772)		-0.868*** (0.0767)
2016	6.427*** (0.0803)		-0.665*** (0.0774)
Agricult. and fisheries		3.005*** (0.221)	1.686*** (0.217)
Accom. food services		1.390*** (0.252)	-0.0194 (0.269)
Construction		0.710*** (0.106)	-0.461*** (0.0986)
Electricity and water		-0.537 (0.497)	-3.806*** (0.537)
Real estate activ.		-0.368 (0.237)	-2.226*** (0.253)
Manufacturing		1.230*** (0.0986)	0.470*** (0.0925)
Other sectors		4.295*** (0.1)	1.244*** (0.095)
Transp. and storage		10.39*** (0.174)	5.525*** (0.152)
ln(age)		5.519*** (0.0393)	4.049*** (0.0356)
ln(total assets)		-0.701*** (0.0265)	-0.105*** (0.0258)
Constant	47.09*** (0.124)	-16.81*** (0.117)	48.24*** (0.179)
Observations	938,513	207,651	938,420
R-squared	0.322	0.114	0.498

Standard errors clustered by firm in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

FIGURE A.2: Estimation outputs for the capital ratio model

VARIABLES	Step 1 - Fixed effects estimator (1)	Step 2 - OLS on fixed effects (2)	Pooled OLS (3)
EBITDA over financial debt	-0.00640*** (0.00008)		-0.0116*** (0.00008)
Financial pressure	-3.33e-06*** (3.38e-06)		-7.00e-06*** (1.90e-07)
Cost of debt	-0.265*** (0.00245)		-0.213*** (0.00194)
Gross margin	0.0101*** (0.00137)		0.0604*** (0.00181)
Assets turnover	0.000361*** (0.00012)		0.000411*** (0.00013)
Current liabilities over assets	-0.204*** (0.00181)		-0.249*** (0.00176)
Cash and deposits over assets	-0.00879*** (0.00272)		-0.0409*** (0.00263)
Days accounts payables	-0.00311*** (0.00014)		-0.00385*** (0.00015)
Days accounts receivables	-0.00330*** (0.00026)		-0.00572*** (0.00028)
Inventory turnover	6.44e-05** (0.00003)		0.000352*** (0.00003)
Fiscal benefits of debt	-0.000969*** (0.0003)		-0.00850*** (0.00042)
Colateral	0.190*** (0.00319)		0.143*** (0.0022)
2007	1.020*** (0.0599)		1.039*** (0.0692)
2008	1.477*** (0.0729)		1.464*** (0.0805)
2009	2.399*** (0.0813)		2.239*** (0.0864)
2010	4.542*** (0.0895)		2.779*** (0.0904)
2011	2.299*** (0.095)		0.494*** (0.0952)
2012	1.608*** (0.1)		-0.00833 (0.0999)
2013	1.451*** (0.104)		-0.00515 (0.102)
2014	1.656*** (0.108)		0.375*** (0.104)
2015	2.264*** (0.112)		0.866*** (0.106)
2016	1.823*** (0.115)		0.434*** (0.106)
Agricult. and fisheries		0.157 (0.293)	0.334 (0.304)
Accom. food services		-0.332 (0.326)	0.646* (0.35)
Construction		0.479*** (0.14)	-0.832*** (0.138)
Electricity and water		2.214*** (0.643)	2.358*** (0.614)
Real estate activ.		4.056*** (0.316)	1.733*** (0.328)
Manufacturing		-1.860*** (0.124)	-1.116*** (0.129)
Other sectors		1.611*** (0.122)	2.018*** (0.129)
Transp. and storage		3.677*** (0.199)	3.302*** (0.193)
Age		0.0234*** (0.00783)	-0.00588 (0.00797)
Age^2		-0.000580*** (0.00013)	-0.000203 (0.00014)
Total assets		0.0468*** (0.00948)	0.0273*** (0.00921)
Total assets^2		-0.000164*** (0.00002)	-0.000148*** (0.00002)
Constant	40.19*** (0.171)	-0.878*** (0.11)	45.09*** (0.195)
Observations	866,344	180,110	866,265
R-squared	0.176	0.007	0.224

Standard errors clustered by firm in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

FIGURE A.3: Estimation outputs for the bank loans to liabilities ratio model

VARIABLES	Step 1 - Fixed effects estimator (1)	Step 2 – OLS on fixed effects (2)	Pooled OLS (3)
EBITDA over financial debt	-0.00531*** (0.00175)		-0.0121*** (0.00189)
Financial pressure	1.07e-05** (0.00001)		1.21e-05** (0)
Cost of debt	0.111* (0.0591)		-0.292*** (0.0653)
Gross margin	-0.558*** (0.0545)		-0.908*** (0.0529)
Assets turnover	0.0728*** (0.00601)		0.115*** (0.00423)
Current liabilities over assets	1.331*** (0.0525)		1.633*** (0.0496)
Cash and deposits over assets	1.509*** (0.092)		0.822*** (0.0879)
Days accounts payables	0.139*** (0.00663)		0.256*** (0.00836)
Days accounts receivables	-0.464*** (0.00872)		-0.885*** (0.0101)
Inventory turnover	-0.0128*** (0.00119)		0.00243*** (0.00094)
Fiscal benefits of debt	-0.0357*** (0.011)		-0.109*** (0.0141)
Colateral	0.801*** (0.0928)		0.793*** (0.0706)
2007	3.135 (2.646)		-0.251 (3.152)
2008	-3.218 (2.779)		-5.109 (3.264)
2009	-9.800*** (2.857)		-8.670*** (3.316)
2010	-1.584 (2.944)		-2.691 (3.356)
2011	4.421 (3.079)		3.136 (3.459)
2012	3.222 (3.194)		-2.317 (3.51)
2013	4.558 (3.307)		-1.375 (3.601)
2014	0.356 (3.373)		-7.062** (3.588)
2015	-0.273 (3.49)		-4.662 (3.635)
2016	-7.702** (3.531)		-5.288 (3.611)
Agricult. and fisheries		-76.49*** (10.75)	-18.98** (7.504)
Accom. food services		377.7*** (21.89)	275.7*** (17.25)
Construction		-167.8*** (5.684)	-111.2*** (3.605)
Electricity and water		-271.0*** (13.79)	-163.5*** (10.31)
Real estate activ.		-86.05*** (11.41)	-93.99*** (9.094)
Manufacturing		-238.6*** (4.838)	-159.7*** (3.329)
Other sectors		-229.2*** (4.96)	-146.3*** (3.508)
Transp. and storage		-276.8*** (5.389)	-174.5*** (3.656)
ln(age)		-13.18*** (2.149)	-4.095*** (1.471)
ln(total assets)		19.10*** (1.338)	3.573*** (0.959)
Constant	147.4*** (5.136)	234.5*** (7.332)	279.4*** (6.567)
Observations	938,513	207,651	938,420
R-squared	0.015	0.029	0.067

Standard errors clustered by firm in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

FIGURE A.4: Estimation outputs for the commercial gap ratio model