UNIVERSIDADE CATÓLICA PORTUGUESA

Capital Structure of Portuguese firms

Debt and workforce evolution in Covid-19

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Católica Porto Business School

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by

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Abstract

This thesis analyses the impact that the Covid-19 pandemic had on debt and workforce and the differences of this impact over the different firm sizes and also on industry and region.

The dataset includes 223 098 companies over the period from 2019 to 2023. Empirical findings indicate that while the overall increase in the debt ratio during the pandemic is not significant across the entire sample, micro firms experienced a significant rise in their debt. This result suggests that smaller firms, with reduced internal funds and liquidity levels, were more vulnerable to external shocks and thus more likely to increase debt under financial distress. In contrast, larger firms demonstrated greater resilience, reflecting their diversified funding sources and robust financial strategies. The analysis of workforce data reveals a notable decline in employment levels during the pandemic, particularly among SMEs (Small and medium enterprises). The results consistently show a negative association between increased debt levels and workforce size, supporting the notion that firms may reduce labor costs as a strategy to manage increased financial commitments during crisis periods.

Sectors such as healthcare mitigated the negative impacts of the pandemic and even recorded improvements in both capital structure and employment, while industries such as construction and accommodation suffered more pronounced adverse effects. Urban centers like Lisbon and Porto, with a higher concentration of large firms, exhibited distinctive trends.

Keywords: Capital Structure, Covid-19, Debt Ratio, Workforce, Portuguese Firms, Financial Crisis.

Number of words: 8 246 words

Resumo

Esta tese analisa o impacto que a pandemia da Covid-19 teve no endividamento e no número de trabalhadores, bem como as diferenças desse impacto consoante o tamanho das empresas e também a nível setorial e regional.

Os dados incluem 223 098 empresas, abrangendo o período de 2019 a 2023. Os resultados empíricos indicam que, embora o aumento do endividamento durante a pandemia não seja significativo em toda a amostra, as microempresas registaram um aumento significativo do seu nível de endividamento. Este resultado sugere que as empresas de menor dimensão, com recursos internos reduzidos e menores níveis de liquidez, foram mais vulneráveis a choques externos e, consequentemente, mais propensas a aumentar o endividamento em situações de stress financeiro. Em contraste, as empresas grandes demonstraram maior resiliência, refletindo a sua diversificação nas fontes de financiamento e estratégias financeiras robustas. A análise dos dados relativos aos trabalhadores revela uma queda nos níveis de emprego durante a pandemia, especialmente entre as PME. Os resultados mostram uma relação negativa entre o aumento do endividamento e o número de trabalhadores, apadrinhando a ideia de que as empresas reduzem os custos laborais como estratégia para gerir os compromissos financeiros acrescidos durante períodos de crise.

Setores como o da saúde mitigaram os impactos negativos da pandemia e até registaram melhorias tanto na estrutura de capital como no emprego, enquanto indústrias como a da construção e alojamento sofreram efeitos adversos mais pronunciados. Lisboa e Porto, com maior concentração de grandes empresas, exibiram tendências distintas.

Palavras-chave: Estrutura de Capital, Covid-19, Razão de Endividamento, Força de Trabalho, Empresas Portuguesas, Crise Financeira.

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List of abbreviations

CAE: Classificação das Actividades Económicas Portuguesa por Ramos de Actividade

EBITDA: Earnings Before Interest, Taxes, Depreciation and Amortization

GDP: Gross Domestic Product

SMEs: Small and medium enterprises

1. Introduction

The outbreak of Covid-19 profoundly changed the global business environment, presenting unique challenges to businesses of all sectors and sizes. In Portugal, driven by the massive presence of SMEs (small and medium enterprises) as part of its economic structure, the pandemic disruption effects were particularly clear.

There are a large number of academic examinations regarding capital structure which mainly revolved around the important work of Modigliani and Miller (1958) and subsequent theories such as the trade-off, pecking order, and agency cost frameworks, the main ones. These theories underscore how firms balance the benefits of debt financing, such as tax shields, against the costs associated with financial distress and agency conflicts. However, the Covid-19 crisis inherently challenged many of these established notions by introducing extreme uncertainty and forcing companies to reconsider their traditional financing and human resource strategies. Despite an extensive body of literature on capital structure, the rapid onset of the Covid-19 pandemic has created a research gap regarding how external shocks affect firms' financial and operational choices. There is not also an extensive literature on how SMEs base their decisions regarding capital structure. Some studies indicate that these types of firms based their decisions on the pecking order theory, based on the difficulties of financing with external sources, but neither of these studies has a focus on crisis. Also, the extent to which these dynamics differ between micro, small, medium, and large enterprises in Portugal is not well understood.

In the Portuguese context, SMEs account for 99,9% of all companies and contribute significantly to national employment and GDP (Direção-Geral das Atividades Económicas, 2025). Their natural characteristics create constraints which make them particularly susceptible to external shocks. As the pandemic unfolded, with its lockdowns, supply chain disruptions, and shifts in consumer behavior, companies were

compelled to reexamine their financing strategies and workforce management practices. For many, internal funds proved to be insufficient, prompting a higher reliance on external financing and the subsequent impact on employment levels.

This research aims to bridge the gap in the literature concerning the impact of Covid-19 and the capital structure decisions of SMEs by analyzing cross-sectional data from 2019 to 2023. It is based on an extensive statistical analysis of over 223 000 companies that have data available in this time frame. Motivated by the need to empirically assess whether the pandemic triggered a shift in firms' financial and work strategies, the study examines aggregate trends in debt ratios and employment levels while also investigating the controlling role of firm size. In particular, it evaluates several hypotheses: whether Covid-19 is associated with a rise in debt levels, especially among smaller firms with limited internal funds, whether the crisis has led to significant workforce reductions, and whether the relationship between increased borrowing and employment contraction holds consistently across various industry sectors and geographic regions. This research not only contributes to the theory of capital structure by clarifying the dynamic relationship between external shocks and financing choices but also provides valuable insights into how different types of businesses, particularly SMEs, adapted to the unique challenges brought by the pandemic.

By contrasting traditional capital structure theories with empirical evidence from a crisis period, this thesis enriches academic debate and provides a foundation for future research into resilience strategies and crisis management.

This master thesis is structured in the following order: chapter two reviews the relevant literature on capital structure, the context of Portuguese firms and Covid-19. Chapter three details the methodology adopted for data gathering and econometric analysis, including the formulation of regression models to test the hypotheses stated in this same chapter. Chapter four presents the results, discussing the findings of the study and

relating them to the literature and the hypothesis. The last chapter, chapter five, offers conclusions, presents the limitations of the study and suggests a couple of ideas for future research.

2. Literature Review

2.1. Capital structure

Capital structure is an essential concept in corporate finance that refers to the mix of debt and equity used by firms to finance their operations and growth. The composition of this structure affects the cost of capital, financial stability and the value of a company. Given the strategic importance of capital structure, extensive empirical research has been conducted, revealing various determinants and implications for companies across different economic sectors and geographical regions. This literature review aims to explore the key theories, determinants, and empirical findings on capital structure, providing a comprehensive analysis of its role in corporate finance.

Durand (1952), started the study of capital structure, enlightening some questions regarding the financing with equity versus other financing methods, as this other could be more attractive or less costly. It was only with the study of Modigliani & Miller (1958), the foundational theory of capital structure, that the discussion and surge of more theories started to appear (Harris & Raviv, 1991).

The study from Modigliani & Miller (1958), was pioneer at the time and they asserted an important theorem, in a perfect world the value of a firm is independent of its capital structure and there is no optimal capital structure. This perfect world was defined by no taxes, no transaction or bankruptcy costs and no information asymmetry. This scenario is almost impossible to achieve, and these factors significantly affect capital structure decisions. Abdulla (2017), empirical study results suggest the importance of market imperfections other than taxation, proving that the theorem of Modigliani & Miller (1958).

Modigliani & Miller (1963) revised their original publication and came up with a conclusion approaching the trade-off theory. This theory suggests that companies choose their optimal capital structure by balancing the tax benefits of debt (interest tax shield)

against the costs of bankruptcy (Myers, 1984). In the same empirical study, the authors remember that even though there is this positive effect, it does not mean that companies should seek the maximum debt possible. The authors concluded that retained earnings may in some circumstances be cheaper when the tax status of investors under the personal income tax is considered (Modigliani & Miller, 1963), linked with the pecking order theory.

The trade-off theory was studied and presented in detail by Kraus e Litzenberger (1973). They conclude that the market value of a levered firm is shown to equal the unlevered market value, plus the corporate tax rate times the market value of the firm's debt, less the complement of the corporate tax rate times the present value of bankruptcy costs. When a firm raises its level of debt, it also elevates the probability of bankruptcy. The researchers state that companies consciously shape their capital structures by balancing the tax benefits derived from interest deductions against the rising bankruptcy risks associated with additional borrowing, to maximize the company value. The firm's value reaches its peak when the current marginal value of the anticipated tax shields from debt matches the current marginal cost of the expected bankruptcy expenses.

One important theory to delve into, following the trade-off theory, is the agency cost theory. Initially proposed by Jensen and Meckling (1976) and further developed by Jensen (1986), this theory advocates that there are inherent conflicts among shareholders, managers, and debtholders. Agency costs are not only limited to the opportunity costs avoided through debt but include bonding costs, monitoring costs, and bankruptcy costs. From this view, managers, whose own incentives will not necessarily coincide with maximizing firm value, can be managed through mechanisms such as incentive structures and third-party audits. The smaller the ownership percentage managers hold, the larger the potential for their actions conflict with shareholders' interests, which creates significant equity agency costs. Conflicts between managers and stakeholders are further

studied by Atkeson and Cole (2005), that propose a dynamic theory that integrates executive compensation and agency costs into the capital structure decision-making process, suggesting that managerial incentives can significantly influence capital structure choices. By opting to fund with debt, firms limit the level of free cash to be used for discretionary purposes, therefore lowering the chances of inefficient or self-serving choices. Nevertheless, the increased leverage creates its own set of issues by raising conflicts of interest between debtholders and shareholders. While debtholders aim for stable interest payments and reduction in default risk, shareholders may opt for riskier projects in order to maximize returns, that can be at the expense of creditors. In this theory, the optimal capital structure comes from the balance (trade-off) between the agency costs and the debt benefits.

The next theory to emerge, was the pecking order theory proposed by Myers (1984) and Myers and Majluf (1984). The main difference is that companies, instead of trying to maximize the firm's value, want to minimize the costs of these decisions, as the theory stresses the role of information asymmetry. Myers and Majluf (1984), consider that managers and inside people have nonpublic information that is not available to outside investors, and both acknowledge it. This means that the equity of a company is undervalued. Abeywardhana (2017), apprises that this theory suggests that firms prefer internal financing over debt capital and explains that firms utilize internal funds first then issue debt and finally as the last resort issue equity capital. Myers (1984) summarized this theory, as firstly firms prefer internal finance, secondly, they reduce dividend policy to have more internal cash flows, thirdly if they have excess cash-flow, they invest or pay their debts and lastly, if external finance is required, they issue the safest security, as noted by Abeywardhana (2017). This theory does not assume an optimal capital structure.

2.2. Portuguese firms

According to Direção-Geral das Atividades Económicas, Small and medium-sized enterprises (SMEs) constitute an essential component of Portugal's business landscape, representing 99.9% of all companies. The contribution of Portuguese SMEs to the Gross Domestic Product is approximately 67.4%, accounting for around 76.2% of total national employment. Their scale renders them particularly vulnerable to changes and to the broader macroeconomic framework. The natural characteristics of these firms differentiate their capital structure decisions from the ones seen before, as most of the times resources are scarce compared to large firms. Belas et al. (2018) emphasizes that there are few empirical studies that explore the relationship between capital structure of the firm and its size. They also claim that these firms will use traditional strategies to keep them competitive and that this effect negatively affects the intensity of their further development.

SMEs resort to debt more as a consequence of insufficient internal finance, suggesting that their capital structure decisions are closer to the suppositions of the pecking order theory (Serrasqueiro et al., 2011). Serrasqueiro & Salsa (2016) found that small firms face greater information asymmetry. As this happens, the transaction costs are higher, making these firms recurring mainly to internal funds, enlightening that SMEs capital structure decisions, do not tend to follow the trade-off theory (López-Gracia & Sogorb-Mira, 2008).

These unique companies have their differences to large companies, as seen, but also inside this variety of companies, micro, small and medium, there are differences. Lopez-Gracia & Aybar-Arias (2000) concluded that a company's self-financing policy is significantly affected by company size. They found clear differences between them, elucidating that the greater the difference in size, the greater the effect.

2.3. Covid-19

Referring to the World Health Organization covid timeline, the office of this organization in People's Republic of China, in the last day of 2019, picked up a media statement by the Wuhan Municipal Health Commission on cases of 'viral pneumonia'. In the end of January 2020, France reported three cases, the first ones to be confirmed in Europe. In the beginning of March, the first two case are announced in Portugal, followed by the classification of Covid-19 as a pandemic. In 18 of march, the president of Portugal, declares an emergency status, with the obligation of confinement, which was enforced until the beginning of May.

In June of that year, the Prime-minister of Portugal, said that the economic and social costs caused by COVID-19 are absolutely brutal, with all indicators pointing to a record decline in Gross Domestic Product and an exponential rise in unemployment *in RTP Notícias*. (Custos económicos e sociais desta crise "são absolutamente brutais", diz António Costa, 2020). This was the first confirmation that the pandemics was affecting the Portuguese companies. In the following months, until middle 2022, there were measures either by district or by the whole country, constantly changing, to try and contain the pandemics.

Understanding the dual impact of Covid-19 on financing decisions and workforce management is vital for several stakeholders. For policymakers, insights from this research can inform the design of targeted support measures that account for the unique challenges faced by SMEs. For managers, the findings offer guidance on optimizing capital structure during periods of economic stress and highlight the importance of maintaining workforce stability.

3. Methodology

In this section, I intend to present the methodology that will be used in this dissertation. Concretely, explain and present the research hypothesis; present the scope of the study, by defining the firms that will be considered; the variables present as well as the data gathering process. Later on, I will present the econometric model.

3.1. Research hypotheses

To define the main questions and try to anticipate the results of this research, it is essential to establish the research questions. The investigation will examine cross-sectional data across various industries, to reveal the dual impact of the pandemic on financial stability and human resource strategies. I selected the variables that have influence on these decisions, to formulate hypothesis and later on, assess them.

Debt decisions in companies are dynamic and are linked to the circumstances of the life of the company. These decisions are influenced either by internal conditions corresponding, for example to liquidity, as well as external conditions, for example economic conditions. Myers (1984) and Rajan & Zingales (1995) explain how firms balance debt and equity financing under normal market conditions. These theories have been extended in crisis contexts, suggesting that adverse shocks increase dependence on debt as firms seek liquidity and a defense against uncertainty, as Ramelli and Wagner (2020) suggest.

To verify if covid influenced debt, we are going to evaluate the following hypothesis:

Hypothesis 1 (H1): Covid is positively related to an increase in debt ratio.

Workforce decisions depend heavily on the macro-economic factors at the moment, as well as the firm-specific conditions. Campello M, Graham J & Harvey C (2010) suggest that firms facing financial constraints during crisis tend to cut more employment than the unconstrained ones.

Having the past empirical work into consideration, the following hypothesis is going to be evaluated:

Hypothesis 2 (H2): Covid is positively related to a decrease in workforce.

Smaller enterprises typically face bigger constraints during crises. Berger and Udell (2002) detail how limited collateral and less diversified revenue streams make SMEs more prone to liquidity shortages. They also affirm that these companies have fewer alternatives to finance their activities. In contrast, larger firms experience diversified funding sources, enabling them to secure financing under favorable terms even during downturns. In a study during the pandemic, Bartik et al. (2020) document how these firms progressively turned into short-term loans or emergency financial support due to reduced capital.

With this in mind, we will assess the following:

Hypothesis 3 (H3): Covid had a different impact in debt ratio, depending on the firm's size classification.

With increasing concern about the spread of Covid, governments worldwide imposed lockdowns that drastically slowed economic activities and even led to the complete shutdown of certain operations. These measures disrupted workforce management across firms, with smaller businesses often experiencing more severe challenges due to limited operational flexibility.

The previous data led us to evaluate the following hypothesis:

Hypothesis 4 (H4): Covid had a different impact on the workforce, depending on the firm's size classification.

The relationship between a company's debt management and its employment strategy is allied to the notion that as companies take on more debt, they might be compelled to reduce operating costs, including labor expenses, to service their financial obligations and maintain profitability. According to the study of Bartik et al. (2020), during the covid suggests, the firms that made part of their sample, the employment dropped 40%.

In connection with the previous literature, the following hypothesis is going to be assessed:

Hypothesis 5 (H5): An increase in debt ratio is linked with a decrease in the workforce.

3.2. Defining variables

In this section, my goal is to define the variables to consider in my analysis, to evaluate the previous hypothesis.

To analyze the impact that covid had on Portuguese firms, I will define two dependent variables, instead of just one, to better understand the real impact on debt ratio and workforce. As said, these variables will be debt ratio and workforce.

The independent variables will be covid and size. Covid has the objective of measuring the impact that the pandemics had on the companies. This variable will take value 0, no impact, for years 2019 and 2023 and value 1, impact, for the rest of the years. The other one, size, will try to capture the differences in each company's size.

For control variables, we will have EBITDA (Earnings before Interest, Taxes, Depreciation and Amortization) and fixed assets. EBITDA accounts for the model to control differences in profitability across companies. Firms with higher EBITDA are likely to have better operating cash flows, which may influence their ability to use less debt. Fixed assets refer to long-term tangible assets, representing the capital intensity of a company. This measure compared with the total assets, the measure of size, helps the model to isolate the specific effects of Covid and other variables on financial and operational outcomes.

As for dummies, we will have industry and location, as there are industries and zones that felt more impact than others.

3.3. Defining Sample

The hypothesizes are defined, as well as the variables, so now, the sample can be presented.

The sample of this study consists of 223 098 companies, extracted from "SABI Informa". SABI has information available for almost 2 900 000 Spanish and 900 000 Portuguese firms, from at least 25 years. To have precise and relevant data for the study, I had to apply a range of filters, which are going to be detailed below.

I started by applying a filter regarding the country/region where the company is established, Portugal, as this study only focus on Portuguese firms, leaving the sample with almost 900 000 companies.

The second filter applied was companies with information available in the period of this study, 2019 to 2023. These years help to understand the previous situation, with 2019 as base year, the years of covid impact 2020 until 2022 and the start of recovery, 2023. This filter left the sample with 293 509 companies.

The third filter that was applied was to only include companies with at least one employee in all these years, as one essential component of this study is the impact on the workforce. There were 223 755 companies remaining as sample.

One of the last filters to be applied was the companies with a known debt ratio for these years. Debt ratio is the division of total debt by total assets of a company. This filter was applied to make the analysis simpler, for the sake of the time to perform this thesis. This filter ported the sample with 223 100 companies.

The last treatment of the sample was not a filter, but an upgrade of the data. This was removing outliers. There were two companies that were skewing the sample, due to an abnormal increase in debt ratio in the last year, 2023. These two companies filed bankruptcy in the same year. They were taken out to provide a more accurate analysis, reaching the final sample of 223 098 companies.

As it was time to extract the sample, there were added some more columns to determine the size of the companies and provide a wider analysis, obtaining the dummies mentioned before. It were also added the control variables mentioned before to isolate and better understand the future results.

In addition to the debt ratio and number of employes in each year, selected in the initial filters, the selection also contained information regarding the industry of each company, identified by the CAE (Classificação das Actividades Económicas Portuguesa por Ramos de Actividade) of each one and the region of each company was also visible by district.

To determine the size of each company, according to Decreto-lei n. º 372/2007, information was also included regarding the turnover and the total assets of 2023, only used for this purpose. 2023 was the year selected to define this criterion, as it was the last period in the time frame, meaning that the number of employees this year was also the used one.

Table 1 presents the distribution of the firms present in the sample by industry and table 2, by location. In both tables, it is important to highlight that micro firms represent almost 82% of the sample. Table 1 enlightens that CAE G (Wholesale and retail trade; repair of motor vehicles and motorcycles) is the industry with the most firms in the sample. Table 2, as expected, evidences that most of the firms are located in the two main poles of our country, Lisboa, and Porto, taking almost 45% of the sample. Braga also has a high concentration of companies, around 9% of our sample.

CAE sections	Micro firms	Small firms	Medium firms	Large firms	Total firms	Total in %
A - Agriculture, animal production, hunting, forestry, and fishing	6 883	966	134	18	8 001	3,59
B - Extractive industries	236	134	25	3	398	0,18
C - Manufacturing industries	14 686	7 325	2 205	371	24 587	11,02
D - Electricity, gas, steam, heat and cold	124	45	21	17	207	0,09
E - Collection, treatment, and distribution of water; sanitation, waste management, and pollution control	292	174	83	33	582	0,26
F - Construction	18 321	4 486	593	77	23 477	10,52
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	46 899	8 064	1 217	235	56 415	25,29
H - Transportation and storage	9 375	1 366	352	82	11 175	5,01
I - Accommodation, restaurants, and similar activities	15 785	4 156	575	56	20 572	9,22
J - Information and communication activities	5 166	779	270	82	6 297	2,82
K - Financial and insurance activities	3 545	181	33	5	3 764	1,69
L - Real estate activities	11 744	588	58	3	12 393	5,55
M - Consulting, scientific, technical, and similar activities	20 805	1 887	271	72	23 035	10,33
N - Administrative and support services	5 931	1 123	345	177	7 576	3,40
O - Public administration and defense; compulsory social security	5	4	4	-	13	0,01
P - Education	2 354	530	102	2	2 988	1,34
Q - Human health and social care activities	12 415	1 198	163	57	13 833	6,20
R - Artistic, entertainment, sports, and recreational activities	3 149	305	78	16	3 548	1,59
S - Other service activities	4 000	208	27	2	4 237	1,90
Total	181 715	33 519	6 556	1 308	223 098	
Total in %	81,45	15,02	2,94	0,59		100

Table 1: Distribution by CAE

Source: Author

District	Micro firms	Small firms	Medium firms	Large firms	Total firms	Total firms in %
Angra do Heroísmo	612	146	16	3	777	0,35
Aveiro	11 823	2 587	487	96	14 993	6,72
Beja	2 162	356	49	12	2 579	1,16
Braga	15 460	3 507	769	73	19 809	8,88
Bragança	1 768	215	18	1	2 002	0,90
Castelo Branco	2 591	407	66	13	3 077	1,38
Coimbra	6 732	1 044	195	38	8 009	3,59
Faro	8 923	1 773	234	25	10 955	4,91
Funchal	3 773	822	182	38	4 815	2,16
Guarda	2 160	268	48	3	2 479	1,11
Horta	413	86	2	2	503	0,23
Leiria	9 483	1 928	353	34	11 798	5,29
Lisboa	48 099	7 730	1 811	549	58 189	26,08
Ponta Delgada	1 306	412	85	16	1 819	0,82
Portalegre	1 526	216	26	11	1 779	0,80
Porto	33 263	6 659	1 355	249	41 526	18,61
Santarém	6 567	1 254	232	28	8 081	3,62
Setúbal	10 873	1 674	278	55	12 880	5,77
Viana do Castelo	3 571	685	100	22	4 378	1,96
Vila Real	2 605	398	49	7	3 059	1,37
Viseu	5 347	934	144	24	6 449	2,89
Évora	2 658	418	57	9	3 142	1,41
Total	181 715	33 519	6 556	1 308	223 098	100

Table 2: Distribution by District

Source: Author

3.4. Methodology

In this section, my aim is to specify the regression models and present the methodology. As previous mentioned, the main objective of this analysis is to determine the impact that Covid-19 had on the debt ratio and on the workforce of companies. In order to isolate both, two OLS regression models were created. The regression model to determine this impact on debt is the following:

$$Debt\ ratio_{i,t} = \beta_0 + \beta_1 * Covid\_Impact + \beta_2 * Workforce + \beta_3 * CompanySize + \beta_4 * EBITDA + \beta_5 * Fixed\ assets + Industry\ dummies_t + Location\ dummies_t + \varepsilon_{i,t}$$

Where "i" represents the companies and "t" the years.

The regression model to determine the impact on the workforce is the following:

$$Workforce_{i,t} = \beta_0 + \beta_1 * Covid\_Impact + \beta_2 * Debt\ Ratio + \beta_3 * CompanySize + \beta_4 * EBITDA + \beta_5 * Fixed\ assets + Industry\ dummies_t + Location\ dummies_t + \varepsilon_{i,t}$$

Where "i" represents the companies and "t" the years.

Every variable presented in these regressions was presented before, expect ε, that represents the estimation error.

To have a better understanding of the effects of size there were two additional tests, to isolate the size factor, as we can see in table 4.

4. Results

In this coming chapter, my aim is to comment on the results and try to find a connection between the previous chapters. I will start with the descriptive statistics and then move on to the OLS regression.

4.1. Descriptive statistics

In the first subsection, we will look at the main descriptive statistics regarding our dataset. The objective is to start with a wider analysis to assess if there are significant differences in the main variables.

	Years	Mean	Median	Standard deviation	Minimum	Maximum
	2019	162,63	62,93	9 150,17	- 455,96	2 861 336
	2020	200,83	63,50	14 155,27	- 701,50	4 933 405
Debt ratio	2021	407,22	62,63	84 440,32	- 678,59	39 057 378
	2022	246,43	60,85	14 186,15	- 192,53	3 821 766
	2023	331,42	58,30	16 103,72	- 259,59	4 655 837
T-test (p-value)		4,304 (0,00)				
	2019	11,54	3	127,65	1	26 559
	2020	11,42	3	123,15	1	26 237
Workforce	2021	11,73	3	125,89	1	26 671
	2022	12,24	3	128,55	1	26 859
	2023	12,65	3	131,51	1	27 151
T-test (p-value)		2,858 (0,00)				

Table 3: Descriptive statistics of whole sample

Source: Author

			Micro	Small	Medium	Large
Debt ratio	Mean	2019	182	81	68	66
		2023	392	65	61	63
	T-test (p-value)		4,38 (0,00)	-1,33 (0,18)	-2,58 (0,01)	-1,64 (0,10)
Workforce	Mean	2019	3,3	17,6	78	668
		2023	3,19	19,8	89	760
	T-test (p-value)		-8,36 (0,00)	23,82 (0,00)	10,7 (0,00)	1,55 (0,12)

Table 4: Descriptive statistics by firm size

Source: Author

In table 3, it is possible to see diverse basic statistics of debt ratio and workforce. These statistics are for the whole sample. To compare these statistics by firm size, table 4 is the indicated.

The mean debt ratio saw a constant increase during the years, being especially affected in the peak of the pandemics, 2021, suggesting that firms were taking more debt during this period. This trend goes in line with hypothesis 1. It is also important to note that the standard deviation followed the mean trend. This suggests a very skewed distribution, where only a limited number of firms are engaging in extremely high borrowing, as suggested in table 4. Micro enterprises were the only ones to have a higher debt ratio after the pandemics. This could support hypothesis 3.

The workforce has a more stable picture, compared to the debt ratio. The median remained constant over the years. The mean rises modestly over time, even in covid years, not supporting hypothesis 2. As the standard deviation and the maximum number of employes also tend to increase, this could be explained by some larger firms contributing to this higher end of the distribution, as suggested in table 4, where besides micro

companies, every other company's size has grown their workforce. This suggests that hypothesis 4 could explain these differences.

For the differences in table 4, there is also evidence to support hypothesis 5, as when debt is higher, the workforce is lower, and the opposite is also verified.

4.2. Regression results

With the objective of examining the impact of the pandemic on debt ratio and workforce, it was estimated the presented equations in section 3.4, creating two models[1]. Model 1 with the dependent variable as debt ratio and model 2 with the dependent variable as the workforce, as seen in table 5. In table 6 it is possible to see how these variables affect the different type of companies by size, with the sub models ranging from micro (1) to large (4).

Model	1	2
Intercept	-87,077 . (48,236)	199,450 *** (4,613)
Covid Impact	40,299 (65,566)	-0,364 * (0,172)
Workforce	-0,024 ** (0,00)	-
Debt ratio	-	-0,000203 . (0,000122)
EBITDA	- 0,0045 * (0,0008)	0,25 ** (0,006)
Fixed assets * Total assets	0,0005 (0,0004)	0,08 (0,05)
Observations	1 115 444	1 115 444
Adjusted R^2	0,048	0,1844

Table 5: OLS regression results by dependent variables

[1] ***, **, * and . indicate that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels and marginally significant, respectively

Sub model	1.1 Micro	1.2 Small	1.3 Medium	1.4 Large	2.1 Micro	2.2 Small	2.3 Medium	2.4 Large
Intercept	150,16 ** (57,789)	75,31 *** (10,916)	79,99 *** (6,377)	116,0 *** (24,774)	3,754 *** (0,052)	18,44 *** (0,441)	83,20 *** (6,999)	-466,4 *** (128,036)
Covid Impact	212,45 * (155,799)	-8,407 (8,618)	-3,260 . (1,902)	0,142 (0,825)	-0,013 . (0,006)	-0,56 *** (0,052)	-3,294 *** (0,494)	-31,863 (28,338)
Workforce	-27,95 *** (6,794)	-0,450* (0,214)	-0,030 * (0,014)	0,001 *** (0,00)	-	-	-	-
Debt ratio	-	-	-	-	-0,0021 * (0,00141)	-0,07 *** (0,035)	-0,008 *** (0,002)	2,482 *** (0,666)
EBITDA	- 5,80 ** (0,35)	- 0,65 (0,625)	- 0,234 (0,545)	0,02 (0,10)	- 1,10 * (0,45)	- 0,45 (0,35)	- 0,23 (0,28)	0,50 . (0,30)
Fixed assets * Total assets	- 0,0102 (0,08)	0,0723 (0,05)	0,05 (0,04)	0,032 (0,03)	0,05 (0,04)	0,06 (0,03)	0,04 (0,02)	0,12 (0,21)

Table 6: OLS regression results isolating firm size

In table 5, the results from model 1 invalidate hypothesis 1, which stated that covid is positively related to an increase in debt ratio. Although the result is positive, it is not significant. This result is rather unexpected in this study, bearing in mind the theoretical literature mentioned in the hypothesis section. Fixed assets stayed constant over time, sustaining this conclusion. On the other hand, it helps to sustain the pecking order theory, which theorizes firms prefer to finance their investments using internal funds first, then debt. We can also validate the pecking order theory, as the EBITDA is negative and significant, meaning that if debt ratio goes up, this control variable follows the inverse trend, supporting that companies with better rentability don't need to finance their operations with debt. This result is also in line with the literature of capital structure for SMEs, as Serrasqueiro et al. (2011), concluded that SMEs resort to debt more as a consequence of insufficient internal finance, suggesting that their capital structure decisions are closer to the suppositions of the pecking order theory. According to Baskin (1989), firms avoid new equity issues and rely on borrowing when there is a limited supply of retained earnings available for investment. The same results help to validate

hypothesis 2, which listed that covid is positively related to a decrease in the workforce. The test for covid impact on the workforce proved to be significant, in line with the literature. Mamede, R. P. et al (2020) also supports this hypothesis, as they suggest, with the lockdown, between February and April 2020, unemployment in Portugal rose 24% and around 22% from this date until the same month in 2021. Fixed assets remained constant, meaning that the reduction in the workforce is not connected with a reduction in fixed assets. Fixed assets reduction can boost reductions in the workforce, as less workers are needed to operate and maintain these types of assets.

With the results from table 6, we can validate hypothesis 3. From the results we can observe that micro enterprises were the only ones to have increased their debt ratio, supported by the negative and significant reduction of EBITDA. The other firm sizes were able to decrease, being the medium firms decrease significant. Berger and Udell (2002) showed that smaller firms are more prone to liquidity shortage and the results are in line with their empirical study. In the same table, we can also authenticate hypothesis 4. Although every type of company demonstrated that covid had a negative impact on the workforce, the decrease in large firms was not significant. This result suggests that hypothesis 4 can be confirmed. A negative EBITDA coefficient there implies that firms with higher EBITDA, and, presumably, stronger financial health, might experience less pressure to reduce their workforce compared to firms with lower profitability. The results indicate that SME's faced higher pressure during covid times and larger companies were able to keep it constant.

Hypothesis 1 and 3 can complement each other and the evidence that we can take from the results is with micro companies. From table 5 and 6 we verify that to micro firms, hypothesis 1 is validated but to the others it was the exact opposite effect. This evidence makes hypothesis 3 verified.

Hypothesis 2 and 4 are also highly correlated. From the results we can validate both hypotheses, as in table 5 it was determined that when covid is present, there is a reduction associated in the workforce. Also, we saw that SME's suffered on a greater scale than large firms.

From table 5 and 6, we can strongly validate hypothesis 5. There are high correlations in table 5 and 6. Reviewing model 1 for debt ratio and model 2 for workforce, as dependent variable, it shows similar patterns. A significant association between increased debt levels and workforce reductions indicates support for Hypothesis 5. In table 5, with the results from model 1, we can see that an increase in employment is linked with a decrease in debt ratio. In the sub-models of debt ratio, we reach the same conclusion, with a higher decrease in the smallest firms. Larger firms do not present the same result, as their structure allows different financial decisions that are not so much affected by the workforce. Model 2 results confirm the same output, indicating that an increase in debt ratio leads to a decrease in the workforce, even though the coefficient is remarkably close to zero. The sub-models present in table 6 also validate this trend, except for large firms. For large companies, an increase in debt ratio leads to an increase in the workforce. In SME's, the scenario is different. All these results help to validate hypothesis 5, at least in the biggest part, which stated than an increase in debt ratio is linked with a decrease in the workforce.

This analysis was also performed with CAE and district, to study the impact on different industries and regions. These results are present in tables 7 and 8, placed in the attachments chapter at the end of this thesis.

In tables 7 and 8, we can also verify the industries who suffered or benefited the most from the pandemics. CAE Q, the industry that englobes healthcare and social care, has been the one from all the sample that benefit the most from this crisis. From the results, we can conclude that this sector reduced the debt ratio and increased the workforce. As

covid is bonded with healthcare, this comes as no surprise. This can be contradictory, as one might think that healthcare cannot benefit the most when they are spending so much. This can be explained, as the private sector companies mainly comprise the sample and these ones did not have the expenses that the public sector had. As for the industries who suffered the most, as expected are CAE's F, I and P, respectively, construction; accommodation, food services, and similar activities; and education. With numerous lockdowns, activities that require essentially the physical presence of their costumers, had to close doors and with no business, the impact was very disruptive. Excluding CAE P, in table 8, we can verify that large firms were the only ones to have an increase in the workforce in CAE F and I, showing their financial strength and adaptation to different environments compared to SME´s, which do not have the same capacity.

In table 7, the districts which had a higher increase in the debt ratios had a more expressive decrease in the workforce, contributing once again to verify hypothesis 5. The two main cities of Portugal were able to invert this tendency, probably due to the higher concentration of larger firms in these two poles.

The results analysis showed overall proof to support most of the hypothesis, with some surprises, but mostly following what was expected. Although we were expecting the SMEs to suffer the most compared to large firms, that was still the case, micro firms were the ones to highlight as they demonstrated notable volatility in debt ratios and employment metrics, supporting notably hypothesis 3 and 4. Such firms proved that they are vulnerable to sudden market shifts. Larger Firms exhibit more stability due to their more robust risk management and financial structures.

5. Conclusion

This dissertation aims to study the impact that the pandemics, Covid-19, had on Portuguese firms. Based on the analysis of a large sample of Portuguese companies, from 2019 to 2023, this thesis reveals the effects of this crisis on both capital structure, mainly debt ratio and in workforce management, with an additional focus in company size.

The results show that the overall rise in the debt ratio throughout the full sample is not statistically significant, a finding that is in accordance with the pecking order theory in terms of firms' preference to use internal financing, as well as the literature. On the contrary, micro firms had a significant rise in their debt ratio during the pandemic period and hence supporting the hypothesis that the impact of Covid-19 on capital structure centers on the firm's size and supporting Hypothesis 3. Moreover, the investigation related to the labor force indicates a steep fall due to the pandemic and hence the hypothesis that Covid-19 is related to a decrease in employees (Hypothesis 2) with a strong effect in smaller firms (Hypothesis 4). The regression analyses also always demonstrate a negative relationship between the rise in debt and the strength in the labor force (Hypothesis 5).

The analysis also clarifies differences between various industries and geographic regions. Sectors like healthcare showed resilience or even improved performance indicators during the pandemic, compared to industries such as construction, accommodation, food services, and education, which suffered a much more significant negative effect. In addition, key urban areas, such as Lisbon and Porto, showed distinctive trends, likely due to the presence of larger firms that were better able to resist disruption thanks to their stronger financial bases and adaptation strategies.

This research opens the field to a deeper study on the effects of covid on the capital structure of Portuguese companies, providing empirical research on the effects,

complementing the general theories of pecking order and trade-off, by providing concrete results. It also complements diverse studies on capital structure of SMEs, such as Serrasqueiro et al. (2011), Serrasqueiro & Salsa (2016) and López-Gracia & Sogorb-Mira (2008). The study additionally opens up roads for further research into resilience strategies, particularly in enhancing liquidity management and operational adaptability among smaller firms.

The limitations of this study, in the biggest part, are related to one variable used in the dataset, the debt ratio. Besides having the control variables, EBITDA and fixed assets, they are not enough to quantify the real impact. This study has the intuition to be simpler, for sake of time and the unnecessary need to diving too deep into the data. The debt ratio, even that indicates variations and gives validity to the results, is not enough to study the real impact, either in each industry, location and firm size. It is also a very large ratio, as its envelopes a lot of different financial categories from the balance sheet.

For future studies, it would be interesting to develop this study using short- and long-term debt, focusing on the different type of firm sizes, providing the way to a more specific analysis on how Covid-19 affected the debt structure on each type of firm.

Overall, the findings of this thesis underscore the importance of adopting different policy measures, from the firm itself to the policy makers, which consider the firm size and the industry specific characteristics to mitigate, besides the management of Covid-19 being positive overall, even more future crisis. These insights are critical for stakeholders aiming to strategy effective interventions and support instruments in times of economic instability.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of my written work/thesis, "Capital Structure of Portuguese firms. Debt and workforce evolution in Covid-19", Copilot and Chat GPT were used for the following tasks: grammar improvements, finding information and helping to structure ideas, with the prompts used listed at the end of the document in the Prompts List section. After using these tools/services, I reviewed and edited the content as necessary, and I take full responsibility for the content of the work presented.

I also declare that I am aware of and respect the Artificial Intelligence Rules of Conduct of Católica Porto Business School.

References

Abdulla, Y. (2017). Capital structure in a tax-free economy: evidence from UAE. International Journal of Islamic and Middle Eastern Finance and Management, 10(1), 102–116. https://doi.org/10.1108/IMEFM-11-2015-0144

Abeywardhana, D. K. Y. (2017). Capital Structure Theory: An Overview. Accounting and Finance Research, 6(1), 133. https://doi.org/10.5430/afr.v6n1p133

Atkeson, A., & Cole, H. L. (2005). A Dynamic Theory of Optimal Capital Structure and Executive Compensation (11083; NBER Working Paper Series). http://www.nber.org/papers/w11083

Bartik, A. W., Bertrand, M., Cullen, Z., Glaeser, E. L., Luca, M., & Stanton, C. (2020). The impact of COVID-19 on small business outcomes and expectations. Proceedings of National Academy of Sciences (PNAS), 117(30), 17656–17666. https://doi.org/https://doi.org/10.1073/pnas.2006991117

Baskin, J. (1989). An Empirical Investigation of the Pecking Order Hypothesis. Financial Management, 18(1), 26–35. https://doi.org/https://doi.org/10.2307/3665695

Belas, J., Gavurova, B., & Toth, P. (2018). Impact of selected characteristics of SMES on the capital structure. Journal of Business Economics and Management, 19(4), 592–608. https://doi.org/https://doi.org/10.3846/jbem.2018.6583

Berger, A. N., & Udell, G. F. (2002). Small Business Credit Availability and Relationship Lending: The Importance of Bank Organisational Structure. The Economic Journal, 112(477). https://doi.org/https://doi.org/10.1111/1468-0297.00682

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. Journal of Financial Economics, 97(3), 470–487. https://doi.org/https://doi.org/10.1016/j.jfineco.2010.02.009

Custos económicos e sociais desta crise "são absolutamente brutais", diz António Costa. (2020, 3 de junho). RTP Notícias. https://www.rtp.pt/noticias/covid-19/custos-economicos-e-sociais-desta-crise-sao-absolutamente-brutais-diz-antonio-costa_a1234205 (2025.04.01; 16H 02M)

Decreto-lei n.º 372/2007 (2007.Nov.06). DIÁRIO DA REPÚBLICA: I SÉRIE. n. º 213 pp. 8080-8084.

Direção-Geral das Atividades Económicas. 2025. Política Empresarial. Available in https://www.dgae.gov.pt/servicos/politica-empresarial.aspx (2025.04.01; 16H 02M)

Durand, D. (1952). Costs of Debt and Equity Funds for Business: Trends and Problems of Measurement. In Universities-National Bureau Committee for Economic Research (Ed.), Conference on Research in Business Finance (pp. 215–262).

Harris, M., & Raviv, A. (1991). The Theory of Capital Structure. The Journal of Finance, 46(1), 297–355. https://doi.org/10.1111/j.1540-6261.1991.tb03753.x

Jensen, M. C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. The American Economic Review, 76(2), 323–329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics, 3(4), 305–360. https://doi.org/https://doi.org/10.1016/0304-405X(76)90026-X

Kraus, A., & Litzenberger, R. H. (1973). A State-Preference Model of Optimal Financial Leverage. The Journal of Finance, 28(4), 911–922. https://doi.org/https://doi.org/10.2307/2978343

Lopez-Gracia, J., & Aybar-Arias, C. (2000). An Empirical Approach to the Financial Behaviour of Small and Medium Sized Companies. Small Business Economics, 14, 55–63. https://doi.org/https://doi.org/10.1023/A:1008139518709

López-Gracia, J., & Sogorb-Mira, F. (2008). Testing trade-off and pecking order theories financing SMEs. Small Business Economics, 31, 117–136. https://doi.org/10.1007/s11187-007-9088-4

Mamede, R. P., Pereira, M., & Simões, A. (2020). Portugal : rapid assessment of the impact of COVID-19 on the economy and labour market.

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. The American Economic Review, 48(3), 261–297.

Modigliani, F., & Miller, M. H. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. The American Economic Review, 53(3), 433–443.

Myers, S. C. (1984). The Capital Structure Puzzle. The Journal of Finance, 39(3), 575–592. https://doi.org/https://doi.org/10.2307/2327916

Myers, S. C., & Majluf, N. S. (1984). 19 - Myers-and-Majluf 1986. Journal of Financial Economics, 13(2), 187–221. https://doi.org/https://doi.org/10.1016/0304-405X(84)90023-0

Rajan, R. G., & Zingales L. (1995). What Do We Know about Capital Structure? Some Evidence from International Data. The Journal of Finance, 50(5), 1421–1460. https://doi.org/https://doi.org/10.2307/2329322

Ramelli, S., & Wagner, A. F. (2020). Feverish Stock Price Reactions to COVID-19. The Review of Corporate Finance Studies, 9(3), 622–655. https://doi.org/https://doi.org/10.1093/rcfs/cfaa012

Serrasqueiro, Z. S., Armada, M. R., & Nunes, P. M. (2011). Pecking Order Theory versus Trade-Off Theory: Are service SMEs' capital structure decisions different? Service Business, 5, 381–409. https://doi.org/10.1007/s11628-011-0119-5

Serrasqueiro, Z., Matias, F., & Salsa, L. (2016). Determinants of capital structure: New evidence from Portuguese small firms. Dos Algarves: A Multidisciplinary e-Journal, 28, 13–28. https://doi.org/10.18089/DAMeJ.2016.28.2

Attachments

Attachment 1

Model	1	2
B - Extractive industries	31,742 (22,171)	1,757 . (0,987)
C - Manufacturing industries	34,054 * (15,462)	-0,528 (0,343)
D - Electricity, gas, steam, heat and cold	70,117 (93,926)	-31,908 *** (7,055)
E - Collection, treatment, and distribution of water; sanitation, waste management, and pollution control	3,5827 (15,669)	-8,712 *** (2,209)
F - Construction	183,77 * (77,288)	0,444 * (0,214)
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	66,237 * (33,731)	0,024 (0,279)
H - Transportation and storage	-19,799 (39,362)	1,323 * (0,544)
I - Accommodation, restaurants, and similar activities	137,27 *** (39,437)	0,815 *** (0,191)
J - Information and communication activities	233,77 (143,31)	-1,472 ** (0,462)
K - Financial and insurance activities	402,66 (284,30)	-1,079 *** (0,186)
L - Real estate activities	-42,053 (43,921)	-1,246 *** (0,136)
M - Consulting, scientific, technical, and similar activities	51,713 (57,691)	-0,920 *** (0,167)
N - Administrative and support services	91,306 . (47,908)	14,787 *** (1,403)
O - Public administration and defense; compulsory social security	8,5108 (42,596)	5,984 . (3,617)
P - Education	103,02 ** (35,139)	0,800 *** (0,176)
Q - Human health and social care activities	-77,059 * (33,511)	4,150 *** (0,551)
R - Artistic, entertainment, sports, and recreational activities	213,55 (165,77)	-1,768 *** (0,263)
S - Other service activities	2 233,2 (1 817,5)	0,261 . (0,137)

Aveiro	-27,495	-0,440
	(30,107)	(0,565)
Beja	-34,47	0,018
	(29,742)	(0,624)
Braga	34,647	0,280
	(37,981)	(0,555)
Bragança	16,43	0,265
	(61,385)	(0,552)
Castelo Branco	134,59	-0,599
	(185,24)	(0,603)
Coimbra	3,0502	0,025
	(49,222)	(0,705)
Évora	-35,491	-0,070
	(30,898)	(0,603)
Faro	-7,8265	-0,210
	(30,107)	(0,586)
Funchal	458,08 *	-2,218 **
	(212,26)	(0,775)
Guarda	-68,533 .	0,231
	(35,127)	(0,565)
Horta	-40,141	-0,795
	(39,886)	(0,689)
Leiria	88,551	-0,200
	(93,525)	(0,558)
Lisboa	259,88 .	1,409 *
	(137,47)	(0,604)
Ponta Delgada	-44,172	-0,348
	(32,568)	(0,789)
Portalegre	-18,867	-0,466
	(31,128)	(0,719)
Porto	78,761 *	0,727
	(38,734)	(0,628)
Santarém	107,31	-0,593
	(69,278)	(0,566)
Setúbal	263,95 *	-0,401
	(105,38)	(0,594)
Viana do Castelo	-40,976	0,021
	(30,802)	(0,618)
Vila Real	177,54	-0,427
	(165,94)	(0,568)
Viseu	-40,139	0,052
	(35,84)	(0,577)

Table 7: OLS regression results by dependent variables with CAE and industry

Attachment 2

Sub Model	1.1 Micro	1.2 Small	1.3 Medium	1.4 Large	2.1 Micro	2.2 Small	2.3 Medium	2.4 Large
B - Extractive industries	29,068 (27,830)	-21,822 * (9,969)	-16,164 * (6,289)	-19,85 *** (4,414)	1,451 *** (0,093)	2,534 *** (0,446)	-1,647 (5,649)	264,437 * (131,712)
C - Manufacturing industries	21,338 (17,889)	-13,443 (9,768)	-15,225 * (6,166)	0,202 (3,269)	1,110 *** (0,023)	3,837 *** (0,214)	9,029 ** (3,344)	264,4 *** (29,633)
D - Electricity, gas, steam, heat and cold	63,331 (155,994)	-19,191 (11,975)	-22,96 *** (6,778)	15,16 *** (4,335)	-0,603 *** (0,089)	-5,06 *** (1,128)	-47,5 *** (4,317)	27,536 (86,757)
E - Collection, treatment, and distribution of water; sanitation, waste management, and pollution control	-27,611 (23,546)	-23,987 * (9,723)	-21,17 *** (6,078)	2,296 (3,656)	1,390 *** (0,189)	2,674 *** (0,723)	8,179 . (4,237)	231,4 *** (42,040)
F - Construction	238,78 * (98,803)	-7,413 (11,043)	-12,566 * (6,282)	9,749 ** (3,385)	-0,647 *** (0,023)	0,575 ** (0,218)	-6,013 . (3,484)	260,2 *** (56,150)
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	79,390 * (40,244)	-23,956 * (9,862)	-15,050 * (6,252)	7,861 * (3,288)	0,065 ** (0,020)	-0,96 *** (0,210)	-15,4 *** (3,391)	367,4 *** (73,040)
H - Transportation and storage	-52,772 (54,083)	-13,985 (9,763)	-8,403 (6,314)	23,11 *** (4,314)	-0,605 *** (0,032)	1,887 *** (0,248)	4,560 (3,575)	525,5 *** (76,680)
I - Accommodation, restaurants, and similar activities	176,9 *** (47,539)	18,752 (20,740)	-7,634 (6,485)	9,461 ** (3,526)	-0,636 *** (0,023)	-0,032 (0,218)	-6,275 . (3,547)	386,1 *** (58,634)
J - Information and communication activities	261,664 (175,485)	-12,717 (10,529)	-11,456 . (6,682)	9,033 ** (3,369)	-0,517 *** (0,028)	1,050 *** (0,272)	5,933 (3,700)	197,4 *** (38,905)
K - Financial and insurance activities	413,549 (302,366)	-38,36 *** (10,759)	-26,65 *** (6,914)	0,845 (5,041)	-0,874 *** (0,024)	-1,285 ** (0,437)	-18,27 ** (5,697)	-122,6 ** (38,039)
L - Real estate activities	-73,162 (57,128)	-18,452 . (10,844)	-17,521 * (6,875)	23,64 *** (5,521)	-1,082 *** (0,022)	-6,56 *** (0,267)	-48,22 *** (3,971)	-96,406 * (44,415)

M - Consulting, scientific, technical, and similar activities	47,842 (66,878)	-21,213 * (10,299)	-6,972 (7,207)	13,43 *** (3,554)	-0,395 *** (0,023)	-0,99 *** (0,230)	-9,610 ** (3,590)	86,710 * (36,925)
N - Administrative and support services	104,010 . (60,480)	-7,412 (10,160)	12,183 (13,336)	19,35 *** (3,545)	-0,077 (0,059)	3,426 *** (0,538)	12,67 *** (3,838)	918,5 *** (69,953)
O - Public administration and defense; compulsory social security	8,305 (49,543)	-15,744 (10,767)	-30,61 *** (8,675)	-	0,023 (0,707)	10,04 *** (2,691)	6,799 (12,181)	-
P - Education	126,31 ** (42,969)	4,802 (10,604)	-10,409 (6,667)	-35,34 *** (3,789)	0,052 (0,031)	2,841 *** (0,296)	4,719 (3,857)	-3,148 (40,323)
Q - Human health and social care activities	-106,7 * (44,249)	-10,088 (10,059)	-6,962 (6,466)	33,54 *** (3,922)	-0,720 *** (0,021)	1,005 *** (0,243)	2,999 (3,860)	1 399 *** (108,046)
R - Artistic, entertainment, sports, and recreational activities	211,729 (189,618)	22,319 . (12,292)	22,628 * (10,739)	7,089 (5,156)	-0,737 *** (0,027)	0,121 (0,369)	-5,763 (4,392)	94,569 * (45,262)
S - Other service activities	2 359,478 (1 920,7)	-0,794 (10,628)	-7,874 (7,062)	18,30 * (8,059)	-0,386 *** (0,025)	0,725 . (0,393)	8,122 (5,316)	446,93 ** (152,089)
Aveiro	-51,752 (38,571)	8,545 *** (1,292)	-9,447 *** (2,407)	-65,61 ** (24,522)	-0,444 *** (0,050)	-0,666 . (0,403)	0,916 (6,233)	466,1 *** (105,641)
Beja	-56,468 (37,749)	6,847 . (3,714)	13,765 . (7,373)	-46,372 . (25,017)	-0,570 *** (0,056)	-0,285 (0,601)	-3,559 (7,385)	717,7 *** (101,362)
Braga	27,534 (48,177)	30,01 *** (7,079)	-3,705 (2,397)	-61,84 * (24,545)	-0,296 *** (0,050)	-0,676 . (0,400)	3,478 (6,228)	380,8 *** (105,004)
Bragança	8,680 (71,806)	4,674 * (1,889)	-15,63 *** (4,013)	-35,681 (24,756)	-0,708 *** (0,055)	-0,506 (0,506)	-16,267 * (7,412)	602,5 *** (102,594)
Castelo Branco	150,256 (221,207)	18,289 ** (6,636)	-6,681 . (4,006)	-72,10 ** (24,712)	-0,496 *** (0,054)	-0,056 (0,456)	1,785 (6,855)	251,58 * (110,434)
Coimbra	-6,879 (60,074)	6,422 *** (1,486)	-4,493 . (2,544)	-68,76 ** (24,598)	-0,516 *** (0,051)	-0,706 . (0,424)	1,443 (6,369)	545,1 *** (143,949)

Évora	-52,571 (39,231)	9,853 *** (2,117)	-3,257 (3,448)	-25,359 (28,385)	-0,588 *** (0,055)	-1,207 ** (0,459)	-5,061 (6,804)	436,4 *** (129,279)
Faro	-16,356 (38,200)	9,948 (6,414)	-6,543 * (3,071)	-57,679 * (24,713)	-0,354 *** (0,051)	-0,910 * (0,411)	3,097 (6,437)	441,4 *** (124,825)
Funchal	572,074 * (270,987)	5,123 * (2,388)	-9,021 *** (2,626)	-67,15 ** (24,641)	-0,428 *** (0,054)	-1,351 ** (0,429)	-7,807 (6,348)	367,41 ** (123,023)
Guarda	-88,583 * (44,128)	4,840 * (1,971)	-5,521 * (2,766)	-76,29 ** (24,777)	-0,646 *** (0,054)	-0,691 (0,488)	2,897 (7,201)	419,94 ** (140,335)
Horta	-44,831 (49,598)	0,839 (3,421)	-20,193 * (8,513)	-70,41 * (28,824)	0,075 (0,079)	-1,405 * (0,599)	5,327 (10,049)	-272,040 (169,773)
Leiria	96,826 (116,584)	5,650 *** (1,433)	-7,499 ** (2,424)	-59,362 * (24,661)	-0,428 *** (0,050)	-0,745 . (0,406)	0,280 (6,286)	290,69 ** (101,816)
Lisboa	297,497 . (165,471)	27,031 ** (9,463)	1,606 (2,682)	-59,691 * (24,551)	-0,661 *** (0,050)	-0,548 (0,400)	1,010 (6,197)	720,4 *** (109,762)
Ponta Delgada	-73,001 . (42,752)	5,754 ** (1,816)	-15,26 *** (2,750)	-50,087 * (25,355)	-0,040 (0,063)	0,978 * (0,463)	9,305 (6,634)	435,4 *** (102,781)
Portalegre	-32,149 (39,507)	8,032 *** (2,408)	4,288 (3,102)	-59,193 * (24,796)	-0,613 *** (0,059)	0,366 (0,719)	-9,708 (7,479)	434,1 *** (109,336)
Porto	84,437 . (48,491)	15,09 *** (1,655)	-0,758 (2,515)	-63,081 * (24,551)	-0,457 *** (0,049)	-0,485 (0,396)	0,222 (6,186)	625,8 *** (121,167)
Santarém	115,434 (85,818)	10,94 *** (2,339)	7,711 (12,083)	-58,373 * (24,611)	-0,482 *** (0,052)	-0,805 . (0,415)	-7,909 (6,311)	369,5 *** (104,865)
Setúbal	299,697 * (124,906)	10,92 *** (1,668)	3,414 (3,425)	-59,527 * (24,573)	-0,582 *** (0,050)	-0,849 * (0,411)	-3,680 (6,373)	478,7 *** (113,286)
Viana do Castelo	-62,455 (39,204)	8,77 *** (1,630)	-3,111 (2,641)	-56,662 * (24,648)	-0,387 *** (0,055)	-1,119 ** (0,431)	0,442 (6,520)	535,2 *** (107,343)
Vila Real	201,777 (195,021)	1,464 (1,451)	-13,16 *** (2,844)	-56,849 * (24,777)	-0,427 *** (0,054)	-1,359 ** (0,462)	-3,571 (6,999)	535,2 *** (107,343)
Viseu	-57,593 (45,283)	5,736 *** (1,370)	5,025 (11,938)	-65,52 ** (24,584)	-0,404 *** (0,053)	-0,921 * (0,421)	2,048 (6,469)	525,9 *** (110,461)

Table 8: OLS regression results isolating firm size with CAE and district

Prompts Lists

Can you check this sentence to detect any grammatic errors, please?

Can you help me to find some news that supports the negative impact of Covid?

I am going to study capital structure of Portuguese firms; can you give me some insights regarding what I should discuss?

How should I structure an introduction for a master thesis?

Do you understand what I mean with the following sentence?

Can you help me on how to numerate the pages in my thesis? The rules are attached in the print screen.