
# The Global Financial Crisis, the European Sovereign Debt Crisis and the COVID pandemic: The Case of Portuguese Micro, Small and Medium Enterprises

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# Abstract

This thesis measures and compares the impact of the global financial crisis, European sovereign debt crisis and COVID pandemic on Portuguese Micro, Small and Medium enterprises' Revenues, using data from 350,265 unique firms from the period of 2001 to 2025. This thesis concludes that the global financial crisis and European sovereign debt crisis, collectively, had a similar impact than the COVID pandemic, resulting in decreases of around 44% to 46% of Revenues. It also concludes that the impact of the COVID pandemic was more persistent in time than the global financial crisis and European sovereign debt crisis collectively. The findings also suggest an "inverted parabolic" relationship between firm size and crises resilience, as Small firms were the most affected type of firm during the periods of crises studied.

Esta tese mede e compara o impacto da crise financeira mundial, da crise de dívida soberana europeia e da pandemia COVID nas receitas das Micro, Pequenas e Médias empresas portuguesas, usando dados de 350,265 empresas desde 2001 a 2025. Esta tese conclui que a crise financeira mundial e a crise de dívida soberana europeia, juntamente, tiveram um impacto similar à pandemia COVID, resultando na diminuição de 44% a 46% das receitas. Também conclui que a pandemia COVID teve um impacto mais persistente no tempo que a crise financeira mundial e que a crise de dívida soberana europeia, juntamente. As conclusões sugerem uma relação de "parábola invertida" entre o tamanho das empresas e a sua resiliência durante períodos de crise, pelo que as Pequenas empresas foram o tipo de empresa mais afetado pelas crises estudadas.


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**Manuel Falé Nobre**



**Keywords:** global financial crisis, European sovereign debt crisis, Micro enterprises, Small enterprises, Medium enterprises, SMEs, Portugal

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# Table of Contents

*1. Introduction* ..... *1*

*2. Literature Review* ..... *4*

*3. Sample* ..... *7*

*4. Methodology* ..... *10*

*5. Results & Discussion* ..... *14*

*5.1. Heckman correction* ..... *14*

*5.2. Global financial crisis and European sovereign debt crisis vs COVID pandemic: general performance comparison* ..... *17*

*5.3. Global financial crisis and European sovereign debt crisis vs COVID pandemic: industry performance comparison* ..... *24*

*5.4. Global financial crisis and European sovereign debt crisis: within crisis comparison* ..... *31*

*5.4.1. General Performance* ..... *31*

*5.4.2. Industry Performance* ..... *33*

*5.5. COVID pandemic: within crisis comparison* ..... *35*

*5.5.1. General Performance* ..... *35*

*5.5.2. Industry Performance* ..... *36*

*6. Conclusions and Limitations* ..... *38*

*Disclaimer* ..... *40*

*Bibliography* ..... *41*

*Appendix* ..... *47*

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# 1. Introduction

In the past decades, two macroeconomic shocks impacted the world: the global financial crisis of 2007-09, accompanied by the European sovereign debt crisis of 2008-2012, and the COVID pandemic of 2020. Both crises were structurally different, with very different starting points, but both with a significant impact. In this study, I attempt to measure and compare the impact of these macroeconomic shocks on Portuguese Micro, Small and Medium enterprises (SMEs) through a Firm Fixed Effects model, combined with a Heckman Correction to account for sample selection bias. I attempt to measure the impact of the crisis in firm performance and explain if firm characteristics such as size or industry had any impact on it. To better understand the impact of these shocks, highlight the relevance of this work, and give overall context, an overview of both crisis is important.

The global financial crisis began in the United States of America (USA) and was the result of a housing market bubble. From the early 1990s until mid-2000s, the American housing market was growing at a pace that was never seen in history. Its raise was a result of various factors, from legislation facilitating house mortgages to low-income borrowers (named "subprime lending") to a growing financial market based on housing. Average home prices more than doubled from 1998 to 2006, the largest increase in history and home ownership rose from 64% of USA's GDP in 1994 to 69% in 2005 (Council on Foreign Relations, 2025). This expansion was accompanied by a growth in housing mortgage borrowing, in a period of time marked by low interest rates. The financial sector enjoyed from this growth and largely contributed to crisis. In fact, by mid-2008, more than 60% of all USA's mortgages were "securitized" (IMF, 2009), i.e. 60% of mortgages (residential, commercial, and others) were pooled with many others and sold as a "mortgage-backed securities", that were traded in financial markets. Pooling these assets created a great advantage for banks when it came to risk management, as by having a large number of mortgages bundled together, the impact of a singular default was mitigated. However, it was this reasoning that led to an abnormal number of subprime loans being granted every day and pooled with others (many of these loans had adjustable rates, beginning with introductory low rates, and no income verification). When house prices began to fall in the first quarter of 2007, the subprime industry collapsed with many subprime lending firms declaring bankruptcy. Stock markets reacted negatively, with the Dow Jones Industrial Average recording its largest loss since 9/11 (Council on Foreign Relations, 2025).

The crisis snowballed into a wide-spread economy recession, with the Government bailing out some of the largest US firms, such as AIG (largest insurer in the US) and automakers General Motors and Chrysler. Lehman Brothers, one of the largest investment banks at the time for more than 150 years, filed for bankruptcy as well. The unemployment rate went from 5 to 10%, and the GDP decreased by 4.3%, making it the deepest recession since World War 2 (Federal Reserve History, 2013) For a complete analysis and retrospective of this crisis, check Chen, Wenjie, Mrkaic and Nabar, 2019, and JPMorgan, 2020.

The crisis that started in the US rapidly found its way to Europe grounds, initially through the banking sector. European Banks were also involved in US sub-prime mortgage securitization, taking as heavy losses as their American peers. European Banks started to deleverage their balance sheets and to close down credit lines, cutting lending into the economy. Together with the decrease in exports to the United States, Europe was in a crisis of its own, with rising unemployment, a crisis that had an unequal effect amongst Member States (Szczepanski, 2019). In response, Members States undertook measures, alongside with the European Central Bank, to boost the economy. Measures were taken to support the banking sector, by increasing bank's liquidity and by local government's recapitalizing and bailing out banks when needed. Local governments also adapted fiscal policies by increasing public investment, relieving taxes and granting subsidies. These fiscal policies were funded by public debt, leading to record high public debt in countries like Greece, Ireland and Portugal. In the years preceding the crisis, sovereign bonds markets were considering Germany and the countries mentioned before as equally risky, with their respective bond spreads being close to zero (Lane, 2012). However, as the crisis developed, investors fled from peripherical "riskier" countries to central "safer" countries like Germany or France. This led to a rise of bond spreads and yields that together with the large amount debt governments took to salvage their economy, lead to an unsustainable financial situation of these countries.

Ireland, Greece, Spain, Cyprus and Portugal needed the intervention of the European Financial Stabilization Mechanism, the European Financial Stability Facility and the International Monetary Fund, that aided them through financial packages. The programmes were conducted and concluded, with countries expected to begin repaying the debt in the early 2030s (European Stability Mechanism, 2025). For a complete analysis of this crisis and its impact on European countries like Spain and Portugal, check Hobelsberger et al. 2022, and Afonso, António and Verdial, 2020.

Economies eventually recovered from this crisis and were beginning to grow and to prosper, until December 2019, when cases of a novel coronavirus were first detected. The situation escalated, and on March 2020 the World Health Organization (WHO) declared the outbreak as a pandemic (WHO, 2025). The pandemic impacted the world economy and caused a generalized disruption in production and supply chains, with countries being forced to close boarders, preventing the normal flow of people, goods, capital and services. Generalized lockdowns were declared to prevent the spread of the virus, something that cutback consumption, forcing many firms worldwide to close temporarily. In the Eurozone, real GDP declined 6.5% in 2020, with countries like Portugal and Spain bearing the largest losses (9.1% and 9.3%, respectively), as countries where tourism carries a big weight in the economy, strongly affected by the international travel bans (Muggenthaler et al. 2021). As vaccines were being developed and launched to the market, and countries' vaccination plans underway, countries began to re-open and the world economy began to recover, with some countries like the USA, Netherland and Sweden quickly exceeding pre-pandemic GDP levels (Valla et al. 2022). For comprehensive analysis of the impact of the pandemic on economies and businesses, check Apedo-Ama et al. 2020, and World Bank (2022).

Looking back on time, history stands out one country that felt both crises in a unique way: Portugal. First, because Portugal was one of the European economies most affected by the global financial crisis (and the subsequent European sovereign debt crisis), and again one of the European economies most affected by the COVID pandemic. This makes the impact of both more visible on data, thus providing a good setting to research on how these crises affected firm performance. Another interesting fact is that Portugal is the 2$^{nd}$ country in the EU with highest number of SMEs per 1000 inhabitants (106), only behind Slovak Republic with 108 (Schulze et al. 2025). SME's account for 99% of the non-financial enterprises in Portugal (INE. 2025), hence studying the impacts that these enterprises faced during these periods is a relevant study on the overall economy. In addition to that, Portugal's law provides accounting data transparency, allowing any person, private or public entity to consult a firm's annual accounting reports (Ministério da Justiça, 2025).

This study is organized as follows: Chapter 2 presents a brief literature review on Micro, Small and Medium enterprises and crises; Chapter 3 and 4 present the sample and the statistical approached used, respectively; Chapter 5 presents the results and discusses the findings. conclude in Chapter 6.

## 2. Literature Review

Before diving into the literature landscape, a definition of Micro, Small and Medium enterprises is in order. According to the European Union recommendation 2003/361 (EU, 2003), Micro, Small and Medium enterprises are defined as follows: Micro enterprises are firms with less than 10 employees, and yearly Revenues or balance sheet bellow €2 million; Small enterprises are firms with less than 50 employees, and yearly Revenues or balance sheet bellow €10 million; Medium enterprises are firms with less than 250 employees, yearly Revenues bellow €50 million or balance sheet bellow € 43 million.

Micro and SMEs are the bedrock of economies. Employing 48% of the population of the European Union (Eurostat, 2024), they are associated with economic growth (Beck, Demirgüç-Kunt and Levine, 2005), and their predominance in economies highly depend on different factors like entry costs, property registration costs and effective credit information sharing systems (Ayyagari et al. 2007).

Most of the existing literature focuses on constraints that SMEs face, with a large focus on limited access to financing. Being unlisted, they cannot use the stock market to obtain funds and mainly rely on credit from financial institutions like commercial banks to grow (La Rocca et al. 2009). Binks, Martin and Ennew (1996) concluded that a firm's "relative youth" can indeed imply a credit constraint, with bank relationships also playing a part on this. Bank relationships are further explored by Berger, Allen and Udell (1995) and Petersen, Mitchell and Rajan (1994), concluding that small firms with longer banking relationships borrow at lower interest rates than other small firms. Limitations to financing prevent SMEs to fully exploiting their growth (Wagenvoort, 2003) and are mostly due to the limited reputation derived from short track record (Diamond, 1989), creating a situation of information asymmetry. This has been researched in Portugal also, with Serrasqueiro and Nunes (2012) arriving at the same conclusions.

In practice, this is proven by a Europe Central Bank's study, that concludes that SMEs have more obstacles to obtaining a bank loan (mainly from discouragement and loan rejection) than larger firms (European Central Bank, 2025), which ultimately result in smaller firms using less external finance than larger firms (Beck et al. 2008). Even within smaller firms, high growth SMEs do not seem to have easier access to financing that non-high growth SMEs (Brown, Ross, and Neil Lee, 2019).

This makes the ability to access funds crucial to firms avoiding financial distress situation (specially in periods of crises), highlighting the importance of banks as liquidity providers (Kashyap et al. 2002), hence making SMEs extremely sensitive to changes in bank lending conditions (Robb, Alicia and Robinson, 2014). This reinforces the interest of studying SMEs during periods of crisis, making Portugal a good geography to study this, as in the European sovereign debt time period, bank lending as one of the first things to be cut. As Leão, João, Martins and Gonçalves, 2014 concluded, during the European sovereign debt crisis, limits to financing were one of the main constraints to overall investment and competitiveness of Portuguese firms.

Other authors have also studied lending to SMEs during periods of crises, like Chodorow-Reich, Gabriel, et al (2022) that analysed SME lending during the COVID pandemic, concluding that banks applied more stringent criteria to the drawdown of credit lines by SMEs than by large firms. In fact, tight credit supply conditions for SMEs tend to prolong even after periods of crisis (Armstrong, Angus, et al, 2013). Studying credit constraints on SMEs during crisis has led to an interest in studying SME's overall capital structures. Some authors suggest that SME's capital structure determinants on leverage do not change during periods of economic crises (Balios, Dimitris, et al. 2016), while others present the opposing view, as D'Amato (2020) presenting the Italian case, concluding that Italian SMEs did decrease their leverage during the European sovereign debt crisis, and Demirgüç-Kunt, Peria and Tressel (2020) concluding that deleveraging and debt maturity were significant during this period. In Portugal, deleveraging seems to be what happened, according to Proença, Laureano and Laureano, 2014.

In the end, SMEs that are pushed away from contracting debt from financial institution end up resourcing to the alternative of trade credit instead (Carbo-Valverde, Fernandez and Udell, 2016 and Casey and O'Toole, 2014).

Governments recognize this overall issue and employ policies in attempt to counter them. As such, there is also a vast literature studying the impact of these policies on SMEs, not only those that facilitate capital access to SMEs, but also policies of training programs to micro and SME's business managers (McKenzie and Woodruff, 2014). Regarding policies towards capital access, they are proven to help firms increasing investment and employment during times of crisis (Bonfim, Custódio and Raposo, 2023). These have positive impact on firm performance, as well as employment generation and labour productivity, especially in

developing countries (Cravo, Tulio, and Piza, 2016). However, the impact of such policies is also questioned, as to in which point in a firm's growing process they work the most (Grimm, Michael and Paffhausen, 2015). Anderson et al. 2021 points out that, during times of crisis, they might actually lead to SME "zombification", i.e, firms continuing to operate when financially unviable, with their existence being prolonged by policies like this.

A relevant focus of the literature, and the most relevant to this thesis is the study of the relation between firm size amongst Micro, Small and Medium enterprises and crises resilience The notion that "the larger the firms, the larger the more resilient they are to crises" is highly questioned by researchers, with some like Smallbone (2012) concluding that such relation doesn't exist, arguing that it all depends on each firm's specific strategy. Ferreira and Saridakis (2017) concluded the opposite and found that in Portugal Micro enterprises were far less resilient to the global financial crisis and European sovereign debt crises that Large firms. I will attempt to contribute to this debate with this thesis.

Research on SMEs also dives into the strategic orientation of these businesses, in different aspects, like productivity (Chen, Lee, 2023), effects of internationalization, (Lu, Jane and Beamish, 2001) (Julien, Pierre-André and Ramangalahy, 2003) R&D offshoring (Rodríguez, Alicia and Nieto, 2016) and M&A activity (Bauer, Florian and Matzler, 2014).

Overall, current research mainly focuses on the challenges smaller firms face, and how they deal with them. Another large focus of academia related to the latter is understanding the dynamics of these firm's capital structures given such challenges, and what drives them in normal and in crises periods. From my research, I found a lack of research on Micro enterprises, as most of the literature focuses on SMEs. This is expected as data availability can be the main obstacle of pursuing this, leaving the Micro enterprise scope under researched. In addition to that, to the best of my knowledge, I found that research on Micro, Small and Medium enterprises' performance during periods of crises lacking, as most research focuses on the previous topics. With this, I attempt to make a contribution to this field, taking advantage of the Portuguese data availability, not only by including a significant number of Micro enterprises in my sample, but also by attempting to quantify and compare the impact of the recent crises in Micro, Small and Medium enterprises, on a country that was one of the most affected by the previous crises.

## 3. Sample

I gathered data from Orbis's database SABI (*Sistema de Análise de Balanços Ibéricos* – "Iberian Balance Sheet Analysis System"), a database containing information of more than one million Portuguese firms. Only those with at least four years of available data were retrieved, to ensure a consistent panel data structure and relieve any issues related to excessive unbalance in the panel. I also retrieved unconsolidated accounts only to avoid any firm duplication. Applying these filters allowed me to retrieve data on 350,265 unique firms from the period of 2001 to 2025, giving a total of 4,677,667 firm-year observations.

To attribute an industry classification to each observation, I used the CAE Rev. 3 code (Portugal's code of classification of economic activities) and followed the approach used by Serrasqueiro, Leitão and Smallbone (2021) to classify each firm in the following industry groups: (1) "Agriculture, Forestry, Fishing and Mining"; (2) "Construction"; (3) "Manufacturing"; (4) "Transport, Storage and Communication"; (5) "Wholesale and Retail"; and (6) "Services". For a detailed view of how each firm was attributed to each industry, check Appendix Table 1.

In addition, I perform winsorization to all the variables in order to deal with extreme values that can distort the analysis. I winsorized each variable between the 1st and 99th percentiles within each year, industry and size group. Table 1 shows the distribution of firms recorded in the sample per industry.

**Table 1**
Distribution of Sample Firms by Industry

| Industry | Number of firms | Revenues | | ROA | | Leverage | |
|---|---|---|---|---|---|---|---|
| | | Mean | Median | Mean | Median | Mean | Median |
| Agriculture, Forestry, Fishing and Mining | 49,866 | 888.85 | 166.48 | 0.47 | 2.52 | 79.55 | 65.45 |
| Construction | 33,525 | 509.27 | 155.85 | 0.89 | 2.45 | 77.58 | 68.66 |
| Manufacturing | 14,447 | 1,488.81 | 288.69 | - 0.32 | 2.39 | 83.87 | 66.80 |
| Transport, Storage and Communication | 16,020 | 442.43 | 52.18 | - 4.90 | 1.91 | 82.01 | 50.21 |
| Wholesale and Retail | 80,964 | 1,103.11 | 247.85 | - 1.50 | 2.30 | 90.72 | 69.90 |
| Services | 155,443 | 393.00 | 95.13 | - 5.21 | 2.63 | 107.41 | 64.30 |

This tables shows the distribution of firms in our sample by industry. Revenue is in €thousands. Return on Assets (ROA) and Leverage are in percentage.

Table 1 shows that in the sample we have a bigger number of firms on the "Services" industry, comprising of 44% of the firms in the sample. Regarding Revenue, the "Manufacturing" industry stands out as having the highest mean and median. Overall, the firms in the sample have significant Leverage, with no mean or median below the 50% value.

Table 2 shows summary statistics of the relevant variables discriminated by size.

**Table 2**
Summary Statistics

| | Mean | Std. Dev. | p25 | Median | p75 | Observations |
|---|---|---|---|---|---|---|
| **Panel A: Micro** | | | | | | |
| Revenue | 191.95 | 258.60 | 40.97 | 99.31 | 226.38 | 3,652,305 |
| ROA | -4.24 | 51.11 | -3.77 | 2.34 | 10.66 | 3,754,833 |
| Leverage | 101.10 | 206.38 | 33.22 | 66.96 | 94.55 | 3,783,983 |
| Total Assets | 237.10 | 320.60 | 40.85 | 111.46 | 287.74 | 3,783,962 |
| **Panel B: Small** | | | | | | |
| Revenue | 1,531.82 | 1,599.43 | 494.05 | 948.33 | 1,924.79 | 554,467 |
| ROA | 3.74 | 16.47 | 0.55 | 3.20 | 9.27 | 554,473 |
| Leverage | 66.73 | 43.82 | 42.89 | 64.13 | 81.78 | 554,553 |
| Total Assets | 1,404.15 | 1,570.00 | 366.27 | 833.39 | 1,808.10 | 554,553 |
| **Panel C: Medium** | | | | | | |
| Revenue | 8,638.59 | 8,317.51 | 3,004.21 | 5,751.60 | 11,159.22 | 79,749 |
| ROA | 4.55 | 12.91 | 0.52 | 3.37 | 9.34 | 79,740 |
| Leverage | 63.49 | 32.34 | 43.64 | 63.18 | 78.87 | 79,759 |
| Total Assets | 7,812.85 | 7,684.71 | 2,290.91 | 5,197.73 | 10,666.84 | 79,759 |

This table shows summary statistics for each size category in the sample: Micro, Small and Medium enterprises. Revenue and Total Assets are in €thousands. Return on Assets (ROA) and Leverage are in percentage.

In the sample, larger firms have higher average Revenues and ROA, showing a "scale" effect. Micro enterprises appear to be the most leveraged in the sample, with the highest mean and median. Within the microenterprise size group, there is a "special" type of entities consisting of firms with only one employee throughout the whole sample period. These firms consist of self-employed individuals (freelancers, entrepreneurs, etc) who register their economic activity as a firm. While they may formally present only one employee, they may also have, for most of the time, more employees that are hired as "independent workers" (in Portugal's "*Recibos Verdes*"). This system allows this firms to have more structural flexibility, making them more adaptable during crisis.

There are about 57,452 firms in the sample with only one employee, most of them in the "Services" and "Wholesale and Retail" industries. Table 3 provides the summary statistics of this group.

**Table 3**
Summary Statistics of Micro enterprises with one employee

| | Mean | Std. Dev. | p25 | Median | p75 | Observations |
|---|---|---|---|---|---|---|
| Revenue | 72.62 | 124.67 | 16.72 | 36.16 | 76.50 | 536,123 |
| Return on Assets | -4.83 | 60.85 | -4.76 | 2.40 | 14.40 | 563,949 |
| Assets | 187.76 | 317.10 | 19.96 | 55.75 | 188.25 | 571,397 |
| Leverage | 103.64 | 230.58 | 21.28 | 62.08 | 97.07 | 571,401 |

This table shows summary statistics for Micro enterprises with one employee. Revenue and Total Assets are in €thousands. Return on Assets (ROA) and Leverage are in percentage.

In this case, it is curious to note that "Leverage" here consists of personal credit that self-employed individuals undertake in their activity.

Finally, Table 4 presents of the correlation matrix of all the relevant variables.

**Table 4**
Correlation Matrix

| | **Revenue** | **ROA** | **Total Assets** | **Leverage** |
|---|---|---|---|---|
| **Revenue** | 1.0000 | 0.0477 | 0.6148 | -0.0408 |
| **ROA** | 0.0477 | 1.0000 | 0.0352 | -0.6242 |
| **Total Assets** | 0.6148 | 0.0352 | 1.0000 | -0.0447 |
| **Leverage** | -0.0408 | -0.6242 | -0.0447 | 1.0000 |

## 4. Methodology

I use panel data to measure the impact of crises on Revenues. I decide to Log transform the Variable "Revenues" to treat possible "right skewness" and facilitate the interpretability of the coefficients.

I decide to use a firm-fixed effects model for the purpose of measuring and comparing the impact of the crises in the firms of the sample. This allows to control for unobserved heterogeneity, as the firm's fixed effects absorb any time-invariant characteristics of the firms. Firm's individual characteristics like company culture or management quality are not random and may influence the outcome and the predictor variables, hence creating the need to control for them (better managed firms may outperform badly managed firms during crisis, for example). This makes the model capture the "within firm" variations, i.e, whether in the time of analysis did performance change or not, and what might have impacted it.

To test the suitability of this model formally, I performed the Hausman (1978) test. The Hausman test is a statistical method used to determine whether a fixed effects or a random effects model is the most appropriate for a specific situation by testing the correlation between the error terms and the regressors themselves. The main difference between both these options is that a fixed effect model assumes that the error terms are correlated with the regressors, whilst a random effect model assumes that they are not. The Hausman test essentially tests which model, a fixed effect or a random effect model better fit the data. Out of the 24 regressions I ran, only 4 of them did the Hausman test pointed out that random effects were a more appropriate model (Appendix Table 2 and Appendix Table 3).

Hence, firm fixed effects models are used in this study, given that on the majority of the models, fixed effects are more appropriate, and that conceptually and in this particular study, it is reasonable to assume that the error terms are correlated with the regressors.

Having the type of model selected, I address another possible issue arising from the analysis: sample selection bias. Throughout the sample there are some firms that ceased their activity, for example by declaring insolvency. Only considering the firms that are survived the crises would bias the results, as I would only consider the portion of the firms that managed to perform. To address this, I perform a Heckman (1979) correction, much like Serrasqueiro and Nunes (2012) did to address Portuguese SMEs. A Heckman correction consists of using a two-step estimation method, where at first it consists of running a probit regression with all the firms (surviving and non-surviving), taking as a dependant variable a dummy that equals to one if the

firm is active and zero if otherwise. To this probit regression I add three variables with the goal of predicting survival: *Current Ratio*$_{it}$, which equals to Current Assets / Current Liabilities; a dummy *Negative Book Value of Equity*$_{it}$ that equals to one if the Book Value of Equity of a firm is negative, zero otherwise; and *Negative Retained Earnings*$_{it}$ that equals to one if the Retained Earnings of a firm are negative, zero otherwise. The *Current Ratio*$_{it}$ evaluates a firm's ability to repay is short-term financial obligations with its short-term assets. A low *Current Ratio*$_{it}$ indicates that the firm has considerable risk of financial distress in the short term; *Negative Retained Earnings*$_{it}$ indicate that a firm's profits haven't occurred significantly enough for a period of time to offset long-term series of losses and *Negative Book Value of Equity*$_{it}$ occurs when the Retained Earnings have become so negative that they offset the shareholder's capital. I decide to also include the outcome variable of interest lagged (*Ln (Revenue)*$_{i,t-1}$) as an explanatory variable in the selection equation. In addition to the variables mentioned, I also add *Leverage*$_{it}$, defined as (Total Liabilities / Total Assets) as an explanatory variable, industry dummies ("Services" omitted) and year fixed effect dummies ($\lambda_t$). The selection equation looks as follows:

$$Prob\ (Surviving\ or\ not)_{it} = \alpha_{it} + \beta_1\, Ln\ (Revenue)_{i,t-1} + \beta_2\, Current\ Ratio_{i,t-1} +$$

$$\beta_3\, Negative\ Book\ Value\ of\ Equity_{i,t-1} + \beta_4\, Negative\ Retained\ Earnings_{i,t-1} + \beta_5\, Leverage_{i,t-1} +$$

$$\sum_s \beta_s\, Industry_i + \lambda_t + \varepsilon_{i,t}$$

After running the probits, a metric named Inverse Mill's Ratio (IMR) is computed. It is the ratio of the normal probability density function to the normal cumulative distribution function, evaluated at the probit index, i.e, it represents a "value" from the probit model that summarizes how likely each firm is to survive, at each point in time. With this variable, the main regression equations are computed only with the surviving firms, and the Inverse Mill's Ratio is used as an additional explanatory variable.

I decide to run the selection equation through the entire sample, covering both crises, and obtain the subsequent IMR for each observation. A crisis-specific selection equation would be the ideal way to capture each specific crisis' survival likelihood function, however there was not enough variability in the sample of surviving and non-surviving firms within each specific crisis for the probit regressions to converge.

One important setting for this research is defining the time periods of the crises. I follow the Portugal's gross domestic product (GDP) data from the Portuguese's Institute of Statistics (*Instituto Nacional de Estatística* – INE 2025), using the periods of negative GDP change as reference. As such, I define the global financial crisis and the European sovereign debt crisis as one crisis, that started in the 4th trimester of 2008 and lasted until the 3rd trimester of 2013 (inclusive) and the COVID pandemic, that happened from the 1st trimester of 2020 until the 1st trimester of 2021 (inclusive). To isolate the impact of the crises on the relevant outcome variables, I create the dummies $During_{it}$ , that equals to one if the observation is within the crisis period, zero otherwise; and $After_{it}$, that also equals to one if the observation is within the "after" crisis period, zero otherwise, leaving the "before" period omitted. I set the "after" crisis period as the time window right after each crisis, with exact same length as the crisis itself. To ensure that there is no "contamination" of the $During_{it}$ and $After_{it}$ variables, I ensure that, for any of these dummies to be one, that the entire fiscal year of each firm needs to be inside of each variables' time window. This means, for example, that for a firm that reported its accounts in 31/01/2020, that year's observation will not trigger the $During_{it}$ dummy (because on this fiscal year, eleven months are "pre-crisis" period), but next year's will. This ensures that the $During_{it}$ and $After_{it}$ variables reflect entirely the periods of crises, and their aftermath.

Regarding studying the crises effect on each type of firm (Micro, Small and Medium), I categorize each of them by locking the size of firms before each crisis. For example, if a firm is "Small" in the last observation before the COVID pandemic, it will be considered "Small" for the whole period of the regression.

In terms of standard errors, I decide to use clustered standard errors, more specifically clustered by firm. Cluster-robust standard errors are a statistical method to correct for autocorrelation within "clusters" of data. In our case, "clusters" can be set as firms, industries or even years. Ideally, it would be optimal to cluster by firm, by industry and eventually by year, i.e, it is not unreasonable to assume that there is correlation between errors within industries ("Wholesale and Retail" firms may react in similar ways during crises) or within years (in the years crises began, all firms are somewhat similarly affected). However, using Cameron and Miller (2015) research as a benchmark, I conclude that the data does not present enough "clusters" to report consistent results. Considering the different time windows of each crisis (with the COVID pandemic being considerably shorter that the global financial crisis + European sovereign debt crisis), the difference in the number of year "clusters" would compromise comparability of results, which is one of the end goals of this work.

As such, firm clustered standard errors are used in order to control for serial correlation and heteroskedasticity of the error terms within firms.

Having the settings defined, the regression equations are the following:

$$\textbf{[1]}\ Ln(Revenue)_{i,t} = \alpha_i + \beta_1 During_{i,t} + \beta_2 After_{i,t} + \lambda\, IMR_{it} + \varepsilon_{i,t}$$

$$\textbf{[2]}\ Ln(Revenue)_{i,t} = \alpha_i + \beta_1 During_{i,t} + \beta_2 After_{i,t} + \sum_s \beta_s^D\, (During_{i,t} \times Industry_i) + \sum_s \beta_s^A\, (After_{i,t} \times Industry_i) + \lambda\, IMR_{i,t} + \varepsilon_{i,t}$$

(Where $\alpha_i$ is the firm's specific "fixed effect" component, $IMR_{it}$ is the Inverse Mill's Ratio and $\varepsilon_{i,t}$ is the error term)

I begin by attempting to measure the "During" and "After" impact of each crisis, by running the regression **(1)** with all the firms pooled together, and then for each size, all for both crises. To further attempt to identify the impacts of the crises on each industry ("Services" omitted), I run the regression **(2)**, running with all firms pooled together, and then for each size, all for both crises.

# 5. Results & Discussion

## 5.1. Heckman correction

I begin by analysing the effectiveness of the Heckman correction applied to all the regressions. Overall, in the selection equations most of the regressors are significant at predicting firm survival. Using Certo et al. (2016)'s recommendations, a comprehensive analysis of the significance of the regressors in the selection equation, the significance of the Inverse Mill's Ratio (IMR) on the main regressions, the correlation between the IMR and the relevant explanatory variables and the Pseudo $R^2$ of the selection equations are needed in order to derive any conclusions regarding the existence and correction of sample selection bias.

Looking at the selection equations only, I conclude that the selection equation performs better as the size of the firms increase, shown in the increase in pseudo $R^2$ from "Micro" sized to "Medium" sized firms. The main regression's IMR coefficients are statistically significant in all regressions ran. Regarding the correlation between the IMR and the relevant explanatory variables (Appendix Table 4), most of the variables present a relatively medium to weak correlation with the IMR. The correlation is collectively lower during the global financial crisis and European Sovereign Debt crisis than on the COVID pandemic, which might indicate that the selection equation is stronger in this crisis. Overall, only very few variables present a strong correlation, with the maximum being of -0.7323.

Combing all the different elements of the Heckman correction, I am confident concluding that the overall selection equations are indeed effective, and thus sample selection bias does exist on this study. Given the significance of the main regression's IMR coefficients, I am confident that sample selection bias is also controlled for in the regressions.

Table 5 presents the selection equation results when all the firms are pooled together. Table 6 presents the selection equation results when the firms are split by size.

**Table 5**
**Selection Equations with pooled sample**

| **Dependent Variable: $Alive_{i,t}$** | |
|---|---|
| **$Ln(Revenue)_{i,t-1}$** | 0.152*** |
| | (87.925) |
| **$Current\ Ratio_{i,t-1}$** | -0.000*** |
| | (-8.637) |
| **Book Value of Equity < 0 $_{i,t-1}$** | -0.150*** |
| | (-27.294) |
| **Retained Earnings < 0 $_{i,t-1}$** | -0.098*** |
| | (-21.211) |
| **$Leverage_{i,t-1}$** | -0.000*** |
| | (-22.526) |
| **Agriculture, Forestry,** | -0.101*** |
| **Fishing and Mining $_i$** | (-11.544) |
| **Construction $_i$** | 0.035*** |
| | (3.369) |
| **Manufacturing $_i$** | -0.071*** |
| | (-4.708) |
| **Transport, Storage** | 0.035** |
| **and Communication$_i$** | (2.436) |
| **Wholesale and Retail$_i$** | -0.139*** |
| | (-18.750) |
| **Constant** | 0.497** |
| | (2.213) |
| **Observations** | 3,490,998 |
| **Number of Firms** | 350,004 |
| **Pseudo $R^2$** | 0.0626 |

This table presents the selection equations corresponding to the Heckman correction's 1st stage. Year fixed effects are included on the regressions but not shown on the table for brevity. Robust z-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 6**
**Selection Equations by firm size**

| **Dependent Variable:** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
|---|---|---|---|---|---|
| **Alive$_{i,t}$** | **Micro** | **Micro[1]** | **Micro[2]** | **Small** | **Medium** |
| **Ln (Revenue)$_{i,t-1}$** | 0.170*** | 0.142*** | 0.172*** | 0.194*** | 0.206*** |
| | (92.831) | (18.671) | (90.955) | (17.370) | (5.580) |
| **Current Ratio$_{i,t-1}$** | -0.000*** | 0.000 | -0.000*** | -0.001*** | -0.002 |
| | (-6.174) | (0.004) | (-6.035) | (-2.642) | (-0.808) |
| **BV (Equity) < 0$_{i,t-1}$** | -0.141*** | -0.112*** | -0.144*** | -0.219*** | -0.496*** |
| | (-25.009) | (-5.886) | (-24.486) | (-6.976) | (-4.129) |
| **Ret. Earnings < 0$_{i,t-1}$** | -0.084*** | -0.051*** | -0.084*** | -0.105*** | -0.213** |
| | (-17.671) | (-3.215) | (-16.899) | (-4.236) | (-2.232) |
| **Leverage$_{i,t-1}$** | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.001 |
| | (-21.687) | (-6.082) | (-21.016) | (-5.386) | (-1.259) |
| **Agriculture, Forestry, Fishing and Mining$_i$** | -0.089*** | -0.033 | -0.092*** | -0.220*** | -0.232 |
| | (-9.706) | (-0.984) | (-9.634) | (-5.595) | (-1.516) |
| **Construction$_i$** | 0.029*** | -0.060 | 0.035*** | 0.142*** | -0.011 |
| | (2.651) | (-1.274) | (3.052) | (2.757) | (-0.039) |
| **Manufacturing$_i$** | -0.083*** | -0.115 | -0.080*** | 0.015 | -0.633*** |
| | (-5.124) | (-1.222) | (-4.870) | (0.254) | (-3.126) |
| **Transport, Storage and Communication$_i$** | 0.043*** | 0.013 | 0.039** | -0.143 | -0.592* |
| | (3.002) | (0.337) | (2.511) | (-1.404) | (-1.728) |
| **Wholesale and Retail$_i$** | -0.153*** | -0.251*** | -0.147*** | -0.160*** | -0.832*** |
| | (-19.843) | (-9.235) | (-18.354) | (-3.509) | (-4.958) |
| **Constant** | 0.844** | -1.454** | 0.779** | -1.099* | 0.916*** |
| | (2.501) | (-2.333) | (2.308) | (-1.864) | (3.012) |
| **Observations** | 3,143,600 | 182,393 | 2,961,205 | 159,231 | 12,503 |
| **Number of Firms** | 320,678 | 25,525 | 295,153 | 13,745 | 1,304 |
| **Pseudo $R^2$** | 0.0637 | 0.0585 | 0.0643 | 0.0762 | 0.15 |

This table presents the selection equations corresponding to the Heckman correction's 1st stage. Year fixed effects are included on the regressions but not shown on the table for brevity. Robust z-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

## 5.2. Global financial crisis and European sovereign debt crisis *vs* COVID pandemic: general performance comparison

I begin with analysing the regression **[1]**'s results, both in the pooled sample regressions and when firms are split by size. For the pooled case:

**Table 7**
**Regression [1]: Comparison of crises with pooled sample**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.615*** | -0.586*** |
| | (-7.227) | (-6.204) |
| **After Crisis$_{i,t}$** | -0.444*** | -0.739*** |
| | (-5.214) | (-7.824) |
| **IMR$_{i,t}$** | -3.910*** | -3.843*** |
| | (-129.381) | (-213.971) |
| **Constant** | 6.531*** | 6.555*** |
| | (76.250) | (69.321) |
| **Observations** | 1,674,764 | 3,080,869 |
| **Number of firms** | 255,398 | 299,546 |
| **Within $R^2$** | 0.108 | 0.138 |
| **Wald F-test** | 9,071*** | 31,951*** |

This table presents the main regression **[1]** with all the firms in the sample pooled together. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Given that $Revenue_{it}$ is log-transformed, for the exact interpretation of the coefficient, I need to "re-do" the log transformation, i.e, the percentual change in $Revenue_{it}$ from each coefficient is equal to: $(e^{\beta} - 1) * 100$. Another important aspect to remember is that the *Before Crisis*$_{i,t}$ is omitted. As such, the *During Crisis*$_{i,t}$ and *After Crisis*$_{i,t}$ are both in relation to the pre-crisis's periods. Considering the *During Crisis*$_{i,t}$ coefficient, for example, the percentual change in Revenues due to the GFC/ Euro. Sov. Crisis in relation to before the crisis is equal to $(e^{-0.615} - 1) * 100$ , that is approximately – 45.95%. Performing this transformation to all the coefficients:

**Table 8**
**Log-conversion of regression [1] coefficients with pooled sample, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$** | -46 % | -44 % |
| **After Crisis$_{i,t}$** | -36 % | -52 % |

On Micro, Small and Medium enterprises as a whole, the global financial crisis and the European sovereign debt crisis caused relatively the same impact to firm's average Revenues as the COVID pandemic did. A significant difference, however, is noticed in the aftermath of both crises. After the global financial crisis and the European sovereign debt crisis, Revenues were still lower than the period preceding the crisis, but not as low as during the crisis, registering a recuperation of approximately 10% of Revenues. The opposite effect is registered on the COVID pandemic, when Revenues were actually lower after the crisis period per se, than during the crisis. There was a lag between overall economic recovery and Micro, Small and Medium enterprises' performance, as Portugal's GDP registered a 16.5% increase in the second trimester of 2021, and 5.5% increase on the trimester after, whilst Revenues actually registered a decrease during these periods. Given that the crises periods are defined using GDP data, some reasons that can explain this behaviour.

The first possible reason can be the "zombification" of firms due to governmental support on credit-support programs during the crisis. They made them "survive" the more intense pandemic period but didn't really solve their structural problems, hence the significant low Revenues in the periods after the pandemic. This goes along with Anderson et al. (2021) analysis, and it was what caused firms that normally don't have financial conditions to perform to "artificially" prolong their life from what they normally can. The share of "zombie" firms tends to more present in periods of economic downturns, and its increased presence is not fully reversed in the subsequent recoveries, as concluded by Banerjee and Hofmann (2018). My results seem to fit in in the authors conclusions. In Portugal, this has also been studied, with Carreira, Teixeira, Carrillo (2022) finding a widespread presence "zombie" firms.

One other possible reason is the change in consumer behaviour derived from the lockdowns. As consumers were limited to their own domiciles, a boom in remote and digitalized services was registered, naturally reducing the business of in-person services. As the lockdowns began to end, consumers didn't particularly adapt the same exact pre-COVID consuming habits, with e-commerce, for example, gaining more predominance, and in-person consumption still being reduced compared to before. Larger, more developed businesses were more able to adapt to the lockdowns and to the new consumer needs, whilst smaller businesses with less resources like the ones studied didn't ( Sheth (2020) ).

Remembering the fundamental nature of both crises, the COVID pandemic was a global crisis, with every economy in the world being directly affected. The first crisis, however, that had a more local focus on peripherical European regions. Given that the scale of these economic downturns is slightly different, it could explain why the impact between both crisis is too.

Analysing by size, Micro and Small enterprises registered the same effect as the pooled case, with the global financial crisis and the European sovereign debt crisis causing relatively the same impact to firm's average Revenues as the COVID pandemic did (Table 10 and Table 14).

Medium enterprises, however, registered a slightly higher revenue decline during the COVID pandemic, of 61%, than in the global financial crisis and the European sovereign debt crisis, of 49% (Table 16). Being larger, they have larger supply chains, leaving them more exposed to supply chain disruptions, which was one of the most impacted areas by the COVID pandemic. Not only that, but having a bigger workforce, they were more affected by the labour shortages due to mandatory quarantine and lockdowns, something that didn't happen in the global financial crisis and in the European sovereign debt crisis. Medium enterprises registered worse Revenues in the aftermath of both crises than in the respective pre-crises' periods, indicating a higher persistence of economic downturn than Micro and Small enterprises.

As mentioned in the "Sample" chapter, microenterprises contain a "special" type of firms, which are firms with only one employee all throughout the sample. To better study this group, I decide to split on the regressions the entire Micro enterprise group in two: the Micro enterprises with only one employee and Micro enterprises with more than one employee (Microenterprise with more than one employee's regression tables can be found in Appendix Table 5). Excluding those with only one employee, the during and after crisis effects are almost identical to the entire microenterprises group.

Looking into the firms with only one employee, the models were unable to compute the after-crisis effects due to no variability in the data. However, a particularly interesting finding is that during the COVID pandemic one-employee firms registered an increase in revenue of approximately 5%. This can be explained by the increase in the freelancing activity, with entrepreneurs resourcing to the internet to provide their services, enjoying from the increase demand of remote services caused by the lockdowns.

I proceeded with diving deeper into the impacts of the crises by running the regression **[2]**, in an attempt to isolate each industry's performance during these periods.

Tables 9 to 16 present the regression results and the respective log-transformation of the coefficients.

**Table 9**
**Regression [1]: Comparison of crises with Micro enterprises**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.828*** | -0.858*** |
| | (-5.330) | (-5.371) |
| **After Crisis$_{i,t}$** | -0.636*** | -0.991*** |
| | (-4.097) | (-6.199) |
| **IMR$_{i,t}$** | -3.694*** | -3.678*** |
| | (-125.337) | (-209.531) |
| **Constant** | 6.457*** | 6.591*** |
| | (41.491) | (41.208) |
| **Observations** | 1,483,543 | 2,767,442 |
| **Number of firms** | 230,925 | 273,541 |
| **Within $R^2$** | 0.12 | 0.148 |
| **Wald F-test** | 8,954*** | 30,984*** |

This table presents the main regression **[1]** with only Micro enterprises. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 10**
**Log-conversion of regression [1] coefficients with Micro enterprises, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$** | -56 % | -58 % |
| **After Crisis$_{i,t}$** | -47 % | -63 % |

**Table 11**

**Regression [1]: Comparison of crises with firms with only one employee**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.145*** | 0.050*** |
| | (-14.651) | (6.103) |
| **After Crisis$_{i,t}$** | | |
| **IMR$_{i,t}$** | -1.508*** | -1.642*** |
| | (-11.819) | (-35.081) |
| **Constant** | 4.234*** | 4.197*** |
| | (111.522) | (602.983) |
| **Observations** | 61,010 | 157,674 |
| **Number of firms** | 13,515 | 21,309 |
| **Within $R^2$** | 0.0225 | 0.055 |
| **Wald F-test** | 117.9*** | 1,585*** |

This table presents the main regression **[1]** with "Micro" sized firms with only one employee all throughout the sample. *After Crisis$_{i,t}$* is omitted due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 12**

**Log-conversion of regression [1] coefficients with Micro enterprises with only one employee, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$** | -13 % | +5 % |

**Table 13**
**Regression [1]: Comparison of crises with Small enterprises**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -1.271*** | -1.132*** |
| | (-8.734) | (-6.663) |
| **After Crisis$_{i,t}$** | -1.183*** | -1.290*** |
| | (-8.124) | (-7.491) |
| **IMR$_{i,t}$** | -3.986*** | -3.786*** |
| | (-29.685) | (-40.183) |
| **Constant** | 8.536*** | 8.409*** |
| | (54.897) | (48.278) |
| **Observations** | 86,509 | 144,558 |
| **Number of firms** | 11,412 | 12,223 |
| **Within $R^2$** | 0.153 | 0.155 |
| **Wald F-test** | 436.4*** | 1,217*** |

This table presents the main regression **[1]** with only Small enterprises. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 14**
**Log-conversion of regression [1] coefficients with Small enterprises, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$** | -72 % | -68 % |
| **After Crisis$_{i,t}$** | -69% | -72 % |

**Table 15**
**Regression [1]: Comparison of crises with Medium enterprises**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.667*** | -0.941*** |
| | (-5.010) | (-5.685) |
| **After Crisis$_{i,t}$** | -0.717*** | -1.024*** |
| | (-5.126) | (-5.440) |
| **IMR$_{i,t}$** | -2.443*** | -2.680*** |
| | (-9.256) | (-8.697) |
| **Constant** | 9.283*** | 9.469*** |
| | (55.755) | (46.996) |
| **Observations** | 6,341 | 11,402 |
| **Number of firms** | 993 | 1,200 |
| **Within $R^2$** | 0.131 | 0.14 |
| **Wald F-test** | 31.91*** | 60.63*** |

This table presents the main regression **[1]** with only Medium enterprises. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 16**
**Log-conversion of regression [1] coefficients with Medium enterprises, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$** | -49% | -61% |
| **After Crisis$_{i,t}$** | -51% | -64% |

### 5.3. Global financial crisis and European sovereign debt crisis *vs* COVID pandemic: industry performance comparison

After reviewing general firm performance, I attempt to discover how individual industries performed and recovered during and after the crises, by running regression **[2]**. Overall, the regressions failed to achieve consistent significant coefficients on most of the industries, with the exception of the omitted industry, "Services". For brevity, only the variables with significant coefficients are displayed on this chapter, with the complete tables being located on the Appendix.

**Table 17**
**Regression [2]: Comparison of industries in crisis with pooled sample**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.767*** | -0.755*** |
| | (-3.465) | (-3.412) |
| **After Crisis$_{i,t}$** | -0.577*** | -0.896*** |
| | (-2.607) | (-4.051) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.463** | 0.613** |
| | (2.058) | (2.482) |
| **During$_{i,t}$ x Transport, Storage, and Communication$_i$** | 0.026*** | -0.001 |
| | (4.837) | (-0.194) |
| **After$_{i,t}$ x Manufacturing$_i$** | 0.449** | 0.664*** |
| | (1.994) | (2.690) |
| **IMR$_{i,t}$** | -3.906*** | -3.845*** |
| | (-129.274) | (-213.952) |
| **Constant** | 6.565*** | 6.597*** |
| | (60.618) | (58.646) |
| **Observations** | 1,674,764 | 3,080,869 |
| **Number of firms** | 255,398 | 299,546 |
| **Within $R^2$** | 0.109 | 0.139 |
| **Wald F-test** | 2,381*** | 8,082*** |

This table presents the main regression **[2]** with all the firms in the sample pooled together. Coefficients that are not statistically significant are not shown for brevity. See this complete regression table in Appendix Table 6. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

In order to read the coefficients in this regression and to review the regression **[2]** it is important to remember that the omitted industry is the "Services" industry. As such, the *During* $Crisis_{i,t}$ and *After* $Crisis_{i,t}$ represent the coefficients of the "Services" industry, and the interaction terms represent the difference in relation to the "Services" industry. This means that in order to derive to the results of to the During and After Crisis for each industry, the correct interpretation implies interacting the *During* $Crisis_{i,t}$ and *After* $Crisis_{i,t}$ with the respective *During* $Crisis_{i,t}$ *x* $Industry_i$ and *After* $Crisis_{i,t}$ *x* $Industry_i$, that merely represent the Revenue differences of the respective industry to the "Services" industry.

For simplicity, the following tables already include this adjustment, presenting each industry's revenue change during and after each crisis.

**Table 18**
**Log-conversion of regression [2] coefficients with pooled sample, rounded to units**

| | GFC / Euro. Sov. Crisis | COVID |
|---|---|---|
| **During $Crisis_{i,t}$ x $Services_i$** | -54% | -53% |
| **After $Crisis_{i,t}$ x $Services_i$** | -44% | -59% |
| **During$_{i,t}$ x Transport, Storage and Communication$_i$** | -51 % | *Non-significant* |
| **After$_{i,t}$ x Manufacturing$_i$** | +13 % | +35% |

Analysing the coefficients, the same effect diagnosed in the previous regression remains relevant on the "Services" industry: relatively same impact of both crises, with the particular effect on the aftermath of the COVID pandemic. This is somewhat expected, both in the pooled case, and when split by size, as the "Services industry" represents around 44% of the firms in the sample.

The "Transport, Storage and Communication" industry had a similar global financial crisis and the European sovereign debt crisis impact to the "Services" industry, with a -51% impact on Revenues during the crisis.

Regarding the "Manufacturing" industry, it is possible to conclude that the industry was able to successfully rebound from both crises, achieving higher Revenue levels than both pre-crisis periods, in both crises (+13% in the global financial crisis and the European sovereign debt crisis; and + 35% in the COVID pandemic). During times of economic downturn and uncertainty it is somewhat expected that consumers overall postpone their consumption to periods of less uncertainty. This means that in the aftermath of both crises, the "pent-up

demand" is released, leading to its surge. In the COVID pandemic, where supply chains were more limited, the re-opening of economies led to a more "explosive" rebound effect.

Analysing by size, giving the significance of the coefficients, the conclusions regarding the "Services" industry are quite similar to ones of regression **[1]**: Micro and Small enterprises on the "Services" industry registered the same effect as the pooled case, with the global financial crisis and the Europe sovereign debt crisis causing relatively the same impact to firm's average Revenues as the COVID pandemic did (Table 20 and Table 24); Medium enterprises on the "Services" industry also registered a slightly higher revenue decline during the COVID pandemic than in the global financial crisis and the European sovereign debt crisis. Medium enterprises on the "Services" industry registered worse Revenues in the aftermath of both crises than in the respective pre-crises' periods.

Elaborating the previous finding that firms with only one employee performed better during the COVID pandemic (Table 22), it is now visible that the "Agriculture, Forestry, Fishing and Mining" , the "Services" , the "Manufacturing" and the "Wholesale and Retail" industries had a revenue increase during the COVID pandemic, with emphasis to the "Wholesale and Retail" and "Manufacturing" industry that performed significantly better than the industries mentioned above. The performance of the "Wholesale and Retail" industry is coherent with the boost in e-commerce during the lockdowns. The performance of the "Manufacturing" industry with only one employee is somewhat particular, and could be explained by the increase in production and demand of "home-made" artisanship, like customized masks, etc, or by the fact that many of these "one-employee firms" have in fact, for most of the time, more employees, that are hired as "independent workers", as mentioned in the Sample chapter. This system allows this firms to have more structural flexibility, making them more adaptable during crisis.

Next, I will analyse the "within crisis" behaviour of firms, attempting to discover which type of firms suffered or recovered more with each crisis.

Tables 19 to 26 present the regression results and the respective log-transformation of the coefficients.

**Table 19**
**Regression [2]: Comparison of industries in crisis with Micro enterprises**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.724*** | -0.733*** |
| | (-3.273) | (-3.335) |
| **After Crisis$_{i,t}$** | -0.517** | -0.853*** |
| | (-2.338) | (-3.882) |
| **During$_{i,t}$ x Agriculture, Forestry,** | -0.411* | -0.497** |
| **Fishing and Mining$_i$** | (-1.857) | (-2.264) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.005 | -0.041*** |
| | (0.923) | (-6.939) |
| **During$_{i,t}$ x Transport, Storage,** | 0.032*** | -0.001 |
| **and Communication$_i$** | (5.992) | (-0.195) |
| **After$_{i,t}$ x Agriculture, Forestry,** | -0.402* | -0.502** |
| **Fishing and Mining$_i$** | (-1.820) | (-2.284) |
| **IMR$_{i,t}$** | -3.688*** | -3.679*** |
| | (-125.183) | (-209.493) |
| **Constant** | 6.477*** | 6.621*** |
| | (48.049) | (47.942) |
| **Observations** | 1,483,543 | 2,767,442 |
| **Number of firms** | 230,925 | 273,541 |
| **Within $R^2$** | 0.12 | 0.15 |
| **Wald F-test** | 1,789*** | 15,090*** |

This table presents the main regression **[2]** with only Micro enterprises. Coefficients that are not statistically significant are not shown for brevity. See this complete regression table in Appendix Table 7. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 20**
**Log-conversion of regression [2] coefficients with Micro enterprises, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$ x Services$_i$** | -52% | -52% |
| **After Crisis$_{i,t}$ x Services$_i$** | -40% | -57% |
| **During$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | -86% | -91% |
| **During$_{i,t}$ x Manufacturing$_i$** | *Non-significant* | -56% |
| **During$_{i,t}$ x Transport, Storage, and Communication$_i$** | -49% | *Non-significant* |
| **After$_{i,t}$ x Agriculture, Forestry Fishing and Mining$_i$** | -73% | -96% |

**Table 21**
**Regression [2]: Comparison of crises with Micro enterprises with only 1 employee**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.170*** | 0.024*** |
| | (-11.533) | (2.684) |
| **During$_{i,t}$ x Agriculture, Forestry,** | 0.036 | 0.034** |
| **Fishing and Mining$_i$** | (1.124) | (2.379) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.118* | 0.132*** |
| | (1.648) | (3.328) |
| **During$_{i,t}$ x Transport, Storage,** | 0.062*** | -0.024 |
| **and Communication$_i$** | (3.527) | (-1.632) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | 0.046** | 0.142*** |
| | (2.246) | (12.451) |
| **IMR$_{i,t}$** | -1.496*** | -1.679*** |
| | (-11.773) | (-35.709) |
| **Constant** | 4.231*** | 4.201*** |
| | (111.881) | (602.684) |
| **Observations** | 61,010 | 157,674 |
| **Number of firms** | 13,515 | 21,309 |
| **Within $R^2$** | 0.0229 | 0.0572 |
| **Wald F-test** | 35.41*** | 473.5*** |

This table presents the main regression [2] with "Micro" sized firms with only one employee all throughout the sample. Coefficients that are not statistically significant are not shown for brevity. See this complete regression table in Appendix Table 8. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 22**
**Log-conversion of regression [2] coefficients with Micro enterprises with only 1 employee, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$ x Services$_i$** | -16% | + 2% |
| **During$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | *Non-significant* | +3% |
| **During$_{i,t}$ x Manufacturing$_i$** | +13% | +14% |
| **During$_{i,t}$ x Transport, Storage, and Communication$_i$** | +6% | *Non-significant* |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | +5% | +15% |

**Table 23**
**Regression [2]: Comparison of industries in crisis with Small enterprises**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -1.330*** | -1.248*** |
| | (-7.144) | (-5.523) |
| **After Crisis$_{i,t}$** | -1.232*** | -1.386*** |
| | (-6.619) | (-6.096) |
| **During$_{i,t}$ x Agriculture, Forestry,** | -0.006 | 0.134*** |
| **Fishing and Mining$_i$** | (-0.505) | (8.961) |
| **During$_{i,t}$ x Construction$_i$** | -0.002 | -0.119*** |
| | (-0.087) | (-5.651) |
| **During$_{i,t}$ x Transport, Storage,** | 0.011 | 0.066* |
| **and Communication$_i$** | (0.440) | (1.855) |
| **During$_{i,t}$ x Wholesale and** | 0.065*** | 0.084*** |
| **Retail$_i$** | (5.209) | (5.358) |
| **IMR$_{i,t}$** | -3.985*** | -3.851*** |
| | (-29.595) | (-40.468) |
| **Constant** | 8.571*** | 8.495*** |
| | (48.417) | (40.932) |
| **Observations** | 86,509 | 144,558 |
| **Number of firms** | 11,412 | 12,223 |
| **Within $R^2$** | 0.153 | 0.16 |
| **Wald F-test** | 722.3*** | 1,634*** |

This table presents the main regression **[2]** with only Small enterprises. Coefficients that are not statistically significant are not shown for brevity. See this complete regression table in Appendix Table 9. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 24**
**Log-conversion of regression [2] coefficients with Small enterprises, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$ x Services$_i$** | -74% | -71% |
| **After Crisis$_{i,t}$ x Services$_i$** | -71% | -75% |
| **During$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | *Non-significant* | -57% |
| **During$_{i,t}$ x Construction$_i$** | *Non-significant* | -82% |
| **During$_{i,t}$ x Transport, Storage, and Communication$_i$** | *Non-significant* | -64% |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | -67% | -62% |

**Table 25**
**Regression [2]: Comparison of industries in crisis with Medium enterprises**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.686*** | -1.164*** |
| | (-4.838) | (-6.251) |
| **After Crisis$_{i,t}$** | -0.753*** | -1.244*** |
| | (-5.236) | (-6.113) |
| **During$_{i,t}$ x Agriculture, Forestry,** | -0.076 | -0.084* |
| **Fishing and Mining$_i$** | (-1.491) | (-1.881) |
| **During$_{i,t}$ x Construction$_i$** | -0.050 | -0.185* |
| | (-0.527) | (-1.724) |
| **During$_{i,t}$ x Manufacturing$_i$** | -0.017 | 0.189** |
| | (-0.301) | (2.032) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | 0.053 | 0.240*** |
| | (1.162) | (4.726) |
| **IMR$_{i,t}$** | -2.453*** | -2.769*** |
| | (-9.337) | (-9.047) |
| **Constant** | 9.320*** | 9.696*** |
| | (55.133) | (44.653) |
| **Observations** | 6,341 | 11,402 |
| **Number of firms** | 993 | 1200 |
| **Within $R^2$** | 0.134 | 0.148 |
| **Wald F-test** | 15.04*** | 26.99*** |

This table presents the main regression **[2]** with only Medium enterprises. Coefficients that are not statistically significant are not shown for brevity. See this complete regression table in Appendix Table 10. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 26**
**Log-conversion of regression [2] coefficients with Medium enterprises, rounded to units**

| | **GFC / Euro. Sov. Crisis** | **COVID** |
|---|---|---|
| **During Crisis$_{i,t}$ x Services$_i$** | -50% | -69% |
| **After Crisis$_{i,t}$ x Services$_i$** | -53% | -71% |
| **During$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | *Non-significant* | -77% |
| **During$_{i,t}$ x Construction$_i$** | *Non-significant* | -86% |
| **During$_{i,t}$ x Manufacturing$_i$** | *Non-significant* | -49% |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | *Non-significant* | -42% |

### 5.4. Global financial crisis and European sovereign debt crisis: within crisis comparison

#### 5.4.1. General Performance

After comparing the impact of both crises, the next step is to investigate how the impact of both crises changed from Micro to Medium enterprises. Table 27 shows the results of regression **[1]** for the global financial crisis and European sovereign debt crisis, for all sizes studied, and Table 28 the correspondent log-transformation.

**Table 27**
**Regression [1]: Comparison of global financial crisis + European sovereign debt crisis by size**

| **Dependent Variable: Ln (Revenue)$_{i,t}$** | **(1) Micro** | **(2) Micro[1]** | **(3) Micro[2]** | **(4) Small** | **(5) Medium** |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$** | -0.828*** | -0.145*** | -0.839*** | -1.271*** | -0.667*** |
| | (-5.330) | (-14.651) | (-5.460) | (-8.734) | (-5.010) |
| **After Crisis$_{i,t}$** | -0.636*** | | -0.648*** | -1.183*** | -0.717*** |
| | (-4.097) | | (-4.219) | (-8.124) | (-5.126) |
| **IMR$_{i,t}$** | -3.694*** | -1.508*** | -3.743*** | -3.986*** | -2.443*** |
| | (-125.337) | (-11.819) | (-125.719) | (-29.685) | (-9.256) |
| **Constant** | 6.457*** | 4.234*** | 6.520*** | 8.536*** | 9.283*** |
| | (41.491) | (111.522) | (42.348) | (54.897) | (55.755) |
| **Observations** | 1,483,543 | 61,010 | 1,422,533 | 86,509 | 6,341 |
| **Number of firms** | 230,925 | 13,515 | 217,410 | 11,412 | 993 |
| **Within $R^2$** | 0.12 | 0.0225 | 0.125 | 0.153 | 0.131 |
| **Wald F-test** | 8,954*** | 117.9*** | 9,000*** | 436.4*** | 31.91*** |

This table presents the main regression (1) split by firm size at the beginning of the correspondent crisis. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

**Table 28**
**Log-conversion of regression [1] coefficients split by firm size**

| | **Micro** | **Micro[1]** | **Micro[2]** | **Small** | **Medium** |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$** | -56% | -13% | -57% | -72% | -49% |
| **After Crisis$_{i,t}$** | -47% | - | -48% | -69% | -51% |

*1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

In the global financial crisis and European sovereign debt crisis, Small enterprises were the most affected, with a higher Revenue drop. The notion "that the larger the firms the more resilient they are to crises" that literature attempts to test (check Literature Review) is put in question here, with the exception of Small and Micro enterprises with only one employee. Micro enterprises with only one employee showed to be the most resilient type of firm with the lowest Revenue drop, most likely due to their small structure and subsequent flexibility. As studied before in the comparison with the COVID pandemic, Medium enterprises pose the exception on being the only firms whose performance after crisis is worse than during the crisis, showing that they economic downturns have a higher persistence on this type of firm. However, during the crisis, Medium firms were less impacted than Micro and Small firms, most likely due to their bigger resource base. In contrast, both Micro and Small firms showed a small recovery effect, of 7% and 9% of Revenues, respectively.

These results suggest a possible non-linear relationship, much like an "inverted parabolic" relationship. Micro and Medium firms, the smallest and largest firms in our sample show more resilience (defined here as a smaller decrease in Revenues due to crises) than the in-between Small firms.

Micro enterprises, having smaller structures, present more flexibility and adaptability to periods of crises (Lai, 2016). Medium enterprises, being larger, seem benefit from the "scale" effect, having a larger resource base to rely on during crises (Smallbone, 2012). This findings suggest that Small enterprises appear to not balance flexibility and scale in the optimal point, being the more exposed type of firm to the global financial crisis and European sovereign debt crisis.

### 5.4.2. Industry Performance

**Table 29**
**Regression [2]: Comparison of global financial crisis + European sovereign debt crisis by industry, by size**

| **Dependent Variable: Ln (Revenue)$_{i,t}$** | **(1)** **Micro** | **(2)** **Micro[1]** | **(3)** **Micro[2]** | **(4)** **Small** | **(5)** **Medium** |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$** | -0.724*** | -0.170*** | -0.736*** | -1.330*** | -0.686*** |
| | (-3.273) | (-11.533) | (-3.357) | (-7.144) | (-4.838) |
| **After Crisis$_{i,t}$** | -0.517** | | -0.530** | -1.232*** | -0.753*** |
| | (-2.338) | | (-2.417) | (-6.619) | (-5.236) |
| **During$_{i,t}$ x Agriculture (…)** | -0.411* | 0.036 | -0.423* | -0.006 | -0.076 |
| | (-1.857) | (1.124) | (-1.931) | (-0.505) | (-1.491) |
| **During$_{i,t}$ x Manufacturing$_{i}$** | 0.005 | 0.118* | 0.006 | 0.120 | -0.017 |
| | (0.923) | (1.648) | (1.042) | (0.663) | (-0.301) |
| **During$_{i,t}$ x Transport (…)** | 0.032*** | 0.062*** | 0.029*** | 0.011 | 0.021 |
| | (5.992) | (3.527) | (5.171) | (0.440) | (0.153) |
| **During$_{i,t}$ x Wholesale and Retail$_{i}$** | -0.285 | 0.046** | -0.280 | 0.065*** | 0.053 |
| | (-0.801) | (2.246) | (-0.799) | (5.209) | (1.162) |
| **After$_{i,t}$ x Agriculture (…)** | -0.402* | | -0.415* | | |
| | (-1.820) | | (-1.895) | | |
| **IMR$_{i,t}$** | -3.688*** | -1.496*** | -3.738*** | -3.985*** | -2.453*** |
| | (-125.183) | (-11.773) | (-125.564) | (-29.595) | (-9.337) |
| **Constant** | 6.477*** | 4.231*** | 6.542*** | 8.571*** | 9.320*** |
| | (48.049) | (111.881) | (49.339) | (48.417) | (55.133) |
| **Observations** | 1,483,543 | 61,010 | 1,422,533 | 86,509 | 6,341 |
| **Number of firms** | 230,925 | 13,515 | 217,410 | 11,412 | 993 |
| **Within $R^2$** | 0.12 | 0.0229 | 0.126 | 0.153 | 0.134 |
| **Wald F-test** | 1,789*** | 35.41*** | 3,445*** | 722.3*** | 15.04*** |

This table presents the main regression **(2)** split by firm size at the beginning of the correspondent crisis. Coefficients that are not statistically significant are not shown for brevity. Missing coefficients are due to no variability in the data. See this complete regression table in Appendix Table 11. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

**Table 30**
**Log-conversion of regression [1] coefficients split by firm size**

| | Micro | Micro[1] | Micro[2] | Small | Medium |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$ x Services$_i$** | -52% | -16% | -52% | -74% | -50% |
| **After Crisis$_{i,t}$ x Services$_i$** | -40% | - | -41% | -72% | -53% |
| **During$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | -86% | *Non-significant* | -86% | *Non-significant* | *Non-significant* |
| **During$_{i,t}$ x Manufacturing$_i$** | *Non-significant* | -3% | *Non-significant* | *Non-significant* | *Non-significant* |
| **During$_{i,t}$ x Transport, Storage, and Communication$_i$** | -49% | -10% | -49% | *Non-significant* | *Non-significant* |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | *Non-significant* | -11% | *Non-significant* | -67% | *Non-significant* |
| **After$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | -85% | - | -86% | - | - |

*1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

Regarding individual industry differences, the "Services" industry follows the track of overall firms with lower Revenues after the period of crisis. Micro enterprises with only one employee working on the "Manufacturing" industry were very resilient to the crisis, showing a small decrease in Revenues. The "Agriculture, Forestry, Fishing and Mining" industry was severely affected by the global financial crisis and European sovereign debt crisis, with the highest Revenue drops out of the significant coefficients. It showed no rebound in the crisis aftermath whatsoever, with Revenues persistently lower than before the crisis. This crisis was significantly marked by a reduction in consumption and commodity prices volatility. Not only that, but the fact that the surrounding European economies also suffered turmoils of their own, can explain the impact on export dependant industries like the "Agriculture, Forestry, Fishing and Mining". This was also registered in neighbour countries like Spain and Italy, having a similar impact in this industry (Crescimanno, Galati, and Ba, 2014).

### 5.5. COVID pandemic: within crisis comparison

#### 5.5.1. General Performance

On the COVID pandemic, Small enterprises were the most affected, showing the largest Revenue drop, much like on the global financial crisis and European sovereign debt crisis, hence demonstrating the same non-linear relationship between size and resilience. In contrast to the previous crisis, none of the different firm sizes displayed any rebound effect, with Revenues being lower on the aftermath of COVID than during the crisis.

**Table 31**
**Regression [1]: Comparison of COVID pandemic by size**

| **Dependent Variable: Ln (Revenue)$_{i,t}$** | **(1)** **Micro** | **(2)** **Micro[1]** | **(3)** **Micro[2]** | **(4)** **Small** | **(5)** **Medium** |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$** | -0.858*** | 0.050*** | -0.893*** | -1.132*** | -0.941*** |
| | (-5.371) | (6.103) | (-5.706) | (-6.663) | (-5.685) |
| **After Crisis$_{i,t}$** | -0.991*** | | -1.025*** | -1.290*** | -1.024*** |
| | (-6.199) | | (-6.548) | (-7.491) | (-5.440) |
| **IMR$_{i,t}$** | -3.678*** | -1.642*** | -3.824*** | -3.786*** | -2.680*** |
| | (-209.531) | (-35.081) | (-208.892) | (-40.183) | (-8.697) |
| **Constant** | 6.591*** | 4.197*** | 6.714*** | 8.409*** | 9.469*** |
| | (41.208) | (602.983) | (42.874) | (48.278) | (46.996) |
| **Observations** | 2,767,442 | 157,674 | 2,609,766 | 144,558 | 11,402 |
| **Number of firms** | 273,541 | 21,309 | 252,232 | 12,223 | 1,200 |
| **Within $R^2$** | 0.148 | 0.055 | 0.157 | 0.155 | 0.14 |
| **Wald F-test** | 30,984*** | 1,585*** | 30,494*** | 1,217*** | 60.63*** |

This table presents the main regression **(1)** split by firm size at the beginning of the correspondent crisis. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

**Table 32**
**Log-conversion of regression [1] coefficients split by firm size**

| | **Micro** | **Micro[1]** | **Micro[2]** | **Small** | **Medium** |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$** | -58% | +5% | -59% | -68% | -61% |
| **After Crisis$_{i,t}$** | -63% | - | -64% | -72% | -64% |

*1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

### 5.5.2. Industry Performance

**Table 33**
**Regression [2]: Comparison of COVID pandemic by industry, by size**

| Dependent Variable: Ln (Revenue)$_{i,t}$ | (1) Micro | (2) Micro[1] | (3) Micro[2] | (4) Small | (5) Medium |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$** | -0.733*** | 0.024*** | -0.768*** | -1.248*** | -1.164*** |
| | (-3.335) | (2.684) | (-3.554) | (-5.523) | (-6.251) |
| **After Crisis$_{i,t}$** | -0.853*** | | -0.887*** | -1.386*** | -1.244*** |
| | (-3.882) | | (-4.107) | (-6.096) | (-6.113) |
| **During$_{i,t}$ x Agriculture (…)** | -0.497** | 0.034** | -0.527** | 0.134*** | -0.084* |
| | (-2.264) | (2.379) | (-2.441) | (8.961) | (-1.881) |
| **During$_{i,t}$ x Construction$_{i}$** | -0.017 | 0.014 | -0.014 | -0.119*** | -0.185* |
| | (-0.077) | (0.654) | (-0.063) | (-5.651) | (-1.724) |
| **During$_{i,t}$ x Manufacturing$_{i}$** | -0.041*** | 0.132*** | -0.038*** | 0.123 | 0.189** |
| | (-6.939) | (3.328) | (-6.354) | (0.551) | (2.032) |
| **During$_{i,t}$ x Transport (…)** | -0.001 | -0.024 | -0.004 | 0.066* | -0.050 |
| | (-0.195) | (-1.632) | (-0.606) | (1.855) | (-0.476) |
| **During$_{i,t}$ x Wholesale and Retail$_{i}$** | -0.334 | 0.142*** | -0.324 | 0.084*** | 0.240*** |
| | (-0.876) | (12.451) | (-0.880) | (5.358) | (4.726) |
| **After$_{i,t}$ x Agriculture (…)** | -0.502** | | -0.533** | | |
| | (-2.284) | | (-2.468) | | |
| **IMR$_{i,t}$** | -3.679*** | -1.679*** | -3.823*** | -3.851*** | -2.769*** |
| | (-209.493) | (-35.709) | (-208.738) | (-40.468) | (-9.047) |
| **Constant** | 6.621*** | 4.201*** | 6.747*** | 8.495*** | 9.696*** |
| | (47.942) | (602.684) | (50.324) | (40.932) | (44.653) |
| **Observations** | 2,767,442 | 157,674 | 2,609,766 | 144,558 | 11,402 |
| **Number of firms** | 273,541 | 21,309 | 252,232 | 12,223 | 1,200 |
| **Within $R^2$** | 0.15 | 0.0572 | 0.159 | 0.16 | 0.148 |
| **Wald F-test** | 273,541*** | 21,309*** | 252,232*** | 12,223*** | 1,200*** |

This table presents the main regression **(2)** split by firm size at the beginning of the correspondent crisis. Coefficients that are not statistically significant are not shown for brevity. Missing coefficients are due to no variability in the data. See this complete regression table in Appendix Table 12. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

**Table 34**
**Log-conversion of regression [1] coefficients split by firm size**

| | Micro | Micro[1] | Micro[2] | Small | Medium |
|---|---|---|---|---|---|
| **During Crisis$_{i,t}$ x Services$_i$** | -52% | +2% | -54% | -71% | -69% |
| **After Crisis$_{i,t}$ x Services$_i$** | -57% | - | -59% | -75% | -72% |
| **During$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | *-91%* | *+5%* | -95% | -57% | -77% |
| **During$_{i,t}$ x Construction$_i$** | *Non-significant* | *Non-significant* | *Non-significant* | -82% | -86% |
| **During$_{i,t}$ x Manufacturing$_i$** | -56% | +16% | -57% | *Non-significant* | -48% |
| **During$_{i,t}$ x Transport, Storage, and Communication$_i$** | *Non-significant* | *Non-significant* | *Non-significant* | -64% | *Non-significant* |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | *Non-significant* | +17% | *Non-significant* | -62% | -42% |
| **After$_{i,t}$ x Agriculture, Forestry, Fishing and Mining$_i$** | -96% | - | -100% | - | - |

*1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

Regarding individual industry differences, the "Services" industry follows the track of overall firms with lower Revenues after the period of crisis, much like on the previous crisis. A curious observation is that, for the "Services" industry, the larger the firm the higher the Revenue drop, showing that the "scale" effect was in fact true in the COVID pandemic when it came to downturns in this industry, i.e, the larger the "Services" firm, the higher the downturn during COVID.

# 6. Conclusions and Limitations

I compare the impact of the impact global financial crisis, European sovereign debt crisis and COVID pandemic on Portuguese Micro, Small and Medium enterprises, using Revenues as the comparison metric. I conclude that the global financial crisis and European sovereign debt crisis, collectively, had a similar impact in Micro, Small and Medium enterprises than the COVID pandemic. I also conclude that the COVID pandemic had a longer-lasting downturn effect than the global financial crisis and European sovereign debt crisis, with the aftermath of the COVID pandemic being marked by lower Revenues than during the crisis period, unlike the aftermath of the global financial crisis and European sovereign debt crisis, when firms demonstrated a slight Revenue recovery. I appoint as motives for this the "zombification" of firms due to credit-support policies (coherent with Anderson et al. (2021)'s findings), that "artificially" prolonged the life of financially unviable firms, and the change in consumer behaviour due to the lockdowns, that fundamentally impacted the business of Micro, Small and Medium enterprises.

I conclude that both during the global financial crisis, European sovereign debt crisis and COVID pandemic, the relationship between firm size and resilience is non-linear, similar to an "inverted parabolic" relationship. Small enterprises, firms with less than 50 employees, and yearly Revenues or balance sheet bellow €10 million, showed poorer resilience than the Micro and Medium enterprises (the respective smaller and larger peers), showing a higher decrease in Revenues in both crises. Using the relationship between scale and flexibility as an explanation to why this happens, Small enterprises seem to be placed in the "between" point of these two traits, resulting in more exposure to crises in comparison to Micro enterprises with small scale and high structure flexibility (Lai, 2016), and Medium enterprises who rely on their larger resource base (Smallbone, 2012).

Overall, this research includes certain caveats that must be considered. The selection equation, part of the Heckman correction for sample selection bias, was made with the whole sample. This neglects the survival mechanism of each specific crisis, which can impact the outcome of the correction procedure. As the crises studied in here are fundamentally different, the factors that predict survival or not in one crisis may not necessarily be the same for all crises. As such and related to what was said in the Methodology chapter, a sample with higher variability of surviving and not surviving firms within both crises' periods would have allowed a crisis-specific selection equation that would provide a more accurate sample bias correction.

Another factor regarding the Heckman correction is the role of exclusion variables. An effective selection equation requires powerful exclusion variables, that in this case, need to strongly impact the outcome of firm survival or not, without directly impacting the outcome variable, which is Revenues. Given that the scope of this study are smaller, non-public firms, the only data available is accounting data, which makes the task of finding such variables a challenge, as most of accounting variables like ratios are inherently correlated with each other. The use of Current Ratio, Book Value of Equity and Retained Earnings as exclusion variables were, to the best of my knowledge, the best available variables to serve as exclusion variables. In order to identify better exclusion variables, I suggest practitioners a possible cross-referencing with any third-party data and/or firm's specific operational data, available on firm's websites, for example.

Related to the data used in this study, it is important to point out that the use of accounting data may also fundamentally pose a challenge to this analysis. Accounting data from the database SABI (check Sample chapter) is mostly from audited accounting statements. However, any possible wrongdoing on the auditing process of firms or accounting data distortion may distort the variables used in this study and further distort the respective findings.

At last, although this study, to the best of my knowledge, uses a significantly larger sample than most papers on Portuguese Micro, Small and Medium enterprises, some regressions had coefficients that were omitted due to no available data on the sample, or simply not enough variability in the sample. Even though data availability will always pose a challenge in this scope of study, I suggest to any practitioners to perform similar studies in the future, as databases like SABI or others may contain more data, allowing a possible confirmation of the results achieved here, and deeper, meaningful research on this "under-researched" topic.

I further suggest performing this analysis on other geographies in Europe, similarly affected by both crises and with common country characteristics as Portugal, like Spain or Greece, for example. Comparing the impact of the crises on Micro, Small and Medium enterprises of different countries can also provide insights on country-specific patterns and test whether the findings for the Portugal case hold or not.

## Disclaimer

I hereby disclaim that throughout this dissertation I used artificial intelligence tool ChatGPT as an assistance tool for literature research, coding and text revision and fluidity purposes. I take fully responsibility for all that is written in this dissertation. All the data, code and ChatGPT prompts I used are available in this Google Site: www.sites.google.com/view/thesisthegfctheeurmsme/

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# Appendix

**Table 1: Industry classification**

| Industry | CAE Rev.3 code and description |
|---|---|
| Agriculture, Forestry, Fishing and Mining | 01: Crop and animal production, hunting and related service activities<br>02: Forestry and logging<br>03: Fishing and Aquaculture<br>05: Mining of coal and lignite<br>06: Extraction of crude petroleum and natural gas<br>07: Mining of metal ores<br>08: Other mining and quarrying<br>09: Mining support service activities |
| Construction | 41: Construction of buildings<br>43: Specialised construction activities |
| Manufacturing | 10: Manufacture of food products<br>11: Manufacture of beverages<br>12: Manufacture of tobacco products<br>13: Manufacture of textiles<br>14: Manufacture of wearing apparel<br>15: Manufacture of leather and related products<br>16: Manufacture of wood and products of wood and cork; except furniture; manufacture of articles of straw and plaiting materials<br>17: Manufacture of paper and paper products<br>18: Printing of reproduction of recorded media<br>19: Manufacture of coke and refined petroleum products<br>20: Manufacture of chemicals and chemical products<br>21: Manufacture of basic pharmaceutical products and pharmaceutical preparations<br>22: Manufacture of rubber and plastic products<br>23: Manufacture of other non-metallic mineral products<br>24: Manufacture of basic metals<br>25: Manufacture of fabricated metal products except machinery and equipment<br>26: Manufacture of computer electronic and optical products<br>27: Manufacture of electrical equipment<br>28: Manufacture of machinery and equipment<br>29: Manufacture of motor vehicles trailers and semi-trailers<br>30: Manufacture of other transport equipment<br>31: Manufacture of furniture<br>32: Other manufacturing |

| | |
|---|---|
| Transport, Storage and Communication | 49: Land transport and transport via pipelines<br>50: Water transport<br>51: Air transport<br>52: Warehousing and support activities for transportation<br>60: Programming and broadcasting activities<br>61: Telecommunications |
| Wholesale and Retail | 45: Wholesale and retail trade and repair of motor vehicles and motorcycles<br>46: Wholesale trade except of motor vehicles and motorcycles<br>47: Retail trade except of motor vehicles and motorcycles |
| Services | 33: Repair and installation of machinery and equipment<br>35: Electricity gas steam and air conditioning supply<br>36: Water collection treatment and supply<br>37: Sewerage<br>38: Waste collection treatment and disposal activities; materials recovery<br>39: Remediation activities and other waste management services<br>42: Civil engineering<br>53: Postal and courier activities<br>55: Accommodation<br>56: Food and beverage service activities<br>58: Publishing activities<br>59: Motion picture video and television programme production sound recording and music publishing activities<br>62: Computer programming consultancy and related activities<br>63: Information service activities<br>64: Financial service activities except insurance and pension funding<br>65: Insurance reinsurance and pension funding except compulsory social security<br>66: Activities auxiliary to financial services and insurance activities<br>68: Real estate activities<br>69: Legal and accounting activities<br>70: Activities of head offices; management consultancy activities<br>71: Architectural and engineering activities; technical testing and analysis<br>72: Scientific research and development<br>73: Advertising and market research<br>74: Other professional scientific and technical activities<br>75: Veterinary activities<br>77: Rental and leasing activities<br>78: Employment activities<br>79: Travel agency tour operator and other reservation service and related activities<br>80: Security and investigation activities<br>81: Services to buildings and landscape activities<br>82: Office administrative office support and other business support activities<br>84: Public administration and defence; compulsory social security |

| | |
|---|---|
| | 85: Education<br>86: Human health activities<br>87: Residential care activities<br>88: Social work activities without accommodation<br>90: Creative arts and entertainment activities<br>91: Libraries archives, museums and other cultural activities<br>92: Gambling and betting activities<br>93: Sports activities and amusement and recreation activities<br>94: Activities of membership organisations<br>95: Repair of computers and personal and household goods<br>96: Other personal service activities<br>97: Activities of households as employers of domestic personnel<br>99: Activities of extraterritorial organisations and bodies<br>98: Undifferentiated goods-and services-producing activities of private households for own use |

**Table 2**
**Hausman test results for regression set [1]**

| | | | | $Chi^2$ | Df. | P-Value | Prefer: |
|---|---|---|---|---|---|---|---|
| **[1]** $Ln\ (Revenue)_{i,t} = \alpha_i + \beta_1 During_{i,t} + \beta_2 After_{i,t} + \lambda\ IMR_{it} + \varepsilon_{i,t}$ | **Pooled Sample** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 166,395 | 3 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 324,306 | 3 | 0 | FE |
| | **Micro (all)** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 128,656 | 3 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 275,371 | 3 | 0 | FE |
| | **Micro (only 1 emp)** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 43,255 | 2 | 1 | **RE** |
| | | **Ln Revenue** | **COVID** | 8,688 | 2 | 0 | FE |
| | **Micro (excl. 1 emp)** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 124,072 | 3 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 253,690 | 3 | 0 | FE |
| | **Small** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 4,406 | 3 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 7,066 | 3 | 0 | FE |
| | **Medium** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 25 | 3 | 1.57E-05 | FE |
| | | **Ln Revenue** | **COVID** | 9 | 3 | 0.0307 | FE |

**Table 3**
**Hausman test results for regression set [2]**

| | | | | $Chi^2$ | Df | P Value | Prefer: |
|---|---|---|---|---|---|---|---|
| **[2]** $Ln\ (Revenue)_{i,t} = \alpha_i + \beta_1\ During_{i,t} + \beta_2\ After_{i,t} + \sum_s \beta_s^D\ (During_{i,t} \times Industry_i) + \sum_s \beta_s^A\ (After_{i,t} \times Industry_i) + \lambda\ IMR_{i,t} + \varepsilon_{i,t}$ | **Pooled Sample** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 458,612 | 13 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 313,940 | 13 | 0 | FE |
| | **Micro (all)** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 142,867 | 11 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 320,953 | 10 | 0 | FE |
| | **Micro (only 1 emp)** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 66,658 | 7 | 1 | **RE** |
| | | **Ln Revenue** | **COVID** | 5,386 | 7 | 0 | FE |
| | **Micro (excl. 1 emp)** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 136,837 | 11 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 293,236 | 10 | 0 | FE |
| | **Small** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 1,739 | 9 | 0 | FE |
| | | **Ln Revenue** | **COVID** | 7,140 | 9 | 0 | FE |
| | **Medium** | **Ln Revenue** | **GFC / Euro Sov. Cri.** | 625 | 9 | 1 | **RE** |
| | | **Ln Revenue** | **COVID** | 88 | 9 | 1 | **RE** |

**Table 4**

Correlation Matrix between IMR and Xs

| $Y_{it}$ | **Firms** | **During (1)** | **After (1)** | **During (2)** | **After (2)** |
|---|---|---|---|---|---|
| Ln (Revenue) | Pooled | 0.0739 | 0.2444 | 0.4367 | -0.4598 |
| Ln (Revenue) | Micro (all) | 0.0534 | 0.2369 | 0.4264 | -0.4409 |
| Ln (Revenue) | Micro (only 1 emp.) | 0.0658 | 0.4221 | 0.6733 | -0.6780 |
| Ln (Revenue) | Micro (w/o only 1 emp.) | 0.0550 | 0.2250 | 0.4093 | -0.4249 |
| Ln (Revenue) | Small | 0.2793 | 0.2570 | 0.5258 | -0.5944 |
| Ln (Revenue) | Medium | 0.3075 | 0.2498 | 0.5109 | -0.5774 |

This table shows the correlation coefficient between the Inverse Mill's Ratio (IMR) and the During/After crises dummies for all the regressions performed. *(1) refers to the global financial crisis + Europe sovereign debt crisis. (2) refers to the Covid pandemic.*

**Table 5**
**Regression [1]: Comparison of crises with "Micro" firms excluding firms with only one employee all throughout the sample**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro. Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.839*** | -0.893*** |
| | (-5.460) | (-5.706) |
| **After Crisis$_{i,t}$** | -0.648*** | -1.025*** |
| | (-4.219) | (-6.548) |
| **IMR$_{i,t}$** | -3.743*** | -3.824*** |
| | (-125.719) | (-208.892) |
| **Constant** | 6.520*** | 6.714*** |
| | (42.348) | (42.874) |
| **Observations** | 1,422,533 | 2,609,766 |
| **Number of firms** | 217,410 | 252,232 |
| **Within $R^2$** | 0.125 | 0.157 |
| **Wald F-test** | 9,000*** | 30,494*** |

This table presents the main regression **[1]** with "Micro" sized firms excluding firms with only one employee all throughout the sample. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 6**
**Regression [2]: Comparison of industries in crisis with pooled sample (complete)**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.767*** | -0.755*** |
| | (-3.465) | (-3.412) |
| **After Crisis$_{i,t}$** | -0.577*** | -0.896*** |
| | (-2.607) | (-4.051) |
| **During$_{i,t}$ x Agriculture, Forestry,** | 0.186 | 0.308 |
| **Fishing and Mining$_i$** | (0.629) | (0.986) |
| **During$_{i,t}$ x Construction$_i$** | 0.116 | 0.089 |
| | (0.526) | (0.401) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.463** | 0.613** |
| | (2.058) | (2.482) |
| **During$_{i,t}$ x Transport, Storage,** | 0.026*** | -0.001 |
| **and Communication$_i$** | (4.837) | (-0.194) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | 0.208 | 0.182 |
| | (0.851) | (0.718) |
| **After$_{i,t}$ x Agriculture, Forestry,** | 0.186 | 0.299 |
| **Fishing and Mining$_i$** | (0.627) | (0.958) |
| **After$_{i,t}$ x Construction$_i$** | 0.137 | 0.193 |
| | (0.618) | (0.869) |
| **After$_{i,t}$ x Manufacturing$_i$** | 0.449** | 0.664*** |
| | (1.994) | (2.690) |
| **After$_{i,t}$ x Transport, Storage,** | | |
| **and Communication$_i$** | | |
| **After$_{i,t}$ x Wholesale and Retail$_i$** | 0.140 | 0.086 |
| | (0.573) | (0.341) |
| **IMR$_{i,t}$** | -3.906*** | -3.845*** |
| | (-129.274) | (-213.952) |
| **Constant** | 6.565*** | 6.597*** |
| | (60.618) | (58.646) |
| **Observations** | 1,674,764 | 3,080,869 |
| **Number of firms** | 255,398 | 299,546 |
| **Within $R^2$** | 0.109 | 0.139 |
| **Wald F-test** | 2,381*** | 8,082*** |

This table presents the main regression [2] with all the firms in the sample pooled together. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 7**
**Regression [2]: Comparison of industries in crisis with Micro enterprises (complete)**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.724*** | -0.733*** |
| | (-3.273) | (-3.335) |
| **After Crisis$_{i,t}$** | -0.517** | -0.853*** |
| | (-2.338) | (-3.882) |
| **During$_{i,t}$ x Agriculture, Forestry,** | -0.411* | -0.497** |
| **Fishing and Mining$_i$** | (-1.857) | (-2.264) |
| **During$_{i,t}$ x Construction$_i$** | 0.026 | -0.017 |
| | (0.119) | (-0.077) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.005 | -0.041*** |
| | (0.923) | (-6.939) |
| **During$_{i,t}$ x Transport, Storage,** | 0.032*** | -0.001 |
| **and Communication$_i$** | (5.992) | (-0.195) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | -0.285 | -0.334 |
| | (-0.801) | (-0.876) |
| **After$_{i,t}$ x Agriculture, Forestry,** | -0.402* | -0.502** |
| **Fishing and Mining$_i$** | (-1.820) | (-2.284) |
| **After$_{i,t}$ x Construction$_i$** | 0.062 | 0.094 |
| | (0.282) | (0.427) |
| **After$_{i,t}$ x Manufacturing$_i$** | | |
| **After$_{i,t}$ x Transport, Storage,** | | |
| **and Communication$_i$** | | |
| **After$_{i,t}$ x Wholesale and Retail$_i$** | -0.351 | -0.433 |
| | (-0.985) | (-1.136) |
| **IMR$_{i,t}$** | -3.688*** | -3.679*** |
| | (-125.183) | (-209.493) |
| **Constant** | 6.477*** | 6.621*** |
| | (48.049) | (47.942) |
| **Observations** | 1,483,543 | 2,767,442 |
| **Number of firms** | 230,925 | 273,541 |
| **Within $R^2$** | 0.12 | 0.15 |
| **Wald F-test** | 1,789*** | 15,090*** |

This table presents the main regression [2] with only Micro enterprises. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 8**
**Regression [2]: Comparison of crises with Micro enterprises with only 1 employee (complete)**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.170*** | 0.024*** |
| | (-11.533) | (2.684) |
| **After Crisis$_{i,t}$** | | |
| **During$_{i,t}$ x Agriculture, Forestry,** | 0.036 | 0.034** |
| **Fishing and Mining$_i$** | (1.124) | (2.379) |
| **During$_{i,t}$ x Construction$_i$** | 0.028 | 0.014 |
| | (0.549) | (0.654) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.118* | 0.132*** |
| | (1.648) | (3.328) |
| **During$_{i,t}$ x Transport, Storage,** | 0.062*** | -0.024 |
| **and Communication$_i$** | (3.527) | (-1.632) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | 0.046** | 0.142*** |
| | (2.246) | (12.451) |
| **After$_{i,t}$ x Agriculture, Forestry,** | | |
| **Fishing and Mining$_i$** | | |
| **After$_{i,t}$ x Construction$_i$** | | |
| **After$_{i,t}$ x Manufacturing$_i$** | | |
| **After$_{i,t}$ x Transport, Storage,** | | |
| **and Communication$_i$** | | |
| **After$_{i,t}$ x Wholesale and Retail$_i$** | | |
| **IMR$_{i,t}$** | -1.496*** | -1.679*** |
| | (-11.773) | (-35.709) |
| **Constant** | 4.231*** | 4.201*** |
| | (111.881) | (602.684) |
| **Observations** | 61,010 | 157,674 |
| **Number of firms** | 13,515 | 21,309 |
| **Within $R^2$** | 0.0229 | 0.0572 |
| **Wald F-test** | 35.41*** | 473.5*** |

This table presents the main regression [2] with "Micro" sized firms with only one employee all throughout the sample. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 9**
**Regression [2]: Comparison of industries in crisis with Small enterprises (complete)**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -1.330*** | -1.248*** |
| | (-7.144) | (-5.523) |
| **After Crisis$_{i,t}$** | -1.232*** | -1.386*** |
| | (-6.619) | (-6.096) |
| **During$_{i,t}$ x Agriculture, Forestry,** | -0.006 | 0.134*** |
| **Fishing and Mining$_i$** | (-0.505) | (8.961) |
| **During$_{i,t}$ x Construction$_i$** | -0.002 | -0.119*** |
| | (-0.087) | (-5.651) |
| **During$_{i,t}$ x Manufacturing$_i$** | 0.120 | 0.123 |
| | (0.663) | (0.551) |
| **During$_{i,t}$ x Transport, Storage,** | 0.011 | 0.066* |
| **and Communication$_i$** | (0.440) | (1.855) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | 0.065*** | 0.084*** |
| | (5.209) | (5.358) |
| **After$_{i,t}$ x Agriculture, Forestry,** | | |
| **Fishing and Mining$_i$** | | |
| **After$_{i,t}$ x Construction$_i$** | | |
| **After$_{i,t}$ x Manufacturing$_i$** | 0.126 | 0.167 |
| | (0.697) | (0.749) |
| **After$_{i,t}$ x Transport, Storage,** | | |
| **and Communication$_i$** | | |
| **After$_{i,t}$ x Wholesale and Retail$_i$** | | |
| **IMR$_{i,t}$** | -3.985*** | -3.851*** |
| | (-29.595) | (-40.468) |
| **Constant** | 8.571*** | 8.495*** |
| | (48.417) | (40.932) |
| **Observations** | 86,509 | 144,558 |
| **Number of firms** | 11,412 | 12,223 |
| **Within $R^2$** | 0.153 | 0.16 |
| **Wald F-test** | 722.3*** | 1,634*** |

This table presents the main regression [2] with only Small enterprises. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 10**

**Regression [2]: Comparison of industries in crisis with Medium enterprises (complete)**

| **Dependent Variable:** | **(1)** | **(2)** |
|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **GFC / Euro Sov. Crisis** | **COVID** |
| **During Crisis$_{i,t}$** | -0.686*** | -1.164*** |
| | (-4.838) | (-6.251) |
| **After Crisis$_{i,t}$** | -0.753*** | -1.244*** |
| | (-5.236) | (-6.113) |
| **During$_{i,t}$ x Agriculture, Forestry,** | -0.076 | -0.084* |
| **Fishing and Mining$_i$** | (-1.491) | (-1.881) |
| **During$_{i,t}$ x Construction$_i$** | -0.050 | -0.185* |
| | (-0.527) | (-1.724) |
| **During$_{i,t}$ x Manufacturing$_i$** | -0.017 | 0.189** |
| | (-0.301) | (2.032) |
| **During$_{i,t}$ x Transport, Storage,** | 0.021 | -0.050 |
| **and Communication$_i$** | (0.153) | (-0.476) |
| **During$_{i,t}$ x Wholesale and Retail$_i$** | 0.053 | 0.240*** |
| | (1.162) | (4.726) |
| **After$_{i,t}$ x Agriculture, Forestry,** | | |
| **Fishing and Mining$_i$** | | |
| **After$_{i,t}$ x Construction$_i$** | | |
| **After$_{i,t}$ x Manufacturing$_i$** | | |
| **After$_{i,t}$ x Transport, Storage,** | | |
| **and Communication$_i$** | | |
| **After$_{i,t}$ x Wholesale and Retail$_i$** | | |
| **IMR$_{i,t}$** | -2.453*** | -2.769*** |
| | (-9.337) | (-9.047) |
| **Constant** | 9.320*** | 9.696*** |
| | (55.133) | (44.653) |
| **Observations** | 6,341 | 11,402 |
| **Number of firms** | 993 | 1,200 |
| **Within $R^2$** | 0.134 | 0.148 |
| **Wald F-test** | 15.04*** | 26.99*** |

This table presents the main regression [2] with only Medium enterprises. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

**Table 11 - Regression [2] (complete)**
**Comparison of global financial crisis + Europe sovereign debt crisis by industry, by size**

| **Dep. Variable:** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
|---|---|---|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **Micro** | **Micro[1]** | **Micro[2]** | **Small** | **Medium** |
| **During Crisis$_{i,t}$** | -0.724*** | -0.170*** | -0.736*** | -1.330*** | -0.686*** |
| | (-3.273) | (-11.533) | (-3.357) | (-7.144) | (-4.838) |
| **After Crisis$_{i,t}$** | -0.517** | | -0.530** | -1.232*** | -0.753*** |
| | (-2.338) | | (-2.417) | (-6.619) | (-5.236) |
| **During$_{i,t}$ x** | -0.411* | 0.036 | -0.423* | -0.006 | -0.076 |
| **Agriculture (…)** | (-1.857) | (1.124) | (-1.931) | (-0.505) | (-1.491) |
| **During$_{i,t}$ x** | 0.026 | 0.028 | 0.028 | -0.002 | -0.050 |
| **Construction$_i$** | (0.119) | (0.549) | (0.130) | (-0.087) | (-0.527) |
| **During$_{i,t}$ x** | 0.005 | 0.118* | 0.006 | 0.120 | -0.017 |
| **Manufacturing$_i$** | (0.923) | (1.648) | (1.042) | (0.663) | (-0.301) |
| **During$_{i,t}$ x** | 0.032*** | 0.062*** | 0.029*** | 0.011 | 0.021 |
| **Transport (…)** | (5.992) | (3.527) | (5.171) | (0.440) | (0.153) |
| **During$_{i,t}$ x** | -0.285 | 0.046** | -0.280 | 0.065*** | 0.053 |
| **Wholesale (…)** | (-0.801) | (2.246) | (-0.799) | (5.209) | (1.162) |
| **After$_{i,t}$ x** | -0.402* | | -0.415* | | |
| **Agriculture (…)** | (-1.820) | | (-1.895) | | |
| **After$_{i,t}$ x** | 0.062 | | 0.065 | | |
| **Agriculture (…)** | (0.282) | | (0.295) | | |
| **After$_{i,t}$ x** | | | | 0.126 | |
| **Manufacturing$_i$** | | | | (0.697) | |
| **After$_{i,t}$ x** | | | | | |
| **Transport (…)** | | | | | |
| **After$_{i,t}$ x** | -0.351 | | -0.346 | | |
| **Wholesale (…)** | (-0.985) | | (-0.988) | | |
| **IMR$_{i,t}$** | -3.688*** | -1.496*** | -3.738*** | -3.985*** | -2.453*** |
| | (-125.183) | (-11.773) | (-125.564) | (-29.595) | (-9.337) |
| **Constant** | 6.477*** | 4.231*** | 6.542*** | 8.571*** | 9.320*** |
| | (48.049) | (111.881) | (49.339) | (48.417) | (55.133) |
| **Observations** | 1,483,543 | 61,010 | 1,422,533 | 86,509 | 6,341 |
| **Number of firms** | 230,925 | 13,515 | 217,410 | 11,412 | 993 |
| **Within R$^2$** | 0.12 | 0.0229 | 0.126 | 0.153 | 0.134 |
| **Wald F-test** | 1,789*** | 35.41*** | 3,445*** | 722.3*** | 15.04*** |

This table presents the main regression **(2)** split by firm size at the beginning of the correspondent crisis. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*

**Table 12 - Regression [2] (complete)**
**Comparison of COVID pandemic by industry, by size**

| **Dep. Variable:** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
|---|---|---|---|---|---|
| **Ln (Revenue)$_{i,t}$** | **Micro** | **Micro[1]** | **Micro[2]** | **Small** | **Medium** |
| **During Crisis$_{i,t}$** | -0.733*** | 0.024*** | -0.768*** | -1.248*** | -1.164*** |
| | (-3.335) | (2.684) | (-3.554) | (-5.523) | (-6.251) |
| **After Crisis$_{i,t}$** | -0.853*** | | -0.887*** | -1.386*** | -1.244*** |
| | (-3.882) | | (-4.107) | (-6.096) | (-6.113) |
| **During$_{i,t}$ x** | -0.497** | 0.034** | -0.527** | 0.134*** | -0.084* |
| **Agriculture (…)** | (-2.264) | (2.379) | (-2.441) | (8.961) | (-1.881) |
| **During$_{i,t}$ x** | -0.017 | 0.014 | -0.014 | -0.119*** | -0.185* |
| **Construction$_i$** | (-0.077) | (0.654) | (-0.063) | (-5.651) | (-1.724) |
| **During$_{i,t}$ x** | -0.041*** | 0.132*** | -0.038*** | 0.123 | 0.189** |
| **Manufacturing$_i$** | (-6.939) | (3.328) | (-6.354) | (0.551) | (2.032) |
| **During$_{i,t}$ x** | -0.001 | -0.024 | -0.004 | 0.066* | -0.050 |
| **Transport (…)** | (-0.195) | (-1.632) | (-0.606) | (1.855) | (-0.476) |
| **During$_{i,t}$ x** | -0.334 | 0.142*** | -0.324 | 0.084*** | 0.240*** |
| **Wholesale (…)** | (-0.876) | (12.451) | (-0.880) | (5.358) | (4.726) |
| **After$_{i,t}$ x** | -0.502** | | -0.533** | | |
| **Agriculture (…)** | (-2.284) | | (-2.468) | | |
| **After$_{i,t}$ x** | 0.094 | | 0.097 | | |
| **Agriculture (…)** | (0.427) | | (0.448) | | |
| **After$_{i,t}$ x** | | | | 0.167 | |
| **Manufacturing$_i$** | | | | (0.749) | |
| **After$_{i,t}$ x** | | | | | |
| **Transport (…)** | | | | | |
| **After$_{i,t}$ x** | -0.433 | | -0.422 | | |
| **Wholesale (…)** | (-1.136) | | (-1.144) | | |
| **IMR$_{i,t}$** | -3.679*** | -1.679*** | -3.823*** | -3.851*** | -2.769*** |
| | (-209.493) | (-35.709) | (-208.738) | (-40.468) | (-9.047) |
| **Constant** | 6.621*** | 4.201*** | 6.747*** | 8.495*** | 9.696*** |
| | (47.942) | (602.684) | (50.324) | (40.932) | (44.653) |
| **Observations** | 2,767,442 | 157,674 | 2,609,766 | 144,558 | 11,402 |
| **Number of firms** | 273,541 | 21,309 | 252,232 | 12,223 | 1,200 |
| **Within $R^2$** | 0.15 | 0.0572 | 0.159 | 0.16 | 0.148 |
| **Wald F-test** | 15,090*** | 473.5*** | 11,770*** | 1,634*** | 26.99*** |

This table presents the main regression **(2)** split by firm size at the beginning of the correspondent crisis. Missing coefficients are due to no variability in the data. Robust t-statistics are in parenthesis. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. *1: Microenterprises with only 1 employee. 2: Microenterprises without those with only 1 employee.*