

## ARE LARGE FIRMS MORE PROFITABLE THAN SMALL AND MEDIUM FIRMS IN THE EUROPEAN UNION?

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ISSN: 2183-4172  
Volume 23, Issue 1

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[www.european-jms.com](http://www.european-jms.com)

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### **Abstract<sup>1</sup>**

This study comparatively analyses the profitability between large enterprises (LE) and small and medium enterprises (SME) in the European Union in order to understand which group of companies is more profitable. The analysis is also segmented by groups of countries and industries. Furthermore, we study the impact of the financial crisis on profitability. The sample includes 54,654 firms from 21 EU countries and from 17 industries during the period between 2004 and 2013. Two measures of profitability are used: (1) Return on Assets (computed both with earnings before interest and taxes and net profit), and; (2) Return on Equity. The results suggest that LE are, on average, more profitable than SME. This finding holds across all industries except one. However, there is additional evidence that SME in Eastern Europe are more profitable than LE and are also more profitable than SME in Western Europe. Finally, the results also suggest that the financial crisis negatively impacted firms' profitability, particularly in SME.

**Key words:** Profitability, large enterprises, small and medium enterprises, crisis.

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<sup>1</sup> We gratefully acknowledge financial support from FCT- Fundação para a Ciência e Tecnologia (Portugal), and national funding through the research grant UID/SOC/04521/2013. We are also thankful to Anaísa Gomes for her initial contributions for this study.

## Introduction

Profitability is a measure of business success and an indicator of economic performance, since it has an impact on companies' ability to invest and deliver sustainable growth (Denčić-Mihajlov, 2014). Thus, the success (or even survival) of firms depends primarily on their profitability (Niresh and Velnampy, 2014) and the primary goal of most organisations is to maximise profitability. According to Ehi-Oshio et al. (2013), there are numerous factors that can influence profitability, highlighting firm size as one of them.

The overwhelming majority (99.8 %) of enterprises active within the European Union (EU)'s non-financial business economy in 2012 were small and medium enterprises (SME) - some 22.3 million. Perhaps the most striking phenomenon of SME is their contribution to employment, since they provided two-thirds of the total private sector employment in the EU. By contrast, there were 43,600 large enterprises (LE) in EU-28's non-financial business economy in 2012. Together LE generated EUR 2.62 billion of added value, which equated to 42.5 % of the non-financial business economy total — by far the most important share among all enterprise size classes.

Thus, a more comprehensive look at the association between size and profitability in EU companies during a recent time period seems relevant given both the importance of these two size classes of firms in the EU market and the uncertainty context experienced by these firms throughout the recent financial crisis. Moreover, it must be noticed that findings from existing studies differ in many respects, which suggests that there is a need for further research.

This study aims at analysing profitability in the EU market by comparing LE with SME, in order to determine which are the most profitable. A comparative analysis of the returns between LE and SME is carried out both in Eastern European and Western European contexts, as well as in different industries. The study expects to determine whether SME are more profitable in a certain region of Europe, and/or in a specific activity sector. Finally, the impact of the financial crisis on corporate profitability will be analysed.

Taking into account that the majority of previous studies focus on LE and present single-country frameworks, the novelty of this research results from both the diversity of data and the time frame covered by a financial crisis with strong economic impacts for European firms.

Covering some 54,654 large, medium and small firms from 17 industries in 21 European countries during a 10-year period (2004-2013), this study aims to contribute to a better understanding of firm-level factors as determinants of profitability, controlling for industry-specific and country-specific factors. In addition, this study intends to contribute to underline potential differences in the behaviour of SME and LE in two different institutional settings (West and East European countries) and also during a period of financial crisis.

The paper is organised as follows. In the next section, we review the theoretical aspects of profitability and firm size. In particular, we examine profitability in LE and SME as well as the most

common studied determinants of profitability. Still in this section, the hypotheses are developed. Section 3 describes the data, variables and the empirical setup. The empirical results are presented and discussed in light of the theoretical background in Section 4. Finally, conclusions and proposals for future research are presented in Section 5.

## **Literature review**

The study of determinants of profitability has been considered an important research topic (Babalola, 2013). However, most studies are single-country analyses and focus only on listed companies, which are by nature larger and more successful companies, limiting the possibility of a generalised conclusion.

Earlier studies on profitability between different sized companies have produced very mixed results, leading to a lack of general consensus on how the size of firms is related to profitability. Some studies show that SME are the most profitable companies (Goddard et al., 2005; Becker-Blease et al, 2010) but other studies suggesting otherwise (Nunes et al., 2009; Denčić-Mihajlov, 2014) usually prevail. Appendix I summarises the main results of the previous literature.

Each study uses a different data set of firms and a different time frame, making it difficult to draw up a general statement about the relationship between profitability and firm size (Dhawan, 2001). In addition, Ehi-Oshio et al. (2013) point out that two of the possible causes for these ambiguous results are: the use of different measures of profitability, and the fact that most studies use single-country data, which may result in different conclusions as firms' characteristics are largely determined by the business environment in which they operate.

### ***Profitability in LE and SME***

One of the pioneering studies examining the relationship between size and profitability is that of Hall and Weiss (1967), which focuses on the profitability of Fortune 500 companies. These authors conclude that LE have higher yields. This study is followed by Marcus (1969), who concludes that size influences the profitability of some, but not all, companies; therefore, rejecting the generalisation that LE are more profitable.

However, several studies conclude that size plays a notable role in explaining profitability and suggest that LE are more profitable compared to SME, particularly within the same industry (Schmalensee, 1989; Majumdar, 1997; Lee, 2009; Gaur and Gupta, 2011; Babalola, 2013; Ehi-Oshio et al., 2013; Doğan, 2013; Devi and Devi, 2014). An additional contribution comes from the research of Dahmash (2015), which highlights that size has a positive impact on profitability and that this impact differs amongst industries. These studies all focus on single-country samples and use different measures of size, namely: total assets, total sales and number of employees.

As suggested by Fiegenbaum and Karnani (1991), LE may be more profitable than SME due to the superior competition and strategic advantages of LE associated with a greater chance of strategic diversification and stronger bargaining power with customers and suppliers.

In contrast, there is another stream of studies that finds a negative relationship between profitability (measured in terms of return on equity and return on investment) and firm size, suggesting that SME present higher rates of profitability when compared to LE (Schneider, 1991; Goddard et al., 2005; Abu-Tapanjeh, 2006; Becker-Blease et al., 2010).

However, Stekler (1964), Samuels and Smyth (1968) and Dunlop (1992) argue that firms within the same industry may perform differently, but even then, the performance variability is lower in LE than in SME, both in terms of technical efficiency and in terms of profitability. Many reasons might explain this difference: the fact that LE are better able to withstand oscillations at the level of activity have better financial stability, face less uncertainty in terms of profit variance, and are generally more diversified, allowing them to offset the losses of one activity with profits from another (Whittington, 1980; Ballantine et al, 1993; Dhawan, 2001).

Nevertheless, Dhawan (2001) agrees that while SME face more market uncertainties and have superior capital constraints, they have higher flexibility in response to market changes and a superior efficiency rate allowing them to survive and succeed. Indeed, according to Porter (1980), technological efficiency is an important requirement for SME to be able to survive. Fiegenbaum and Karnani (1991) add the need to obtain a competitive advantage as key to survive, for instance through the adoption of niche strategies or through flexibility of their cost structure.

Finally, a third set of studies finds no statistically significant relationship between profitability and firm size (Amato and Wilder, 1985; Amato and Amato, 2004; Jónsson, 2007), concluding that there is no link between these two variables. Niresh and Velnampy (2014) point to agency problems to explain this result, since in some cases, managers' own interests outbalance firm's profitability.

Concerning the financial crisis impact on profitability, Denčić-Mihajlov (2014) concluded that listed LE show higher levels of profitability and liquidity during periods of economic recession. The author points out that more experienced managers, the use of new technologies and production processes and access to capital markets might be possible justifications for this positive behaviour of LE.

### ***Determinants of profitability***

In order to test the impact of size on firms' profitability, Majumdar (1997) and Denčić-Mihajlov (2014) hold that it is necessary to take into account firm-specific factors, namely: financial structure (Abu-Tapanjeh, 2006); industry-specific factors, such as the level of concentration; threat of substitute products and services; barriers to entry and exit (Denčić-Mihajlov, 2014),

and; country-specific factors. Lee (2009) adds market-specific factors and company strategies to factors influencing profitability.

Amongst those determinants, firm-specific factors appear to have a much greater impact on profitability, both in LE and SME (Claver et al., 2002; Caloghirou et al., 2004; Lee, 2009). However, this is not entirely consensual, since other studies show evidence of a higher significance of industry-specific factors, especially regarding large and medium-sized firms (Amato and Amato, 2004). Included among the most used firm-specific variables that can be found are: size; leverage; liquidity; age; market share; turnover ratios, and; sales growth (Majumdar, 1997; Niresh and Velnampy, 2014; Goddard et al., 2005; Nunes et al., 2009; Doğan, 2013; Ehi-Oshio et al., 2013; Denčić-Mihajlov, 2014).

### **Hypotheses Development**

Based on extant literature, we formulate the following hypotheses concerning the association between size and profitability of EU firms (H1 and H2).

**H1:** LE are more profitable than SME in EU.

This hypothesis tests the consistency of mainstream literature, which suggests that there is a statistically significant positive relationship between the size and the profitability of companies, i.e. LE have a higher profitability in comparison to SME (Schmalensee, 1989; Fiegenbaum and Karnani, 1991; Gaur and Gupta, 2009; Gaur and Gupta, 2011; Devi and Devi, 2014). Indeed, greater size allows companies greater benefits from scale economies, more efficient use of resources and greater ability to cope with changes in market conditions (Fiegenbaum et al., 1991).

**H2:** LE reported a lower decrease in profitability with the financial crisis.

Stekler (1964) highlights that the variability of profitability over time is inversely correlated with the size of firms. This might be explained by LE experiencing smaller relative variations in output (Schmalensee, 1989) which means that these companies contract less in recession than SME. Therefore, LE when compared to SME, are characterised by greater stability (Whittington, 1980) with higher and lower variable profitability (Dunlop, 1992).

Following Denčić-Mihajlov's (2014) argument that LE demonstrate higher profitability during periods of recession, this hypothesis aims to test whether, indeed, large companies have better profitability management during the period of financial crisis.

## Data and Methodology

### Sample

All data were collected from the Amadeus Database. The sample period covers ten years of observation, corresponding to the time period of 2004 to 2013.

The initial selection criterion was companies belonging to the EU28, from all industries except the financial and public administration sectors, since these sectors have very particular frameworks that could bias results. Additionally, very small firms (total assets below €2,000,000 and less than 10 employees in 2013) were excluded.

Subsequently, companies that did not report full information during the sample period, as well as all companies for which it was not possible to calculate the variables under study were also excluded. As such, some countries, namely Austria, Cyprus and Denmark, were eliminated from the sample. Countries and industries with less than 10 firms were also excluded from the sample, namely Luxembourg, Malta, Bulgaria and Croatia, as well as Sector U and T.<sup>2</sup>

Finally, we excluded outliers in order to avoid biases caused by extreme values. Outliers were defined as being values below the 5% percentile and above the 95% percentile of the variables in the study.

The final sample consists of 54,654 companies, belonging to 21 EU countries and 17 industries. The sample comprises 9,784 LE and 44,870 SME, representing respectively 17.90% and 82.10% of the total sample. The 10-year period of time embraces 346,476 observations.

Appendix 2 reports the composition of the sample by country. Approximately 65% of the firms in the sample are based in Spain (28.13%), Italy (25.81%) and the United Kingdom (11.65%). In these countries, the United Kingdom is the one with the highest weight of LE (38.66%) comparing with SME, while in Italy and Spain LE account for only 15.64% and 9.48%, respectively. This trend is common to almost all EU countries where SME prevail, except for Germany and Holland.

Appendix 3 shows the composition of the sample by industry. The two more representative industries are Sector C - Industrial (39.91%) and Sector G - Wholesale and retail, repair of motor vehicles and motorcycles (25.96%). Looking at industry segmentation by firm size, it is possible to conclude that SME represent an overwhelming majority in all industries except in Sector D – Electricity, gas and air conditioning where SME and LE share the market in an almost equitable way.

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<sup>2</sup> We use NACE's classification (2012).

### Empirical models

We use two profitability measures as dependent variables: Return on Assets (ROA) and Return on Equity (ROE). ROA is measured in two different ways:

**ROA\_EBIT:** operational return on assets, the ratio between earnings before interest and taxes (EBIT) and total assets (Goddard et al., 2005; Becker-Blease et al., 2010; Denčić-Mihajlov, 2014; Niresh and Velnampy, 2014; Dahmash, 2015);

**ROA\_NI:** net return on assets, the ratio between net income (NI) and total assets (Babalola, 2013; Doğan, 2013).

ROA is a profitability measure that excludes financing decisions and it is purely based on companies' ability to transform revenues into margins. This measure has been the most widely used in profitability studies among firms of different sizes. While LE use economies of scale through the dilution of overhead costs, SME rely more on flexibility through the adjustment of operational costs.

Thus, through these two variables it is possible to evaluate a firm's ability to generate results from company's assets. However, the use of net profit also highlights the impact of taxation and firm's financial choices affecting results (Hall and Weiss, 1967).

**ROE** is a measure of profitability from the owners' perspective, since it provides information about the profitability of invested capital by shareholders (Abu-Tapanjeh, 2006; Jónsson, 2007). This variable is measured through the ratio between net income (NI) and owner's equity.

To study the relationship between firm size and profitability we developed the following models:

$$ROA\_EBIT_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Liquidity_{i,t} + \beta_4 Inventory_{i,t} + \beta_5 Growth_{i,t} + \beta_6 Tangibility_{i,t} + \beta_7 Turnover_{i,t} + \beta_8 Country_i + \beta_9 Sector_i + \beta_{10} Year + \varepsilon_{i,t} \quad (1)$$

$$ROA\_NI_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Liquidity_{i,t} + \beta_4 Inventory_{i,t} + \beta_5 Growth_{i,t} + \beta_6 Tangibility_{i,t} + \beta_7 Turnover_{i,t} + \beta_8 Country_i + \beta_9 Sector_i + \beta_{10} Year + \varepsilon_{i,t} \quad (2)$$

$$ROE_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Liquidity_{i,t} + \beta_4 Inventory_{i,t} + \beta_5 Growth_{i,t} + \beta_6 Tangibility_{i,t} + \beta_7 Turnover_{i,t} + \beta_8 Country_i + \beta_9 Sector_i + \beta_{10} Year + \varepsilon_{i,t} \quad (3)$$

where  $ROA\_EBIT_{i,t}$  and  $ROA\_NI_{i,t}$  are return on assets of firm  $i$  in year  $t$ , and  $ROE_{i,t}$  is return on equity of firm  $i$  in year  $t$ , computed as described before.

Size is a dummy variable that assumes value 1 if the company is an LE, or value 0 if the company is an SME. To measure Size, we use the most common proxy variable in the literature: total operating revenue (Abu-Tapanjeh, 2006; Ehi-Oshio et al. 2009). All companies with operating revenue in 2013 above €50,000,000 are considered LE, while all companies with operating revenue equal to or lower than €50,000,000 are deemed to be SME. If the coefficient of the Size variable is positive, this means that the level of profitability of LE is higher than SME.

Based on prior research (Goddard et al., 2005; Nunes et al., 2009; Doğan, 2013; Denčić-Mihajlov, 2014), we use the following control variables: level of debt (*Leverage*), level of liquidity (*Liquidity*), inventory weight (*Inventory*), growth of annual sales (*Growth*), asset tangibility (*Tangibility*) and asset turnover (*Turnover*). *Country*, *Sector* and *Year* are dummy variables. They are included in the models in order to control for the impact of the different characteristics of countries (law system, accounting practice, economic and financial development, etc.), industries (business cycle, intensity of completion, etc.) and years on profitability levels. Appendix 4 provides variable definition and measurement.

We can expect a negative relation between the levels of debt and ROA based on the general believe that higher debt levels influence performance negatively, by increasing the insolvency risk (Denčić-Mihajlov, 2014) and constraining the capacity of undertaking valuable investments (Goddard et al., 2005). On the other hand, there is theoretical support for a positive relation between leverage and ROE (Modigliani and Miller, 1958). Therefore, we expect a negative relation between leverage and ROA, but a positive one with ROE.

In terms of liquidity, various arguments support the idea that a higher level of liquidity increases profitability. Greater liquidity reduces the risk of being unable to meet short-term financial commitments (Doğan, 2013; Denčić-Mihajlov, 2014); improves the capacity to face environment changes in competitive markets (Goddard et al., 2005); and increases the ability to take advantage of good growth opportunities (Goddard et al., 2005).

Previous studies provide evidence that companies with higher levels of inventory Majumdar (1997) and tangible assets (Nunes at al., 2009) tend to be less profitable. In fact, a higher level of inventories may decrease profitability as more money is invested in inventories and less money is available to invest in business opportunities. In addition, a higher level of inventories increases the risk of stocks becoming obsolete.

Similarly, companies with higher levels of tangible assets, which mean lower levels of liquid assets, tend to be less profitable, since they are less able to explore long-term investment opportunities. Thus, we expect to find a negative coefficient on both *Inventory* and *Tangibility*.

Finally, prior research also provides evidence that sales growth and asset efficiency are positively associated with performance (Denčić-Mihajlov, 2014). Sales growth increases production levels, enhances economies of scale and thus improves profitability. Higher values of asset turnover



suggest better managing of company assets and consequently higher profitability. Therefore, we expect to find a positive coefficient on both *Growth* and *Turnover*.

The multiple regression models were estimated using the Ordinary Least Squares (OLS) regression method and data were formatted according to OLS pooled form (panel not balanced). Through the results of the regressions it is possible to answer Hypothesis 1. Main regressions of the study were also estimated by industry, in order to have a more detailed picture of the profitability behaviour of LE and SME.

To further explore the relationship between size and profitability, we split the sample in two groups - Western Europe and Eastern Europe - and two new variables were introduced in the basic models: the *EU-Western* dummy variable and the *EU-Western\*Crisis* interaction variable, in order to verify if LE are more profitable than SME in both groups of countries, taking into account that most SME in the sample are concentrated in Western European countries. The variable *EU-Western* takes the value 1 if the firm is from a Western European country, and 0 otherwise. Countries were classified as Western or Eastern European according to the UNESCO criterion.

Finally, to analyse the impact of the financial crisis on profitability of both types of companies, LE and SME, and thus test Hypothesis 2, two additional variables are considered and introduced in the basic models: the *Crisis* dummy variable and the *Crisis\*Crisis* interaction variable. The variable *Crisis* takes the value 1 for years of crisis (2009 to 2013) and 0 if otherwise.

As a robustness analysis, we estimated all the three models by industry in order to evaluate if our main findings holds across all industries. We also removed Spanish firms, since Spain is the most represented country in the sample and presents a large imbalance between the proportion of LE and SME, and re-estimated our basic model.

## Results and Discussion

### *Descriptive statistics*

Table 1 presents the descriptive statistics of the variables for the total of the sample (Panel A) and for the two subsamples, LE and SME (Panels B and C, respectively).

In terms of the total sample (Panel A), the ROA\_EBIT, ROA\_NI and ROE are on average approximately 6.26%, 3.82% and 9.91%, with a median of around 5.11%, 2.78% and 7.89%, respectively. These values do not present large discrepancies, which can also be verified through the standard deviations, indicating a normal distribution of the sample.

On average, companies have a level of debt of approximately 60%, a liquidity of 1.67, an inventory weight of around 0.16, an annual sales growth close to 3.7%, a tangibility level of 24.6% and an asset turnover of 1.47.

Results from Panels B and C suggest that LE are more profitable than SME. In fact, results show that in all profitability variables LE present means above those of SME. However, only in the ROE variable does this difference becomes more noticeable, of approximately 2 percentage points (11.62% in LE versus 9.54% in SME). According to Samuels and Smyth (1968), this difference can be explained by the fact that LE suffer more economic pressures from shareholders towards higher profitability levels. Additionally, *T*-tests were performed to compare the means of profitable variables, in order to assess the statistical validity of the differences found. The results (not reported) suggest that all differences are statistically significant, conveying that LE have, on average, higher profitability levels than SME.

On average, LE show higher profitability, lower inventory weight, higher annual sales growth and greater asset turnover compared to SME. Although SME are on average less profitable, they present higher liquidity levels as well as a lower level of debt and a higher level of tangibility. These results are in line with those of Dhawan (2001), who states that SME have lower levels of debt as they operate with higher interest rates as a result of both their weaker negotiating power and their heavier financial uncertainties.

Table 2 presents the correlations between the different independent variables included in the three empirical models. All variables present a weak and statistically significant correlation with each other, except for the correlation between *Growth* and *Tangibility*, which was not statistically significant at 1%. The highest correlation (- 0.667) is between *Leverage* and *Liquidity*, which indicates that companies with higher levels of debt have lower levels of liquidity.

Results from correlations between profitability measures and independent variables (not tabulated) also suggest that companies with higher level of liquidity, higher annual sales growth, higher asset turnover and lower level of debt, less inventory weight and lower tangibility have higher ROA levels. Regarding ROE, the results suggest that more indebted companies, with higher annual sales growth, higher asset turnover, lower liquidity, less inventory weight and less tangibility are more profitable.

### **Profitability LE vs. SME**

Table 3 shows the main results of the coefficient estimation for the three empirical models. *Size* has a positive and statistically significant coefficient in all models, which suggests that LE are indeed more profitable than SME. The difference between the profitability of LE and SME is more visible in ROE measure than in ROA measures, since Model 3 shows a higher coefficient for variable *Size*.

Thus, there is statistical evidence that LE are, on average, more profitable than SME, supporting H1, for both ROA and ROE measures. This result is in line with prior studies, such as that of Nunes et al. (2009), Babalola (2013), Doğan (2013) and Denčić-Mihajlov (2014). According to Fiegenbaum and Karnani (1991), this finding might be explained by the superior competition and strategic advantages of LE, associated to greater chances of strategic diversification and stronger bargaining power with customers and suppliers. In fact, LE have a larger market share and thus have the opportunity to make more profits than SME. In addition, LE are more able to take advantage of the opportunity to work in areas requiring higher capital rates, as these companies have more resources, and this gives them the opportunity to work in more profitable areas with little competition. Nunes et al. (2009) also state that potential agency problems in LE are not sufficiently relevant to reduce profitability and that, on the other hand, increasing the possibility of taking advantage of economies of scale means increasing profitability.

The control variables all have statistically significant coefficients and the expected signals.

In terms of indebtedness, for each 1% increase in the level of leverage one can expect, on average, an approximate decrease of 6.16% and 7.66% in profitability for *ROA\_EBIT* and *ROA\_NI* measures, respectively. On the contrary, 1% increase in leverage generates, on average, an increase in *ROE* of 4.91%, all else unchanged. The negative relationship between the level of indebtedness and profitability (measured by ROA) is consistent with other studies (Majumdar, 1997; Goddard et al., 2005; Serrasqueiro, 2008; Doğan, 2013), showing evidence that companies with higher levels of debt are less able to finance value added projects and/or take advantage of good investment opportunities given the pressure to pay off the debt.

On the contrary, the positive relationship between leverage and the profitability (measured by ROE) follows the expected signal suggesting that companies with higher levels of debt experience increased levels of risk thus equity holders require a higher return for their investment (Modigliani and Miller, 1958).

Regarding the other control variables, companies with higher levels of inventories and tangible fixed assets have, on average, lower profitability, *ceteris paribus*, while companies with more liquidity, higher sales growth and higher asset turnover present higher profitability levels. For instance, when liquidity increases by 1%, profitability, on average, increases by 0.23% and 0.48% in *ROA\_EBIT* and *ROA\_NI*, respectively, and 0.71% in *ROE*, while all others remain constant. The distinctive impact on profitability dependent variables can be clearly observed through the annual sales growth. Although presenting a positive coefficient in all models, an increase of 1% in this independent variable results, on average, in a 5% and 7% increase in *ROA\_EBIT* and *ROA\_NI*, respectively, yet it represents a much more significant increase of 15% in *ROE*.

In short, the results suggest that larger companies with greater liquidity, lower inventory weight, higher annual sales growth, lower percentage of fixed assets and greater assets turnover are, on average, more profitable.

Regarding models validity, Model 2 presents the highest adjusted  $R^2$ , showing that approximately 26% of the  $ROA_{NI}$  variation is explained by the independent variables included in the model. It is also possible to verify that the hypothesis of joint nullity of the coefficients for the independent variables can be rejected, due to a  $p$ -value of zero for the  $F$ - statistic, proving that all models are valid in explaining profitability.

### **Profitability by group of countries: Western Europe and Eastern Europe**

Table 4 summarises results segmented by groups of countries from Western Europe and Eastern Europe. The results suggest that in Western Europe LE are more profitable than SME, since the coefficient for  $EU\text{-}Western*Size$  is positive and statistically significant in all models. On the contrary, in Eastern European countries, SME are more profitable than LE; however, this conclusion is limited to  $ROA_{EBIT}$  measure, since the variable  $Size$  is only statistically significant in Model 1. Therefore, all else unchanged,  $ROA_{EBIT}$  of the LE is, on average, 0.0038 units lower than  $ROA_{EBIT}$  of SME from Eastern Europe.

It is also possible to conclude that Western European SME have, on average, lower returns than Eastern European SME, *ceteris paribus*, since  $EU\text{-}Western$  variable has a negative and statistically significant coefficient in all models.

Summing up, LE are indeed more profitable; however, this validity is not generalised, since SME in Eastern European countries are more profitable than their LE counterparts when profitability is measured in terms of  $ROA_{EBIT}$ . Furthermore, Eastern European SME are more profitable than Western European SME, even if the largest number of the European SME is based in Western Europe. This suggests that Eastern Europe has fewer SME, but clearly the more profitable ones.

### **Impact of the Financial Crisis on Profitability**

In order to evaluate the impact of the financial crisis on the profitability of companies, we estimated all the three models considering two additional independent variables:  $Crisis$  and  $Crisis*Size$ . Table 5 summarises the results.

The interaction variable  $Crisis*Crisis$  has a positive and statistically significant coefficient in all models, suggesting that LE present higher returns than SME during the crisis. Hence, all else unchanged, during the years of financial crisis,  $ROA_{EBIT}$ ,  $ROA_{NI}$  and  $ROE$  of LE are, on average, 0.0066, 0.0039 and 0.0074 units higher than those of SME. Furthermore, the  $Crisis$  variable presents a negative and statistically significant coefficient in all models, which suggests that SME

during the crisis years have an ROA decrease, on average, of approximately 0.01 units, in both measures, and an ROE decrease of 0.03 units. However, LE present less significant decreases of profitability during the financial crisis (0.0083 units for *ROA\_EBIT*, 0.0065 units for *ROA\_NI*, and 0.0184 units for *ROE*).

In short, and regarding hypothesis H2, it is possible to conclude that the financial crisis affected the profitability of companies, especially SME, which present the greatest decrease in profitability between 2009 and 2013. This finding suggests that LE had a better profitability management during the financial crisis, in line with Denčić-Mihajlov's (2014) argument about the positive association between profitability and size in periods of crisis.

### **Robustness analysis**

This In order to evaluate if our main finding - LE are, on average, more profitable than SME - holds across all industries, we estimate all the three models by industry. Results (not reported) suggest that LE have higher levels of profitability than SME for almost all sectors of activity<sup>3</sup>. Only for Sector E (Water supply, sanitation and waste management activities) is the coefficient on Size negative, suggesting that SME, which represent about 84% of the sector, are more profitable than LE. Nevertheless, this conclusion is only valid for ROA profitability, since the coefficient in Model 3 (ROE) is not statistically significant.

As an additional robustness analysis, we estimate all the models without the most representative country - Spain - that accounts for more than 28% of the total sample. Spain has also the largest imbalance between LE and SME. The results from this analysis (not reported) are very similar to those presented in Table 3, which suggest that our mains findings are not affected. The coefficient on Size remains positive and statistically significant in all the models.<sup>4</sup>

### **Conclusion, Policy Implications and Future Research**

We study the relationship between size and profitability by comparing the profitability of LE and SME, based on a sample of 54,654 enterprises from 21 EU countries for a period of 10 years. Taking into account that the majority of previous studies focus on LE and present a single-country framework, this study adds a relevant value based on a sample of companies from different European countries and belonging to different industries.

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<sup>3</sup> For sectors B, D, L, P and Q the coefficient on Size is not statistically significant.

<sup>4</sup> We also estimate all the models without Italian firms since Italy is the second most representative country in the sample. Our mains findings remain the same.

## **Conclusion**

Our results suggest that European LE are, on average, more profitable than SME, which is in line with prior research (Nunes et al., 2009; Doğan, 2013; Denčić-Mihajlov, 2014). We thus conclude that size affects profitability, both measured by ROA and ROE. The superior competition and strategic advantages of LE, together with greater potential for strategic diversification and stronger bargaining power with customers and suppliers potentially justify this difference.

Additional analyses on the impact of size on profitability also suggest that Eastern European SME are more profitable than their counterparts in Western Europe, and that in Western Europe, SME have higher ROA than LE. Regarding the sectoral analysis, LE are more profitable than SME in all sectors except Sector E - Water supply, sanitation and waste management activities. Finally, the results suggest that the financial crisis had a negative impact on the profitability of European companies, especially SME, as these showed a greater decrease in profitability compared to LE.

## **Policy implications**

As there is less evidence on non-listed companies in the literature, these conclusions can be of interest for policy makers who develop alternative ways of improving profitability and performance crises. The argument that financial constraints faced by firms, especially SME, affect profit growth reinforces that easing such constraints could be important for future policy initiatives.

Although SME represent more than 99% of the economy in EU countries, recent economic literature has focused on analysing the role of the largest enterprises in order to understand economic fluctuations. In fact, large enterprises can account for a sizeable portion of a country's economic output (Eurostat, 2015). For this reason, policy makers are often interested in understanding corporate behaviour, as corporate financial setbacks, especially in larger firms, can have severe consequences for economic activity. For this reason, it is relevant to acknowledge that large firms have faced less decrease in profitability during financial crisis in Europe.

## **Limitations and future research**

Although all the results in the study are robust, they have some limitations. For instance, it was impossible to include industry-specific and institutional variables, used by other authors, namely: uncertainty (Ballantine et al., 1993); market share segmented by industry (Goddard et al., 2005), or, market concentration (Lee, 2009). The use of other determinants of profitability would enrich the explanation of profitability variation between large and small and medium firms. In future research, it would be of interest to get a more comprehensive view of this topic, given the scarce number of studies on the impact of size on firm's profitability. For example, it would be interesting to analyse the impact at the fiscal level, with the aim of determining whether the results obtained in this study would remain the same for countries with a high (or low) fiscal alignment. It also would be challenging to study how earnings management practices may affect firm's profitability and the relation between size and profitability levels.

## Appendixes

Authors	Sample	Time frame	Main results
Dolja (2013)	200 non-financial listed companies (Turkey)	2008-2011	The results indicate a positive relationship between size and profitability. Control variables such as age and level of indebtedness have a negative relation to profitability (ROA). However, the liquidity ratio is positively related to the ROA.
Babalola (2013)	80 Industrial listed companies (Nigeria)	2000-2009	The size of companies has a positive effect on profitability. However, there is a negative relationship between corporate indebtedness and profitability. This result may have been caused by the high level of interest rates in Nigeria.
Lee (2009)	7,158 state-owned companies (USA)	1987-2006	Results indicate that the rates of profit are positively correlated with the size of the firms. In addition, within the same industry the profitability of companies varies.
Goodard et al. (2005)	1,2508 manufacturing and service companies (Belgium, France, Italy, Spain and United Kingdom)	1993-2001	There is evidence of a negative relationship between firm size and profitability. The relationship between the debt ratio and profitability is also negative, however the greater the liquidity of a company the greater the tendency to be more profitable, since it reduces the exposure of the risk of non-compliance.
Majumdar (1997)	1,020 manufacturing companies (India)	1968-1994	The results show that older companies are more productive and less profitable compared to newer companies. While LE are more profitable and less productive compared to SME. These performance differences can be explained by the industrial restriction policies in India over the last three decades.
Denčić-Mihajlov (2014)	108 non-financial listed companies (Serbia)	2008-2011	Profitability increases with size, liquidity, sales growth and asset turnover. In times of crisis, the size of companies and liquidity determine profitability.
Devri & Devri (2014)	50 listed companies (Pakistan)	2006-2012	The firm size and financial leverage are positively correlated with profitability.
Serraqueiro & Nunes (2008)	51 SME (Portugal)	1999-2003	Results show a positive relationship between the size and performance of SME. Leverage and the level of fixed assets negatively influence the performance of SME.
Fiegenbaum & Kärnani (1991)	3,000 companies from 83 industries	1979-1987	Results bring evidence that SME size output volume flexibility as a competitive advantage over LE, since SME can offset the inefficiency of their costs by the volume flexibility of output in order to increase their profitability.
Schmalensee (1989)	All manufacturing companies (USA)	1953-1983	Results point to an advantage of the profitability of LE over SME. It is also possible to verify that LE contract less in recession and expand less in prosperity than rival SME.
Nunes et al. (2009)	75 service companies (Portugal)	1999-2003	There is a positive relationship between size and profitability and between growth and profitability. On the contrary, there is a negative relationship between leverage and profitability and between asset tangibility and profitability.
Hall & Weiss (1987)	374 companies from Fortune 500 (USA)	1956-1962	The size of firms tends to result in higher profit rates, arguing in favor of the ability of LE to invest in areas where SME do not have access.
Amato & Amato (2004)	12 retail industries (USA)	1977-1987	Results suggest a nonlinear relationship between profitability and size, which means that in some industries medium-sized firms are less profitable than small and LE.

## Appendix I: Literature Review

	Total	%	LE	%	SME	%
Belgium	2,697	4.93%	642	23.80%	2,055	76.20%
Czech Republic	2,688	4.92%	289	10.75%	2,399	89.25%
Estónia	224	0.41%	12	5.36%	212	94.64%
Finland	188	0.34%	66	35.11%	122	64.89%
France	2,204	4.03%	313	14.20%	1,891	85.80%
Germany	1382	2.53%	948	68.60%	434	31.40%
Greece	1,366	2.50%	42	3.07%	1,324	96.93%
Holland	261	0.48%	163	62.45%	98	37.55%
Hungary	275	0.50%	73	26.55%	202	73.45%
Ireland	213	0.39%	91	42.72%	122	57.28%
Italy	14,108	25.81%	2,207	15.64%	11,901	84.36%
Latvia	162	0.30%	19	11.73%	143	88.27%
Lithuania	155	0.28%	14	9.03%	141	90.97%
Poland	455	0.83%	72	15.82%	383	84.18%
Portugal	2,864	5.24%	219	7.65%	2,645	92.35%
Romania	43	0.08%	10	23.26%	33	76.74%
Slovakia	125	0.23%	31	24.80%	94	75.20%
Slovenia	295	0.54%	38	12.88%	257	87.12%
Spain	15,374	28.13%	1,458	9.48%	13,916	90.52%
Sweden	3,206	5.87%	615	19.18%	2591	80.82%
U.K.	6,369	11.65%	2,462	38.66%	3,907	61.34%
	54,654	100.00%	9,784	17.90%	4,4870	82.10%

LE: Large Enterprises; AME: Small and Median Enterprises

## Appendix 2: Composition of the Sample by Country



Sectors	Total	%	LE	%	SME	%
A	945	1.73%	78	8.25%	867	91.75%
B	344	0.63%	79	22.97%	265	77.03%
C	21,814	39.91%	3,736	17.13%	18,078	82.87%
D	378	0.69%	188	49.74%	190	50.26%
E	683	1.25%	111	16.25%	572	83.75%
F	3797	6.95%	421	11.09%	3376	88.91%
G	14,190	25.96%	2,469	17.40%	11,721	82.60%
H	2,946	5.39%	452	15.34%	2,494	84.66%
I	869	1.59%	84	9.67%	785	90.33%
J	2,022	3.70%	443	21.91%	1,579	78.09%
L	389	0.71%	90	23.14%	299	76.86%
M	2,735	5.00%	894	32.69%	1,841	67.31%
N	1,755	3.21%	432	24.62%	1,323	75.38%
P	139	0.25%	13	9.35%	126	90.65%
Q	993	1.82%	173	17.42%	820	82.58%
R	308	0.56%	52	16.88%	256	83.12%
S	347	0.63%	69	19.88%	278	80.12%
	54654	100.00%	9784	17.90%	44870	82.10%

A: Agriculture, hunting and fishing; B: Mining; C: Manufacturing; D: Electricity and gas; E: Water supply; F: Construction, wholesale and retail trade and repair of motor vehicles; G: Motorcycles; H: Transport and storage; I: Hotels and restaurants; J: Financial intermediation; L: Real estate and renting; M: Professional and scientific activities; N: Public administration and defence; P: Education; Q: Health and social work; R: Recreational and cultural activities; S: Other activities and services.

### Appendix 3: Composition of the Sample by Industry

<b>Variable</b>	<b>Description</b>	<b>Formula</b>
<i>ROA_EBIT</i>	Return on Assets based on Earnings before Interest and Taxes	Earnings before Interest and Taxes / Total Assets
<i>ROA_NI</i>	Return on Assets based on Net Income	Net Income / Total Assets
<i>ROE</i>	Return on Equity	Net Income / Total Equity
<i>Size</i>	Size	Dummy variable, value 1 if the company is LE (operating revenue in 2013 above €50,000,000) or value 0 if the company is SME (operating revenue in 2013 equal or lower €50,000,000)
<i>Leverage</i>	Level of Indebtedness	Total Liabilities / Total Assets
<i>Liquidity</i>	Level of Liquidity	Total Current Assets / Total Current Liabilities
<i>Inventory</i>	Inventory Weight	Total Inventory / Total Assets
<i>Growth</i>	Growth of Annual Sales	Annual Change in Sales
<i>Tangibility</i>	Asset Tangibility	Total Property, Plant and Equipment / Total Assets
<i>Turnover</i>	Asset Turnover	Total Sales / Total Assets
<i>Country</i>	Country	Dummy variable; base: Portugal
<i>Sector</i>	Industry	Dummy variable, base: Sector A- Agriculture, Hunting and Fishing
<i>Year</i>	Year	Dummy variable; base: 2004

#### Appendix 4: Description of Variables

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## Tables

## Panel A - Total Sample

	Obs.	Mean	Median	SDeviation	Max	Min
ROA_EBIT	346475	0.06265	0.05111	0.05464	0.23449	-0.05608
ROA_NI	346475	0.03817	0.02784	0.04275	0.17892	-0.05851
ROE	346475	0.09906	0.07887	0.11416	0.52359	-0.26435
Size	346475	0.17746	0.00000	0.38206	1.00000	0.00000
Leverage	346475	0.60150	0.62066	0.18905	0.93354	0.18474
Liquidity	346475	1.67336	1.43344	0.78385	4.85509	0.62123
Inventory	346475	0.16404	0.14437	0.13380	0.50692	0.00000
Growth	346475	0.03734	0.01706	0.12776	0.41234	-0.26294
Tangibility	346475	0.24635	0.21421	0.18035	0.71564	0.00810
Turnover	346475	1.47434	1.34623	0.68513	3.62032	0.33048

## Panel B - Large Enterprises (LE)

	Obs.	Mean	Median	SDeviation	Max	Min
ROA_EBIT	61486	0.06665	0.05692	0.05522	0.23448	-0.05608
ROA_NI	61486	0.04312	0.03525	0.04343	0.17881	-0.05830
ROE	61486	0.11616	0.09962	0.12056	0.52351	-0.26358
Leverage	61486	0.61493	0.63575	0.17889	0.93354	0.18484
Liquidity	61486	1.61279	1.39225	0.74769	4.85245	0.62132
Inventory	61486	0.15752	0.13862	0.12864	0.50687	0.00000
Growth	61486	0.04673	0.03082	0.12091	0.41231	-0.26290
Tangibility	61486	0.24080	0.20744	0.17833	0.71564	0.00810
Turnover	61486	1.61435	1.47219	0.75239	3.61953	0.33048

## Panel C - Small and Median Enterprises (SME)

	Obs.	Mean	Median	SDeviation	Max	Min
ROA_EBIT	284989	0.06178	0.04994	0.05447	0.23449	-0.05608
ROA_NI	284989	0.03711	0.02625	0.04253	0.17892	-0.05851
ROE	284989	0.09538	0.07449	0.11239	0.52359	-0.26435
Leverage	284989	0.59860	0.61738	0.19105	0.93354	0.18474
Liquidity	284989	1.68643	1.44339	0.79083	4.85509	0.62123
Inventory	284989	0.16545	0.14578	0.13485	0.50692	0.00000
Growth	284989	0.03531	0.01381	0.12910	0.41234	-0.26294
Tangibility	284989	0.24755	0.21563	0.18076	0.71562	0.00810
Turnover	284989	1.44414	1.32328	0.66589	3.62032	0.33053

ROA\_EBIT: EBIT/Total Assets; ROA\_NI: Net Income/Total Assets; ROE: Net Income/ Equity; Size: Dummy variable with value 1 for LE and 0 for SME; Leverage: Total Liabilities/Total Assets; Liquidity: Current Assets/Current Liabilities; Inventory: Inventory/Total Assets; Growth: percentage of annual revenues growth; Tangibility: PP&E/Total Assets; Turnover: Total Sales/Total Assets.

Table I: Descriptive Statistics

	Size	Leverage	Liquidity	Inventory	Growth	Tangibility	Turnover
Size	1						
Leverage	0.0330***	1					
Liquidity	-0.0359***	-0.667***	1				
Inventory	-0.0226***	0.0741***	0.0325***	1			
Growth	0.0341***	0.0774***	0.0684***	0.0223***	1		
Tangibility	-0.0143***	0.1130***	0.1671***	0.1389***	-0.0043**	1	
Turnover	0.0949***	0.1260***	0.1106***	0.1004***	0.0711***	-0.2275***	1

Size: Dummy variable with value 1 for LE and 0 for SME; Leverage: Total Liabilities/Total Assets; Liquidity: Current Assets/Current Liabilities; Inventory: Inventory/Total Assets; Growth: percentage of annual Revenues growth; Tangibility: PP&E/Total Assets; Turnover: Total Sales/Total Assets.

**Table 2: Correlation Matrix**

	Model 1	Model 2	Model 3
	<i>ROA_EBIT</i>	<i>ROA_NI</i>	<i>ROE</i>
<i>Constant</i>	0.0753246 (69,49)***	0.0785715 (95,84)***	0.0607698 (28,22)***
<i>Size</i>	0.0010115 (4,11)***	0.0029004 (15,82)***	0.0080486 (14,93)***
<i>Leverage</i>	-0.0616092 (-92,36)***	-0.0765805 (-154,32)***	0.0491463 (33,3)***
<i>Liquidity</i>	0.0048465 (28,45)***	0.002275 (17,7)***	0.0070605 (22,66)***
<i>Inventory</i>	-0.0405952 (-55,54)***	-0.040939 (-76,23)***	-0.1183931 (-74,71)***
<i>Growth</i>	0.07309 (101,65)***	0.0540413 (100,64)***	0.1496344 (97,28)***
<i>Tangibility</i>	-0.0258222 (-46,58)***	-0.0291264 (-70,07)***	-0.0777232 (-65,4)***
<i>Turnover</i>	0.0144475 (96,95)***	0.0090363 (82,13)***	0.0249501 (76,2)***
Dummy Country	Included	Included	Included
Dummy Sector	Included	Included	Included
Dummy Year	Included	Included	Included
Observations	346475	346475	346475
Adj R <sup>2</sup>	0.1662	0.262	0.1621
F-statistic	1316.27	2347.67	1212.68
p-value	0	0	0

ROA\_EBIT: EBIT/Total Assets; ROA\_NI: Net Income/Total Assets; ROE: Net Income/Equity; Size: Dummy variable with value 1 for LE and 0 for SME; Leverage: Total Liabilities/Total Assets; Liquidity: Current Assets/Current Liabilities; Inventory: Inventory/Total Assets; Growth: percentage of annual revenues growth; Tangibility: PP&E/Total Assets; Turnover: Total Sales/Total Assets.

\*, \*\*, \*\*\* statistical significance at 10%, 5% e a 1%, respectively.

**Table 3: Profitability of LE vs. SME**

	Model 1	Model 2	Model 3
	<i>ROA_EBIT</i>	<i>ROA_NI</i>	<i>ROE</i>
<i>EU-Western</i>	-0.0037334 (-9,59)***	-0.0070742 (-22,53)***	-0.0205355 (-26,21)***
<i>EU-Western*Size</i>	0.0060121 (5,86)***	0.0037547 (4,49)***	0.0146432 (7,03)***
<i>Remaining variables (except Country)</i>	Included	Included	Included
Observations	346475	346475	346475
Adj R <sup>2</sup>	0.1609	0.2432	0.1383

ROA\_EBIT: EBIT/Total Assets; ROA\_NI: Net Income/Total Assets; ROE: Net Income/Equity; Size: Dummy variable with value 1 for LE and 0 for SME; EU-Western: dummy variable with value 1 if it is a firm of a country in Western Europe and 0 otherwise.

\*, \*\*, \*\*\* statistical significance at 10%, 5% e a 1%, respectively.

**Table 4: Profitability of Western vs. Eastern Europe**

	Model 1	Model 2	Model 3
	<i>ROA_EBIT</i>	<i>ROA_NI</i>	<i>ROE</i>
<i>Crisis</i>	-0.0149463 (-79,08)***	-0.009545 (-68,65)***	-0.0254397 (-65,36)***
<i>Crisis*Size</i>	0.0066011 (14,48)***	0.0038746 (11,41)***	0.0074297 (7,45)***
<i>Remaining variables (except Year)</i>	Included	Included	Included
Observations	346475	346475	346475
Adj R <sup>2</sup>	0.1628	0.2591	0.1585

ROA\_EBIT: EBIT/Total Assets; ROA\_NI: Net Income/Total Assets; ROE: Net Income/Equity; Size: Dummy variable with value 1 for LE and 0 for SME; Crisis: dummy variable with value 1 if it is year of crisis and 0 otherwise.

\*, \*\*, \*\*\* statistical significance at 10%, 5% e a 1%, respectively.

**Table 5: Profitability of LE vs. SME - Financial Crisis**