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**Corporate capital structure: the role of  
management and corporate governance  
during the crisis**

By

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## Abstract

Capital structure is a well-researched topic; however, the recent financial crisis highlighted that there are various issues, which deserve further investigation. Within this context, it is not surprising that the irrationally high leverage levels of America's largest firms turned the spotlight on corporate leverage theories and their empirical testing. The current thesis examines the impact of corporate governance and managerial attributes on firm leverage. Such an investigation is of particular interest for two reasons. First, corporate leverage is actually being determined by managerial decisions. Second, inadequate managerial decision making was one of the main drivers behind the recent crisis. The present thesis focuses on three specific attributes of corporate governance and management, those being: the board of directors' genetic diversity, managerial ability and management practices.

The analysis of cross-country data leads to several interesting conclusions. First, I find a significant and negative effect of the genetic diversity of board of directors' on the firms' leverage, stating that heterogeneity inside the boardroom reduces firm's debt, although it tends to increase disputes (Frijns et al., 2016). Second, the results show that managerial ability, as measured by Demerjian et al. (2012), has a positive impact on corporate capital structure both in regular and crisis periods. One potential explanation is that debt financing is preferred by more able managers (as regards firm revenues), in contrast to prior research advocating managers opposition to debt for maximizing their tenures (Bertrand & Schoar, 2003; Berger et al., 1997). Third, good management practices, as defined by the World Management Survey (WMS), positively affect corporate capital structure. This could be attributed to the positive influence of management practices, on firm performance, innovation and employment rates (Bloom & Van Reenen, 2007; Bloom et al., 2013). Overall, the present thesis contributes to the literature by bringing together the capital structure and the corporate governance literature, and by providing new insights that extend our understanding of the "capital structure puzzle".

**Keywords:** capital structure; leverage; genetic diversity; board of directors; managerial ability; management practices; financial crisis; corporate; firms

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## Chapter 1: Introduction

### 1.1 Overview

The debate for capital structure began after the publication of Modigliani and Miller's (1958) research paper that provided the initial framework of capital structure examination. Modigliani and Miller presented the assumptions of perfect capital markets, which are now well-known, and indicated that in efficient financial markets, firms and individuals borrow at the same interest rate, pay no taxes and choose investments that are not affected by financing options. Overall, their work concluded that corporate capital structure is irrelevant under perfect market conditions.

Although this conclusion does not take the form of an influential or applicable argument (since no perfect market exists), it has been the basis for the evolution of capital structure research. Specifically, subsequent studies have rejected Modigliani's and Miller's certain assumptions to provide applicable and realistic capital structure models. Theories of capital structure are derived from the rejection of these certain assumptions.

Various research papers appear in the literature investigating how firms choose their financing methods, the reasons for these choices and the method's effect on firms' performance. Three major theories are concerned with capital-structure managerial decisions. The first, known as the static trade-off theory, suggests target setting for debt-to-equity ratio by a firm's director and subsequent action that accords with that target (Myers, 1984). In contrast, the second theory, the pecking order, argues that firms prefer internal borrowing over exterior borrowing, but there is no target setting regarding debt levels. In other words, the managers of these firms prefer to engage in an increase of the capital share of the firm, rather than to borrow either through banks or through issuing new shares (Myers, 1984). The third, agency theory, argues that managers prefer to borrow from banks because of information asymmetry cost reduction (Jensen & Meckling, 1976). That cost rises between the commanders of the operation and the potential investors (Jensen & Meckling, 1976).

Despite the extensive literature that exists on this topic, none of the theories is followed strictly. Rather, various scholars have made clear that a firm's capital structure does not follow a specific theory, but is influenced by the culture of the company itself, the legal

system in the operating country, institutions, taxation, corporate governance and various other factors (Kayo & Kimura, 2011; Öztekin & Flannery, 2012; Alves & Ferreira, 2011). Any alteration in one or more of the above factors changes capital structure.

Overall, the recent global financial crisis has renewed interest in the topic of capital structure. First, the crisis affects corporate capital structure through various channels (Demirguc-Kunt et al., 2015). Also, the unreasonably high leverage observed during the crisis is considered one of the causes of the United States' (US) financial crisis (see, e.g., US Financial Crisis Inquiry Commission Report, 2011).

Specifically, all the enterprises experienced significant financial effects during the recent crisis, which began at the end of 2007 in the US and quickly spread to the rest of the world. The recent crisis is considered to be more severe than the depression of the 1930s, and it led many enterprises to bankruptcy and many others to the brink. However, governments around the globe tried to avert such catastrophe by applying policies to prevent bankruptcies and reduce their effects. Capital structure (or actually the lack of capital) is one of the factors making enterprises vulnerable to unexpected (and unfavourable) events.

According to the *US Financial Crisis Inquiry Commission Report*, published in 2011,<sup>1</sup> the five core investment banks in the US<sup>2</sup> had extremely high leverage ratios in 2007, around 40:1, making them very exposed, even in minor changes of 3% in their total assets. An illustrative case referred to that report concerns Bear Stearns, which at the end of 2007, had \$383.6 billion in liabilities, but only \$11.8 billion in equity. Still, sizeable European banks experienced similar or even higher leverage ratios (European Commission 2009). At the same time, according to the graph below, the total market credit debt provided to non- financial corporations as percentage of market value of corporate equity increases sharply after 2006, reaching its highest level over the last 20 years during 2007 and 2009. As the US Financial Crisis Inquiry Commission Report (2011) concludes, the unreasonably high leverage ratios as a result of companies'

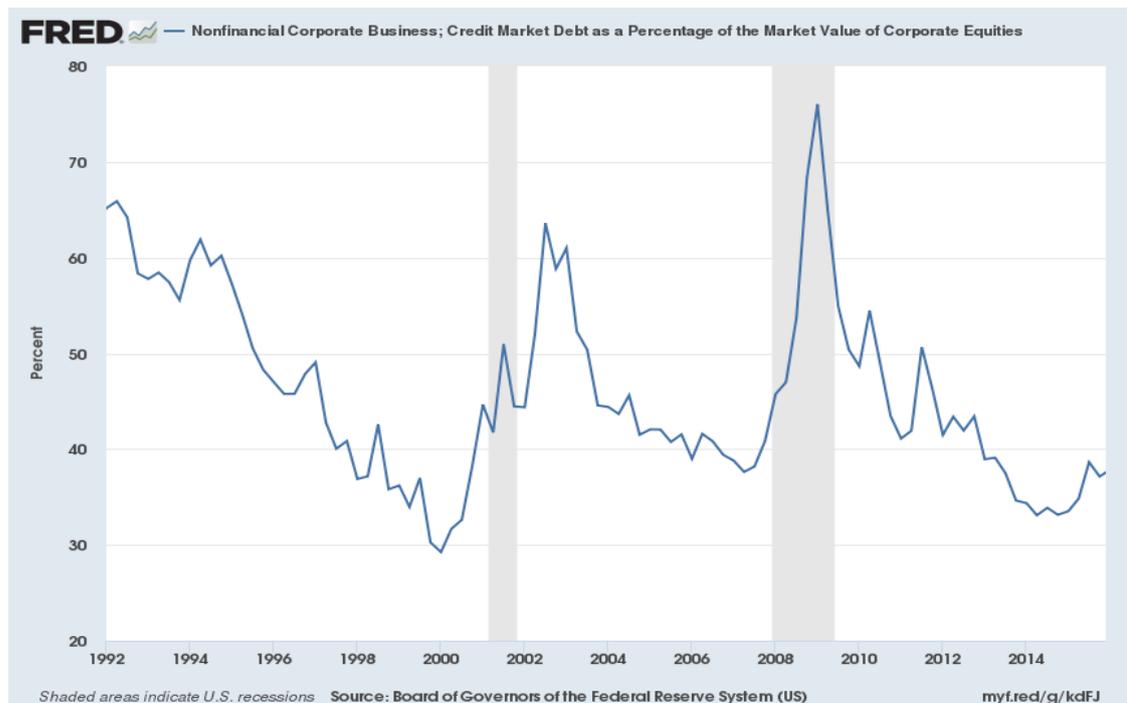
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<sup>1</sup> The Financial Crisis Inquiry Commission is the one that submitted the report about the roots of economic and financial crisis that occurred in United States. This report is the official report presentable to Federal Congress of US (The US Financial Crisis Inquiry Commission 2011).

<sup>2</sup> Namely: Bear Stearns, Goldman Sachs, Lehman Brother, Merrill Lynch and Morgan Stanley.

superfluous borrowing is one of the causes of the US financial crisis, further highlighting that this crisis could absolutely have been avoided.

*Figure 1.1- Total market credit debt to non-financial sector as percentage of market value of equity (USA)*



As the recent crisis highlighted, capital structure is the most determinative factor for organizations, so policy makers target it with regulations. Aiming at reducing leverage ratios and strengthening the banking system overall, the Basel Committee on Banking Supervision introduced in 2010–2011 a new accord, the Basel III. However, the capital requirements imposed to banks do not apply to the capital structure decisions of non-banking institutions.

Although there is no doubt that corporate capital structure is an extensively researched topic, the recent global financial crisis proved that the understanding of capital structure remains incomplete. This is also illustrated in the mixed empirical results of the literature on the determinants of capital structure. In other words, some researchers find that certain factors determine capital structure choices; however, other researchers fail to find supporting evidence. For example, profitability and firm size are widely accepted

determinants of corporate capital structure. Yet, some studies report ambiguous effects of these determinants on corporate capital structure.

The recent financial crisis underlined human factors as the most critical for forming leverage ratios. That conclusion derives from the irrationality, in economic terms, that characterizes the choice of too-high leverage ratios obtained by organizations in pre-crisis periods. In the past decade, many studies concerned with financial and macroeconomic determinants of capital structure turned their attention to qualitative insights. Recent studies have been mainly concerned with the chief executive officers (CEOs) and board of directors' characteristics, including their ages, tenures, compensation schemes, their social networking, and in general the quality of the corporate governance.

Corporate governance is exercised by a board of directors and aims at ensuring the most effective and efficient management, in terms of long-term corporate goals, risk appetite and firm value. A board of directors' traits seem to markedly influence firms' risk-taking, probability of bankruptcy, credit risk assessments and, of course, leverage. A considerable body of literature has been produced on boards of directors, suggesting features, such as directors' (of board) tenure, gender and age, as corporate leverage determinants (Bryan et al., 2006; Jiraporn et al., 2012; Fields et al., 2012). However, enhancing decision making and overall corporate governance might require one to shed light on other characteristics of a board of directors, such as race or ethnicity.

As stated by the UK Financial Reporting Council in 2014, enriching points of view and experiences inside the board of directors, as occurs in the case of gender or racial diversity, leads to more productive discussions complying with shareholders' interest and application of the corresponding corporate strategy. Stakeholders and clients consider board heterogeneity to lead board of directors to make decisions in compliance with their interest, and as a result, they seek it (Luoma & Goodstein, 1999; Wang & Dewhirst, 1992). Therefore, board diversity is considered as a key trait of a boardroom that best serves corporate missions and goals.

At the same time, as the CEO of JP Morgan, Jamie Dimon, strongly emphasized during his testimony to the US Financial Crisis Inquiry Commission, the one to "blame" for the crisis is clearly the management team. In the current context, this is because the

managers are the ones making the decisions concerning the mix of debt (e.g. loans vs bonds, short- vs long-term) and the degree of leverage (i.e. debt versus equity).

However, research concerned with management strategy and practices' effect on capital structure have emphasized only the CEOs' characteristics (Berger et al., 1997; Bertrand & Schoar, 2003). Specific characteristics, such as age, tenure and compensation scheme, have been related to specific management styles that influence corporate leverage (Berger et al., 1997). For example, a CEO's age seems to result in more conventional managerial practices influencing corporate leverage (Bertrand & Schoar, 2003). Managerial ability has not been examined yet as a critical determinant of corporate leverage, although it has been related to several firm-related decisions, such as earnings quality, tax avoidance, loan contracts, and credit risk assessment (Demerjian et al., 2013; Francis et al., 2016b; Bonsall et al., 2016; Koester et al., 2016).

Management practices, overall, can be seen as the tools for achieving long-term targets and enhancing firm performance. Those practices should comply with set corporate goals and objectives. However, some managerial practices that have not been related to capital structure decisions are classified as "good" in terms of increasing total factor productivity. Those practices, as presented by Bloom and Reenen (2007), Bloom and Van Reenen (2010), Bloom et al. (2012) and Bloom et al. (2014) are considered as good or bad according to international empirical experience concerning their effectiveness as regards firm performance.

The current work relates to two stands of the literature. First, it relates to studies mentioning that management effectiveness, as deriving from the managerial practices and ability, seems to influence not only firm performance but also other firm characteristics. It also relates to many papers that study the determinants of capital structure, with the most relevant strand of the literature dealing with corporate governance characteristics (e.g., Alves et al., 2015; Liao et al., 2015). In general, these studies conclude that several aspects of a board of directors influence capital structure.

## **1.2 Research objectives**

The current thesis aims to reveal the unidentified determinants of corporate capital structure, related to corporate governance and management characteristics of non-

financial, and mainly manufacturing, firms around the globe. I do not consider banks for a number of reasons. First, research in the banking sector has been extensive and is up to date. Second, bank capital has been traditionally subject to regulatory capital requirements. Third, banks have unique financial attributes and financial statements that differ from the ones of non-financial firms. Further, manufacturing firms, although they have been extensively examined, provide the best field for researching board diversity, managerial ability and practices' effects in terms of data availability and the applicability of economic theory. At the same time, these firms were also affected substantially by the crisis.

Focusing on the board of directors, I examine the effect of genetic diversity among board members - based on the country of origin of each director - on corporate capital structure of US and UK firms over the period 1999-2012. In addition, employing the managerial ability score developed by Demerjian et al. (2012), and a large sample of US firms from 1995–2015, I examine the impact of managerial ability on corporate capital structure decisions. Finally, I investigate the impact of managerial practices on corporate capital structure between 2006 and 2015, using the World Management Survey (WMS) dimensions of monitoring, targeting and motivation (people's management) (Bloom et al., 2014).<sup>3</sup>

Thus, the current investigation addresses the following four research questions:

1. Does genetic diversity among board directors explains capital structure variations?
2. Does managerial ability determine capital structure decisions?
3. Do good or bad management practices drive corporate capital structure?
4. Does the impact of these attributes differ over normal and turbulent periods?

### **1.3 Contribution of the study**

The current study makes a three-fold contribution to the empirical research of corporate capital structure, as explained below.

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<sup>3</sup> Each year's data are published on September of the year that follows, so up to the end of summer of 2017, only the data published in September 2016 for the 2015, were available.

First of all, no empirical study has yet associated the genetic diversity of the board of directors - based on the country of origin of each director - with firm leverage. Despite the fact that numerous studies identify board diversity, in terms of gender and race, as a critical factor for enhancing firm performance, the literature offers less certain conclusions about the effect of gender diversity on firm leverage, and there are no studies on the influence of race (Delis et al., 2016; Frijns et al., , 2016; Ahern & Dittmar 2012; Rossi, Hu & Foley, 2017).

The impact of a firm's managerial profile on corporate capital structure also remains unexamined. "Managerial profile" denotes both the ability of a management team to generate revenue and denotes specific management practices applied by firms that might be beneficial or not in terms of firm productivity. Specifically, no previous research has examined the effect of managerial ability, as measured by Demerjian et al. (2012) on corporate capital structure.). Rather, a few studies have been concerned with the ability of managers to influence other corporate attributes. Existing evidence covers the relationships between managerial ability and firm performance, tax avoidance, quality of earnings, credit ratings, credit risk and bank loan spread (Demerjian et al., 2013; Demerjian et al., 2012; Bloom et al., 2014; Koester et al., 2016; Bonsall et al., 2016; Francis et al., 2016).

Moreover, the framework, developed by the WMS project, for assessing management practices in innovation, performance and human resources management in enhancing firm productivity has not been related to the use of corporate debt and firm capital structure. Rather, assessments of management practices have mainly been used in estimating firm productivity, performance and national differences on productivity (Bloom & Reenen, 2007; Bloom et al., 2012; Bloom et al., 2014). The current study is not limited to the identification of new factors determining capital structure decisions. Rather, it aims to investigate potential changes on the impact of those factors on leverage during a recent period of economic distress, namely the 2007 global financial crisis.

#### **1.4 Structure of the thesis**

Chapter 2 concerns itself with reviewing the literature, including summaries of the most well-known theories and research concerned with capital structure determinants. It also

reviews research concerned with board diversity, management effectiveness and finally, the effects of crises on corporate capital structure are included in that chapter.

Chapter 3 aims to examine the effect of the board diversity on corporate leverage. The chapter starts with a discussion of the sample, the variables in the models, the descriptive statistics, and the estimated models. Then, it discusses the empirical results and their implications.

The impact of managerial ability on corporate leverage is investigated in Chapter 4, which first presents the sample, the descriptive statistics and correlations, and the specifications of the models. It then discusses the findings.

Chapter 5 examines the relationship of management practices with corporate leverage. As in the previous two chapters, the sample, the variables and the model specifications are summarized first, leading to the discussion and analysis of the empirical findings.

Finally, Chapter 6 outlines the overall conclusions drawn from the previous chapters, as well as the research limitations and future research avenues.

## **Chapter 2: Literature Review**

### **2.1 Introduction**

This chapter reviews the well-known theories and the determinants of corporate capital structure. The discussion begins in Section 2.2 with the trade-off theory, it considers the pecking-order theory in Section 2.3 and then it discusses other theories in Section 2.4. The capital structure determinants are presented in Sections 2.5–2.6, whereas Section 2.7 outlines the relationship of the crisis with firm leverage.

### **2.2 Trade-off theory**

#### **2.2.1 Basic elements**

The trade-off theory emphasizes the identification of the firm's optimal capital structure, which derives from the relaxation of the assumptions of no taxes and no costs under a perfect capital market. Myers (1984) was the first to refer to trade-off theory; however, Jensen and Meckling (1976), followed by Myers (1977), were the first to highlight that both the agency costs of debt and external agency costs are minimised when both debt and equity are issued. Hence, the achievement of a firm's optimal capital structure presupposes a balance between debt and equity.

According to the trade-off theory, therefore, firms initially set a target for debt-to-equity ratio and then make the necessary decisions to reach that target. The theory's name derives from the trade-off between the benefits coming from tax-shield reductions for interest payments and the distress costs coming from that debt (Bradley et al., 1984; Titman & Wessels, 1988).

The static version of trade-off theory implies that firms choose their optimal level of debt in order to achieve the balance between debt and equity required to obtain optimal capital structure (Lemmon & Zender, 2010). Furthermore, this version of the theory hypothesizes that firms choose debt over equity or equity over debt to the extent that a certain choice maximizes a firm's value. Therefore, an optimal capital structure level is supposed to exist that maximizes the firm's value and minimizes external claims to cash flows.

Static trade-off theory, as its name suggests, is static, implying that firms maintain optimal capital structure. In other words, it assumes instantaneous adjustments to optimize capital structure. As Frank and Goyal (2008) highlight, the static trade-off theory rejects the notion of retained earnings (i.e. inside equity), leading to the conclusion that a one-period model is not appropriate to describe a firm's financing behaviour. In addition, a positive relationship between profitability and leverage is suggested by the theory, owing to the fact that more profitable corporations are not considered to be so close to bankruptcy as less profitable ones (Kjellman & Hansen, 1995).

On the other side, the dynamic version of the trade-off theory incorporates another aspect of capital structure, namely target leverage. In this version, firms set an optimal leverage goal and move toward it; the static trade-off theory does not include the concept of target adjustment (Frank & Goyal, 2008). The dynamic trade-off theory supposes a gradual process of optimal adjustment. Analytically, it maintains that firms indeed have a target level of capital structure that leads to value maximization, but potential deviations from that target are not costless. In addition, there is a long-term optimal level of leverage at which a firm converges with a certain speed of adjustment, although the speed of adjustment is not fixed (Frank & Goyal, 2008).

Furthermore, dynamic trade-off theory posits the achievement of optimal capital structure by offsetting bankruptcy and agency costs with corporate tax advantage (Strebulaev, 2007). According to Strebulaev's (2007) model, the leverage of a firm experiences less fluctuation in cases of short-term changes in equity and more fluctuation in case of long-term changes in value. In general, the dynamic version of this theory employs the role of time on firms' financing decisions—of course, the financially optimal action in this period will also be optimal in the next period—and finally it accounts for the speed of adjustment.

As already noted, trade-off theory is concerned with the association between firm's equity and debt; however, many studies have examined the trade-off theory, for debt structure. Those studies emphasize the optimal debt structure, searching for the balance between bank and market debt (Hackbarth et al., 2007). Novae (2003) argues forcefully that the optimal debt choice is differently realised by managers and shareholders. More

specifically, the choice of optimal debt for shareholders is that which secures the efficiency of the firm, whereas the preferred choice for managers is that which maximizes their tenure.

### **2.2.2 Empirical examination of theory**

A sizeable number of studies have been concerned with the validity of the trade-off theory in practice. Researchers have tried to identify whether firms follow trade-off implications in the composition of their financing strategy or not; however, they have drawn different conclusions.

Empirical studies concerned with the validity of the trade-off theory can be separated into three different groups. The first concludes that firms tend to follow the intuitions of the trade-off theory when deciding on their financing method (Ju et al., 2005; Flannery & Rangan, 2006). The second group considers not only the trade-off theory but also other theories, indicating that only certain corporate variables coincide with trade-off theory. The third group of studies completely rejects the theory, supporting instead the pecking-order theory (Hackbarth et al., 2007; Denis, 2012).

The work of Ju et al. (2005) assesses the relevant efficiency of the trade-off theory in predicting leverage. Following trade-off theory's intuitions, they calculate the optimal capital structure and the cost related to the deviation of the firm's leverage from its optimal level. They construct a dynamic "time-contingent claim" model which is directly affected by bankruptcy costs and tax shields, and they compare their model's estimations and hypothesis among large, publicly traded, S&P-indexed firms from 1980–1999 and conclude that trade off models can satisfactory predict leverage levels. The research of Frank and Goyal (2009) is instead concerned with the determinants of leverage of publicly traded US firms. It strongly suggests the acceptance of static trade-off theory and the rejection of the pecking-order theory.

Öztekin and Flannery (2012) claim that a firm's ability to adjust its leverage is mainly influenced by economic, legal and political institutions, by corporate governance, by tax systems and by the structure of a country's credit and securities markets. In particular, they provide evidence that adjustment costs and benefits play a significant role in the speed of convergence on optimal capital structure globally, which is in agreement with the dynamic trade-off theory. Furthermore, the country's legal and institutional heritage

have been found to determine capital structure's adjustment process and that slow adjusters face high adjustment-costs.

On the other side, Hackbarth et al. (2007) emphasize the optimal debt structure of a firm. Specifically, through the development of a trade-off model, they advocate that static trade-off describes debt choices made by firms. Their results imply that bank debt is the optimal financing choice for weak firms, whereas both market and bank debt are the optimal choice for strong firms.

On the contrary, there are studies suggesting that some basic concepts of trade-off do not hold. Specifically, evidence exists that firms have used debt financing extensively in periods in which tax benefits were non-existent (Bargeron & Lehn, 2012; Baskin & Miranti, 1997). Furthermore, trade-off theory predicts a positive association between leverage and profit, while cross-sectional studies strongly suggest the opposite (Denis, 2012).

Furthermore, according to the trade-off theory, "run-ups" in their share price lower leverage ratios and lead firms to increase their debt in order to return to their optimal levels. However, substantive evidence has been produced in the empirical literature that firms prefer to issue equity in the case of "run-ups" (Denis, 2012). At the same time, studies examining the dynamics of capital structure adjustment state that the speed of the adjustment of a firm's leverage ratios towards optimal is lower than predicted by static trade-off theory (Flannery & Rangan, 2006). Therefore, empirical evidence on the trade-off theory suggests that firms might follow other theories of capital structure as well.

## **2.3 Pecking-order theory**

### **2.3.1 Theoretical concept**

Static trade-off implications would not explain specific events occurring during 1980s, such as the announcement of corporate financing events that led to reductions in stock prices (Denis, 2012). In the light of the search for possible explanations, Myers and Majluf (1987) proposed a model which provided different insights into capital structure choices and clarifications for the events mentioned above.

According to their model, there is an asymmetric information problem (the managers do not share their information with shareholders), which leads managers to consider any signal of offering as the firm's stocks have been overpriced. Expanding that concept, Myers (1984) developed the pecking-order theory, which posits that firms make financing decisions to eliminate or minimize those adverse selection problems<sup>4</sup>. In general terms, the meaning of the theory is summarized in four words: "internal over external financing" (pg. 67, Robert & Hunter, 1995).

However, the pecking-order theory is not as simple as the above statement indicates. The Pecking-order theory does not include a specific target set for the debt-to-equity ratio, as does the trade-off theory, but it states that firms have a hierarchical structure for financing choices. In other words, firms tend to prefer internal to external debt, so debt over equity, classifying equity as last-resort financing. Adverse selection problems arising from equity are especially discouraging for firms, since new investors are misinformed.

Generally, the pecking-order theory attempts to minimize adverse selection problem and this opposition to equity financing derives from the costs incurred by that form of financing. It is claimed that the costs imposed by equity financing are higher than those imposed by other financing instruments (Frank & Goyal, 2009; Denis, 2012). Both dynamic and static aspects of the pecking order imply that firms, which are both profitable and have low leverage, are not motivated to increase their leverage. To sum up, the pecking order theory states that firms prefer internal to external financing choice and consider equity financing as the least desirable choice.

### **2.3.2 Empirical examination of theory**

The validity of the pecking-order theory has been discussed by many researchers, although none has provided conclusive remarks on whether firms follow solely the pecking-order theory's implications for their financing choices or not. A considerable number of studies have supported the applicability of pecking-order intuitions by firms, contradicting another group of studies concluding the opposite.

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<sup>4</sup> Adverse selection problem rises in lack of symmetric information between the principal and the agent. For example, in a two party transaction, one party is more well-informed regarding transaction aspects than the second party (Dahlstrom & Ingram, 2003).

Further, numerous research papers have suggested tests for differentiating between the two major theories (i.e., between trade-off and pecking order). The most popular test for examining the pecking-order theory was introduced by Shyam-Sunder and Myers (1999). It is concerned with the identification of the method used to cover financing shortages following the pecking-order theory.<sup>5</sup> The researchers claim that there is strong evidence that pecking-order implications are those followed during financing decision making. Further, they argue that target models, as such proposed by the trade-off theory, have only limited power for capturing modifications in firm's debt financing.

Lemmon et al. (2008) also suggest that firms tend to follow the pecking-order theory's intuitions for their financing needs. Specifically, based on Shyam-Sunders and Myers's (1999) test, Lemmon et al (2008) conclude that the preferred funds are internally generated. Furthermore, in the presence of debt financing with minor transaction costs, profitable but low-leveraged firms prefer to decrease their leverage using excess cash flow to "retire" debt rather than exploiting tax benefits and increasing their leverage ratios.

Still, Perreira Alves and Ferreira (2011) illustrate how institutional variables fit into different theories of capital structure. The empirical study of Perreira Alves and Ferreira (2011) concludes that shareholders' rights are a significant determinant of capital structure. They also provide evidence that size and profitability seem to be common determinants around the world. The negative relation realised between leverage and profitability agrees with the pecking-order theory. Evidence consistent with pecking-order theory is also found by Fama and French (2002), who suggest that any variations in earning and investment in the short-term are financed through debt. However, they underline that the pecking-order theory fails to explain the sizeable amount of equity issuance by firms characterized by small size and high growth.

In accordance with the pecking-order theory are also the results of the study conducted by Arsov and Naumoski (2016) on Balkan-based companies. Their study examines common capital structure determinants in order to uncover the capital structure decisions made by managers in the post-transition era. They conclude that firms' managers follow

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<sup>5</sup> Cash flow identity, i.e. assets growth minus current liabilities growth minus the retained earnings growth constitute the "finance deficit" (Shyam- Sunder & Myers, 1999).

a hierarchy in financing decisions, in accordance with the pecking-order theory. However, they point out that the larger firms with higher fixed assets' investments experience higher leverage levels in contrast to more profitable firms with more tangible assets, which tend to use less debt in times of financing (Arsov & Naumoski, 2016).

By contrast, empirical evidence also supports a rejection of the pecking-order hypothesis, since a significant number of firms tend to issue equity to finance themselves (Denis, 2012). Moreover, Stabulaev and Yang (2013) provide evidence that more than 10% of firms do not use debt at all, and more than one-fourth of the firms under examination have leverage ratios of less than 5%. Another study examining the validity of the pecking order hypothesis is that of Bhama et al. (2016), which differs from others by splitting the firms in the sample into deficit and surplus groups (the distinction is made year by year for every firm, and as a result, the deficit or surplus each year is counted independently of the previous year's result). According to their results, the pecking-order theory is valid only for deficit firms and not for surplus firms. As they advocate, firms tend to use debt in case of deficit, whereas generally they tend to limit debt usage to covering the existing deficit gaps. Thus, they conclude that both the pecking-order theory and the trade-off theory apply in cases of deficit firms. At the same time, the pecking-order theory has no applicability for firms included in the surplus group (Bhama et al., 2016).

In contrast to the hierarchical rankings suggested by the pecking-order theory, Autore and Kovacs (2010) provide evidence that even in the presence of significant asymmetric information problems, firms issue equity, since information asymmetry is considerably less than it used to be. Moreover, Leary and Roberts (2007), who also test whether the pecking-order theory captures firm's financing decisions, find little evidence for the power of the pecking-order theory in explaining financing decisions.

Overall, empirical evidence suggests that firms do not strictly follow the pecking-order theory. Prior research concludes that both the pecking-order and the static trade-off theories' principles may apply and there are also results implying that none of these theories explain capital structure. Hence, firms may follow other theories to form their leverage levels.

## 2.4 Other theories

In the capital structure literature, scholars have examined—apart from the trade-off and the pecking-order theories—the agency theory and the market-timing theory.

### 2.4.1 Agency theory

Agency problems basically arise from the separation of a firm's ownership from its management. Without being the owners, managers' decisions fail to comply with owners' expectations, creating a conflict of interest between them that affects capital structure decisions. As Jensen (1986) has underlined, managers who are self-interested tend to maximize personal benefits by decreasing debt, in spite of the impact of that choice on shareholder's wealth, since debt restricts managers' freedom to use the firm's cash flow. At the same time, pressure for high performance, as well as the reduction in free cash flow that derive from the leverage, may lead dominant managers to select lower debt ratios than those preferred by shareholders, which is an example of agency problem (Parsons & Titman, 2008). Furthermore, another agency problem arises between equity holders and creditors, which may provide the necessary explanation for firms' preference to employ less leverage while expecting to increase the number of investments.

Agency cost models derived from those agency problems imply that the agency cost of debt is offset by the benefits of debt determining the optimal capital structure (Chen & Hammes, 2003; Jensen & Meckling, 1976).

### 2.4.2 Market-timing theory

Another view on how firms choose their financing methods is suggested by market-timing theory. More precisely, according to this theory, the managerial financing choices are based on the market conditions in a given point in time in both the debt and equity markets. Especially in the case of desirable market conditions, managers may raise funds, even if at that time there is no need for new funds. In need of corporate financing, managers prefer a market, either debt or equity, which at the time seems more attractive to them (Baker & Wurgler, 2002)

Arosa et al. (2014) strongly support the validity of the market-timing theory, after having investigated 75,589 firm-year observations from 36 countries. Examining the possible interaction between cultural characteristics and the proxy of market timing, they prove that corporate leverage decisions accord with the market timing theory. Still, they find that when shares prices rise, firms reduce their leverage ratios (Arosa et al., 2014). Furthermore, Chang et al. (2006) advocate that market-timing theory seems to be the most appropriate explanation of the capital structure of small firms in the case of low analyst-coverage. Analyst coverage refers to “the number of analysts that cover a firm” and is used by authors as a proxy for information asymmetries realized between firms’ managers and external investors (pg. 3, Chang et al., 2006). The reported negative relationship between information asymmetries and the number of analysts in a firm lead to the conclusion that firms with a constrained number of analysts may be mis-valued, coinciding with the notion of market-timing theory.

However, as Frank and Goyal (2009) point out, this theory completely rejects all the studies concluding that there are certain factors identified as determinants of corporate leverage. Another controversial implication of this theory is found in the case of undesirable conditions holding in the debt market, such as high rates of Treasury Bills, since firms reduce debt financing in presence of undesirable condition in debt market. In contrast to the implications of this theory, empirical evidence during recessions suggests that that companies increase their leverage.

Another criticism on Baker and Wurgler’s (2002) take on market-timing theory comes from Parsons and Titman (2008). They claim that public reports of market-to-book ratio that are used in the market-timing theory for capturing cases of mis-valuation may be incorrect. In addition to this source of information, there are managers that usually have strong inside information of the firms which can assist them in issuing equity at the appropriate time. Hence Baker and Wurgler (2002) do not offer a convincing explanation as for why managers should time their financing choices based on public information (Parsons & Titman, 2008).

Moreover, Alti (2006) studies the validity of the market-timing hypothesis by examining initial public offerings (IPOs) of firms from 1971–1999, using a sample that is almost identical to the one in Baker and Wurgler’s (2004) study. Alti (2006) separates the

periods into hot- and cold-market periods, where hot-market periods occur when there are high IPO volumes from aggregate issuers, and cold-market periods occur in the opposite conditions. According to his findings, firms that go public in hot-market periods tend to issue more equity than firms that go public in cold-market periods, implying lower debt ratios for them after the IPO. Particularly, firms that go public in hot-market periods tend to raise 76% of pre-IPO asset value, compared to 54% in cold-market conditions. However, the researcher observes that this effect declines over time. In other words, Alti (2006) finds that the effect steadily reduces, and specifically, it is reduced by a half during the first half year of IPO and completely ceases to exist at the end of the second year. As this study highlights, market-timing effects seem to be temporary in the case of young firms.

## **2.5 New trends on capital structure theories**

Much previous research has focused exclusively on proving the sole validity of one specific theory, but has failed to do so. A significant number of recent studies provides evidence that neither trade-off nor pecking-order theory of capital structure dominates (Ebrahim et al., 2014; Proença, Laureano & Laureano, 2014). They claim that trade-off theory and pecking-order theory complement in explaining capital structure (Ebrahim et al., 2014).

According to Proenca et al. (2014), who studied Portuguese small and medium-sized enterprises' (SMEs) leverage during the recent financial crisis, a negative relationship holds between profitability and debt ratios, in accordance with the pecking-order theory. At the same time, however, they find that asset structure is negatively and positively associated with short- and long-term debt, respectively. This result coincides with the static trade-off theory's implications (Proença et al., 2014). Therefore, the findings of Proenca et al. (2014) coincide with both well-known theories of capital structure.

In addition, Gonzalez and Gonzalez (2012) conclude that both theories apply in the case of Spanish firms. They find that Spanish firms have a target leverage, attempting to achieve it in every period through tax incentives gained by debt usage. At the same time, the profitability of Spanish firms is negatively related to leverage, whereas investment opportunities and asset intangibility are positively related to it; all this evidence

completely coincides with pecking-order theory. However, researchers make significant remarks about the validity of both theories in Spanish firms; they underline that firm size is the critical factor in deciding the dominance of the pecking-order or the trade-off theory.

Another trend in capital structure theory is to focus on the role of management, especially on human capital (e.g. age and education level) and management strategies. Although studies have focused on these issues as additional determinants of corporate leverage, no theory has yet been developed to emphasize those features.

## **2.6 Capital structure determinants**

All the theories presented so far have emphasized the mechanisms used by the firms to choose the method of financing (i.e. equity or debt). However, the literature suggests additional factors to the ones presented above as possible determinants of corporate capital. These can be divided into the three specific factors: specifically, firm-, industry- and country-level determinants of corporate capital structure (Kayo & Kimura, 2011).

Of course, the determinants of firms' capital structures can be further distinguished. For example, macroeconomic conditions, regulations and corporate governance are some distinctions among the determinants of corporate capital structure, each covered in the above categories.

### **2.6.1 Firm-level determinants**

Firm level determinants can be sub-divided into corporate governance determinants, financial determinants and other firm determinants.

#### *2.6.1.1 Financial determinants*

A sizeable number of financial variables have been identified in the literature as determinants of a firm's capital structure: business risk, liquidity, distance from bankruptcy, profitability, asset tangibility, market-to-book value, return on assets (ROA), earning volatility and income variability, research and development (R&D) expenses, the volatility of a firm's daily stock returns and cash flow volatility (Lemmon et al., 2008; Frank & Goyal, 2003; Rajan & Jingales, 2005; Fama & French, 2002). In

addition, Wen et al. (2012) suggest asset uniqueness as determinant of capital structure, and Al Najar and Hussainen (2009) suggest firm risk. Moreover, firm size is another critical characteristic of firms that affects their financing decisions (Gungoraydinoglu & Oztekin, 2011).

One of the most thorough studies trying to identify the determinants of leverage is that of Kayo and Kimura (2011), who show that a sizeable proportion of leverage variance derives from firm-level characteristics. Specifically, they confirm the validity of all traditional determinants of firm leverage (size, asset tangibility, profitability and growth opportunities). However, Bah and Dumontier (2001) illustrate that higher R&D expenses and advertising (considered as proxies of intangibility) result in smaller leverage values. In agreement, Brown et al. (2009) provide evidence that young publicly traded high-tech firms (i.e. R&D-intensive firms) tend to fund their projects either with internal or external equity rather than with debt, in order to reduce asymmetric information problems, presenting a case of low valuation of their collateral and of highly uncertain returns. Jiraporn and Liu (2008) also conclude that fixed-asset ratio, non-debt-tax shield and R&D intensity positively affect leverage, while profitability and growth opportunities negatively affect it. Further, Lemmon et al (2008) after examining the behaviour of firms during 1971–2001, conclude that ROA and market-to-book ratio significantly affect leverage.

Li et al. (2016) examine the effect of collateral on corporate capital structure (through the creation of a dynamic model in which financial constraints and capital structure derive endogenously from contracting frictions), concluding that collateral seems to be correlated with another traditional determinant of capital structure: the tangibility of assets.

Another empirical study by Chen and Hammes (2003) provides evidence about the effects of firms' financial characteristics on capital structure. By studying industrial, mining and commercial publicly traded firms operating in seven countries (Canada, Denmark, Germany, Italy, Sweden, UK and the USA) for the period 1990 to 1996, they find that asset tangibility is positively associated with leverage, whereas profitability is negatively associated with it. Furthermore, they find a significant effect of firm size on firm leverage, but the effect of market-to-book ratio on leverage is confusing. In the

same line of inquiry, Denis and Milov (2003) focus on optimal debt, and their empirical evidence suggests that the ratio of market debt to total debt tends to increase with size. Moreover, Decoure (2007), through an empirical analysis of Central and Eastern European countries, finds that profitability negatively affects capital structure but that asset tangibility relates positively to it.

Frank and Goyal (2009) investigate non-financial US firms from 1950–2000 and conclude that industry leverage, firm size, intangible assets and collateral have positive and large effects on leverage. However, researchers strongly urge that higher tangibility leads to higher debt-to-equity ratios (Chen & Hammes, 2003). Najar and Hussainey (2011) also affirm that firm- and country-specific factors determine corporate capital structure. Through their study of UK firms from 1991–2002, they examine the effects of firm size, risk, growth rate, profitability, asset tangibility, board size and outside directorship on firm leverage. These findings are corroborated in earlier research, which has concluded that these findings hold also for UK firms.

Also concerned with firm's financing choices, Hernandi and Ormos (2012) proceed to both quantitative and qualitative (questionnaire) analysis. Through the examination of SMEs operating in European countries<sup>6</sup> from 2005–2008, they try to analyse the financing preferences of firms while also focusing on the applicability of both the pecking-order theory and the trade-off theory. According to their results, firms which set a standard level for their leverage, tend to follow more closely the trade-off theory. However, as their results indicate, the majority of the firms do not seem to set targets for their leverage.<sup>7</sup> Moreover, qualitative research reveals that the most crucial factor determining borrowing level is the cash flow derived from assets in need of finance. The level of cash flow, in particular, determines the financing. On the contrary, the CEOs answers highlight that the corporate tax rate, the costs associated with the distress of bankruptcy, and all the costs associated with the non-debt choices seem to play a significant role in determining firms' financing choices, (Hernandi & Ormos, 2012).<sup>8</sup>

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<sup>6</sup> These included Poland, Hungary, Czech Republic, Romania, Slovakia, Bulgaria, Slovenia, Lithuania, Latvia and Croatia (Hernadi & Ormos, 2012).

<sup>7</sup> Leverage measure = sum of long-term liabilities + current loans divided by the sum of book equity, long-term liabilities and current loans. They refer to it as total leverage ratio (Hernadi & Ormos, 2012).

<sup>8</sup> "We learn that the impact of country dummies might cover much more than the simple fact of belonging to a given country." (pg. 65, Hernandi & Ormos, 2012)

A recent study from Castro et al. (2016) also reveals that the common determinants of corporate leverage (e.g., profitability, tangibility, growth opportunities and size) and their effects on financing choices vary depending upon the life cycle of the firm. The same condition holds for firm's speed of adjustment to its target leverage. In other words, the effect of the above-mentioned variables on firm leverage depends upon the given phase of a business's life cycle (i.e. introduction, growth or maturity). They study European listed firms and find that profitability and tangibility are critical for firms' leverage decisions in all life phases of the firm (introduction to maturity), whilst firm size and its growth opportunities vary among the phases. Still, the speed of adjustment to target leverage is higher in the introduction and maturity stages, whereas it is substantially lower in the growth stage, implying more prevalent asymmetric information and limited access to capital markets. Furthermore, the authors introduce a new independent variable in their research to assess speed of adjustment, "the next-year target debt", as a significant explanatory parameter of current corporate debt and adjustment choices in the different stages of the firm's life cycle.

As far as firm size is concerned, many studies have identified a positive relationship between leverage and firm size (Titman & Wessels, 1988; Kayo & Kimura, 2011). However, studies have also identified a negative relationship between leverage and firm size (Mehran, 1992). Firm size has been found to affect leverage through its manipulation of others determinants of capital structure determinants. According to Gonzalez and Gonzalez (2012), in small firms specifically, debt levels are negatively affected by profitability, whereas investment opportunities and intangible assets have a positive effect on debt. These effects are less intense for medium and large firms than for small ones. According to these authors, the result derives from more significant issues of asymmetric information that exist in small size firms. However, they found no effect of firm size on the speed of adjustment to firms' target levels.

The realization of both the negative and the positive effects of firm size on a firm's leverage implies that the impact of firm size on leverage is not so strong when compared to other determinants of leverage. Parsons and Titman (2008) attempt to provide explanations for this fragile effect. Small firms face an appreciable cost for refinancing, indicating that bigger deviations from their target-level leverage is necessary in the case of refinancing. The authors add that the cost of being over- or under-leveraged defines

the firm's leverage ratio. Precisely, in case that being under-leveraged is costlier than being over-leveraged, firms choose higher leverage ratios. A second explanation is drawn from the correlation between firm size and other omitted elements that possibly determine leverage (Parsons & Titman, 2008). For example, large firms tend to be more diversified than small ones, and as Comment and Jarrell (1995) have shown, debt financing seems to be preferred by more diversified corporations. Large firms are also able to accommodate more debt in their capital structure, since they usually have easier access to debt markets (such as bank loans). Furthermore, the researchers maintain that firm size is crucial to the cost that a firm realizes in conditions of financial distress conditions, advocating that firm size and leverage relation is reversed. In harmony with this finding, Faulkender and Petersen (2006) have argued, after examining large publicly traded companies, that a firm's ability to access public debt markets produces more leverage. In particular, researchers find that firms with a debt rating experience 35% higher debt than their corresponding non-rating firms.

Another parameter associated with firm size that has been examined as a factor that may differentiate the leverage policies among firms is the distinction between multinational and domestic corporations. Park et al. (2013), examining US firms from 1981–2010, conclude that multinational firms' leverage is not differentiated significantly from the leverage levels seen in domestic corporations. Of course, the leverage of multinational firms tends to be lower than that of domestic ones, independent of whether book or market leverages are used as leverage proxies. In addition, they advocate that the difference between multinational companies (MNCs) and domestic companies (DCs) in case of debt maturity is also trivial. In other words, MNCs' financial strategies seem not to differ of those from DCs, although MNCs are more exposed to market imperfections. However, Marsi and Reeb (2002) agree that international activity leads to an increase in corporate leverage. Furthermore, as Park et al. (2013) underline, the examination of non-US MNCs reveals that leverage choices differ from the choices of their domestic peers. Specifically, non-US MNCs tend not only to proceed to quicker change in their leverage but also to more frequent issuance of securities.

In addition, Zhang and Zhang (2016) provide evidence that DCs experience higher leverage ratios than MNCs in the Chinese region. Furthermore, they find that state-owned MNCs experience higher leverage ratios than other MNCs, owing to the fact that

state-owned enterprises have greater access to credit. These researchers also highlight that the greater credit availability of state-owned MNCs derives from the aid they acquire from “the strategic backgrounds”, which alleviates the risks associated with operations in the of rest world (pg, 292, Zhang & Zhang, 2016).

Regarding firm profitability, its effect on capital structure has been extensively examined. Some studies have identified a negative relationship between these variables, but others have identified a positive one. The critical issue concerning the effect of firm profitability on firm leverage is whether profitability comprises an origin of the variation of firms’ optimal debt ratios or whether profitability is a deterministic factor of deviations from the optimal targets (Parsons & Titman, 2008).

The first argument for the relationship between profitability and target capital structure suggests that more profitable firms experience greater exposure to taxation, which should generate higher debt ratio targets. The second argument advocates the view that profitability is a proxy for mix of corporate assets. In particular, a raise in a firm’s profitability may be derived from a raise in productivity in the “firm’s assets in place” compared to its growth opportunities (keeping stock returns unchanged). Therefore, a change in the assets-in-place tends to raise the corporate target for the debt ratio, since these assets are more appropriate for debt financing (Parsons & Titman, 2008). As Myers and Majluf (1984) point out, more profitable firms tend to experience debt ratios lower than their targeted ratios, as a result of better information managers can access concerning firm value compared to outside investors.

Also, the ratio of market value of equity to book value of equity (i.e. market-to-book ratio) is considered a significant determinant of corporate capital structure. In the case of cross-sectional data, the evidence of a negative relationship between debt ratios and market-to-book value of equity is quite strong (Frank & Goyal, 2004; Hovakimian, 2004). This relationship is valid independently of the value of leverage (market or book) that is used as a dependent variable. The significance of market-to-book ratio seems to derive from the information it incorporates, namely information about the asset mix. Firms with higher market values than book values are liable to realize better prospects in the forthcoming time periods with respect to their existing assets. However, Parsons and Titman (2008) emphasize that researchers should be cautious in interpreting the

relationship between market leverage and market-to-book ratios. As the authors underline, in such a relationship, equity value influences both parts of the relationship (dependent and independent variables), and hence it may be wiser to use the proxies of these variables in order to avoid this kind of problem.

On the asset-tangibility side, which is usually measured as ratio of fixed-to-total assets, asset tangibility's effect on firm leverage is positive. The main justification for this impact arises from the ability of tangible assets to maintain their value amid default conditions, and as a result, to enhance investors' rates of recovery, since in the case of default, the expense of recomposing intangible assets is much higher than for tangible assets. In a way, tangible assets act as collateral. According to Harris and Raviv (1991), asset intangibility creates difficulties in their evaluation, imposing high costs for creditors, concluding that higher costs of this type should lead firms to hold less debt, in the case that everything else remains constant. In addition, the claim that tangible assets may be served as better collateral derives from pricing demand for assets by creditors in the event of liquidation (Shleifer & Vishny, 1992). For example, an event causing financial distress to firms in a whole industry provokes the decrease of purchases of illiquid assets at a time when firms are desperately looking for an external market for the assets. As Shleifer and Vishny (1992) argue, intangible assets, necessitating specific know-how and special skills, may be unsuitable for holding high debt ratios. Before continuing to the examination of the relationship between assets' intangibility and capital structure, it is advisable to underline the relationship between assets' liquidity and industries. In other words, the industry in which a firm operates governs the type of assets (i.e. in some industries assets tend to be more tangible than in other industries).

Still, firms with a significant number of intangible assets are not affected by any debt-equity holder conflicts. At the same time, if the tangible assets of the firms offer the chance for a straightforward valuation by creditors, then firms may be able to raise capital for forthcoming investment opportunities. By contrast, firms with intangible assets tend to prefer financial flexibility at the present, since the intangibility of their assets makes them concerned for the potential financial limitations deriving from the nature of the assets (i.e., these are "difficult-to-value assets") (Parsons & Titman, 2008).

Furthermore, a strong negative relationship between stock returns and debt ratios is also present in Welch's (2004) study. In general, a rise in firm's stock prices increases correspondingly the denominator of the debt ratio when it is calculated as debt to market-ratio, resulting in the decrease of that debt ratio. However, the impact of stock returns on debt ratio, as reported by Welch (2004), remains strong, since in his regression the effect realized by stock returns refers to debt to book-ratio. Remarking on Welch's conclusions (2004), Parsons and Titman (2008) provide some explanations on that special effect of market to book ratio. In particular, firm information about debt ratio target may be contained in stock returns. Firms realizing high stock returns at a certain time period may have significant future prospects and may choose to issue equities to fund them. Of course, the issuance of equity following an increase in stock price is the common reaction of managers. However, managers may make this decision in their effort to gain from their expectation about mispricing. The reasons behind these decisions may lay in weak corporate capital structure targets, which may incorporate firms' allowance of varying leverage ratios (Parsons & Titman, 2008).

Cash flow volatility, on the other hand, is a potential determinant of firm leverage, since the existing evidence on its effect on leverage is controversial. The realization of an increase in cash flow volatility that leads to the reduction of tax payments results in firms choosing lower debt levels. On the contrary, a volatility increase that causes an increase of tax payments leads to the growth of the firm's debt level (Parsons & Titman, 2008). Similarly, Keefe and Yaghoubi (2016), through the extensive re-examination of the relationship between cash flow volatility and capital structure, conclude that cash flow volatility has a strongly negative impact on capital structure. They provide, in particular, evidence that a rise of standard deviation by one in the mean of the cash flow volatility leads to a fall of 24% of long-term market debt ratio. Furthermore, they state that increases in cash flow volatility result in a decrease in a firm's holdings of longer maturities of debt and an increase of debt holdings in shorter maturities (one-year maturities or less). At the same, an increase of cash flow volatility leads to a substantial increase in the possibility that the firm holds neither short nor long-term debt (Keefe & Yaghoubi, 2016).

### *2.6.1.2 Corporate governance and management determinants*

In recent years, several studies have examined the potential effects of corporate governance characteristics on capital structure. However, this is not a new phenomenon as the idea that the characteristics of the board of directors may influence capital structure dates back to at least the work of Friend and Lang (1988). Wiwattanakantang (1999) also concludes that corporate governance affects firms' debt policy.

The characteristics that have been identified as determinants of corporate capital structure are the ownership status of the firm, the executive compensation, the power of the CEO, the CEO's gender, the CEO's compensation scheme, the audit and the bylaws (Bryan et al., 2006; Jiraporn et al., 2012). The features of the board of directors have been also extensively examined since they seem to have a substantial effect on a firm's capital structure. These features include the size of the board, board diversity, its independence, the tenure of the board members in a given board, their tenure in other boards, the director's compensation and ownership, director education, the presence of an outside advisory board member and, more recently, the director's social network (Fields et al., 2012; Agrawal & Matsa, 2013; Chang et al., 2014a; Cole et al., 2008).

As far as the characteristics of the CEO are concerned, recent studies have found that the CEO's gender is a critical determinant for the corporate capital structure (Cole, 2013). Women CEOs tend to be risk-averse, and this behaviour leads to better results in capital allocation. Cole (2013) focuses on the capital structure of privately held corporations in the US and provides evidence that corporations with women managers tend to experience lower levels of leverage. The same conclusion is also drawn by the study of Faccio et al. (2016) on newly privatized firms.

Ortiz-Molina (2007) examines the relationship between corporate leverage and managerial compensation in contract design and suggests that pay for performance sensibility is negatively related to corporate leverage; however, this scholar also observes that this effect is more present in the case of firms with convertible debt. As such, the results strongly support the validity of agency costs of debt. Through the examination of 1,652 CEOs from publicly traded US firms, Ortiz-Molina concludes that without doubt the relationship between executive compensation and capital structure is significant and should be considered by decision makers.

Proceeding to a deeper analysis of the CEOs compensation scheme, Mansi et al. (2016) employ data from 1990–2015, examining the effect of severance agreements in CEO contracts on the cost of debt capital.<sup>9</sup> Their evidence indicates that the presence of severance agreements is positively related to the cost of debt capital; specifically, the firms with severance agreements were found to have 10% higher yield spreads. Following the same intuitions about managerial compensation scheme, Brisker and Wang (2016) suggest that “debt-type” compensation of CEOs results in less conservative decisions about debt by the CEO and faster adjustments to optimal leverage, alleviating conflicts interest between CEOs and shareholders.

In addition, the compensation scheme of outside directors also seems to affect debt financing by market. Specifically, Ertugrul and Hedge (2008) show that a stock and option-based compensation for outside directors reduces the bond yield spreads of firms, so the higher the ratio of stock- and option-based compensation to total compensation, the higher the reduction on yield spreads of firms’ bonds. In addition, they provide evidence that in the case of equity-based compensation schemes for outside directors, the impact on spreads is more significant for firms holding better debt quality (Ertugrul & Hegde, 2008).

Another aspect of the compensation scheme, refers to employees’ compensation and their personal characteristics as critical ones for firms’ success. Emotional intelligence (under the topic of behavioural finance) have gradually received more attention for its effect on decision making. The improvement of emotional intelligence of corporate personnel diminishes the possibility of systemic errors in decision making (Howard, 2012). Howard (2012) shows that people, by nature, tend to focus on short-terms gains; bringing that intuition to bear on corporate finance. Howard (2012) confirms that a firm’s focal points are the self and corporate cash flow consumption in the short-term, not acquiring the necessary capital for future investments. In addition, Howard (2012) ascribes to the executive compensation plans the realization of short-term behaviour rather than matching executives’ incentives and actions with shareholders’, customers and society’s overall welfare.

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<sup>9</sup> According to authors, in recent years the severance agreements tend to include cash and non-cash compensation in cases of demotion, termination or forced resignation (Mansi et al. 2016).

Focusing on the effect of managerial entrenchment on firm leverage, Berger et al. (1997) have examined the effects of CEO stock ownership, CEO option holdings, the presence of a major blockholder, CEO tenure, the composition and size of the board of directors, and other firm-level variables (such as ROA, non-interest tax shields, assets' collateral value, company size and asset uniqueness) on 434 firms from 1984–1991. Managers with longer tenure tend to choose lower leverage ratios. At the same time, firms with a small number of directors in their boards are more likely to employ more debt, a conclusion also reached by Rossi et al. (2017). Furthermore, Berger et al. (1997) provide evidence that a higher number of options and stock returns, increases leverage. Overall, their findings affirm that the more entrenched or less monitored the managers of a firm are, the lower the debt levels are.

In line with the above research, Bertrand and Schoar (2003) study the impact of managerial style on firm leverage. Their findings offer substantive insight into the effect of CEO age on the leverage choice. The older the CEOs (*ceteris paribus*), the lower the leverage. More precisely, every 10-year increase in CEO age alters the firm's leverage by +2.50%; in the meantime, cash holdings also increase. These authors advocate that this finding is compatible with the theory that older managers tend to adopt more conventional management styles. In addition, Jiraporn and Liu (2008) posit that the board of directors is highly significant to capital structure decisions. Specifically, their empirical study of 1500 S&P indexed firms, over the period 1990–2004, indicates that firms with staggered boards realise lower leverage.<sup>10</sup> Furthermore, they underline that staggered boards may not only reflect a firm with lower leverage, but may also provoke the lower leverage.

Dittmar and Duchin (2016) introduce another point of view on CEO characteristics that affect business financial decisions. Through the research of 11,578 American industrial firms from 1980–2011, they reveal that CEOs' previous professional experience in firms other than their current firms is a critical determinant for the financial decisions they make in their current positions as CEOs. Analytically, CEOs who have previous professional experience as executives in other firms, especially in firms that faced financial distress (e.g., bankruptcy filings, financial difficulties, adverse cash flow

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<sup>10</sup> A Staggered board is the board of directors at which a number of directors is elected at once (Jiraporn and Liu, 2008).

shocks, etc.) during their tenure there, tend to follow a much more conservative financial policy (i.e. they tend to hold less debt, to invest less and to hold more cash). At the same time, positive professional situations faced by CEOs during their tenures as executives do not seem to have an effect on their financial decisions at their current position. The findings are similar for chief financial officers (CFOs) and their previous professional experience.

Board size is another characteristic of corporate governance that the literature has recognised as a critical factor influencing capital structure. The board of directors' role is to effectively monitoring CEOs and their actions. As mentioned earlier, board size has an inverse relationship with debt, thus with leverage (Berger et al., 1997, Rossi et al., 2017), but at the same time, there is some evidence of a positive relationship between them (Graham et al., 2011). Graham et al. (2011) analyse the features of boards of directors and the impact of these features on several firm variables, among them debt usage, during the Great Depression (1930–1938). Actually, they employ firm data from 1926–1941 and find that board size is positively related to debt during this period; however, in pre- and post-depression years, the relationship ceases to exist, suggesting only a weak connection.

More insights about board size effect on firm debt are offered by Alves et al. (2015), using a sample of listed firms from 31 countries. They confirm the existence of a relationship between these two variables and they find a negative relationship between short-term debt and board size but a positive one in the case of long-term debt, attributing that fact to firms' complexity and other unrecognised parameters that may drive the relationship between them.

Based on published research about management's effect and firm characteristics' (profitability and stock returns) on capital structure, Parsons and Titman (2008) conclude that performance in previous times may affect present capital structure due to its effect on the power of CEOs compared to the board of directors. They mention that firms with highly influential CEOs and inactive boards of directors tend to employ cash flow for debt payments and hence to reduce leverage, indicating that the recorded debt ratios may have a negative association with previous firm's profits, even in the case of value-maximizing capital structures that may embrace more debt for more profitable

firms. In other words, the better a firm performs, the greater the power of the CEO becomes in setting his or her plan for the firm in the board of directors, and in such a case, the leverage ratios are more indicative of managerial preferences following a high-performance period. This concept may provide the necessary explanation for the cases in which more profitable firms and with significant performance of stock prices usually realize lower debt ratios (Parsons & Titman, 2008).

Friend and Lang (1988), on the contrary, examine the potential effect of firm ownership on its capital structure. According to their findings, in firms in which the share of inside holders of equity is above sample mean (above 13%), the managerial ownership is negatively related to book leverage ratios, even in the case that there is no blockholder, indicating that powerful managers results in lower debt ratios. At the same time, they find that debt ratios are higher in publicly held firms. This finding demonstrates that the lower the power of the manager during financing decisions, the more leveraged the firm is. However, researchers fail to conclude about the sign of the relationship between managerial ownership and the capital structure of publicly held firms, since the effects are mixed.

In line with Friend and Lang (1988), Chen and Hammes (2003) provide evidence about the effect of corporate ownership on firms' capital structure. Their empirical evidence indicates that firms controlled by their owners tend to borrow more. In contrast, firms controlled by managers tend to borrow less, especially in countries with a more creditor-protected bankruptcy framework. Also, according to Fu et al. (2011), owner-managers make their decisions about firm's financing methods after considering the benefits they possess under current ownership status, the costs associated with the lack of diversification and the benefits lost in the case of bankruptcy. Bryan et al.'s (2006) evidence affirms the above conclusion, indicating that executive compensation seems indeed to be related to the agency problem of debt. Further, Huang et al. (2016) through their study on firms of the Growth Enterprise Market in China, advocate that executive shareholding has a positive effect on firm leverage, as does the remaining percentage of tradable shares, whilst leverage seems to be reduced with ownership concentration (Huang et al., 2016).

Hanssens et al. (2016) focus on start-ups and find that they have an initial debt level that remains stable, owing to the founder-CEO. Once the founder-CEO is withdrawn, the debt level changes, and in general it is reduced. However, Hanssens et al. (2016), who study start-up firms, point out that there is a determinant, a firm-level and time-invariant one starting from start-up, which maintains the stability of debt and capital structure over years and has not yet been captured by the capital structure and debt structure literature.

Hernandi and Ormos (2012) also show that there are significant differences in leverage between firms in which managers are also the owners and firms in which managers do not have ownership. Specifically, firms managed by owner-managers do not tend to set a target for their leverage level, whereas the firms managed by non-owner-managers tend to set a target level.

In contrast to the above effects, Mehran (1992) finds a positive relationship between the share of equity held by firm managers and its leverage ratio, suggesting that the higher the ownership share possessed by managers, the higher the alignment of incentives between shareholders and managers. In addition, the share of executives' total compensation in incentive plans is positively associated with firms' leverage ratio. Mehran (1992) advocates that this result proves that managers tend to bear more risk when their stock options increase. Furthermore, the researcher provides evidence that the share of equity held by large individual investors, as well as the percentage of investment bankers in the board of directors, are positively related with firm's leverage ratio. The author finds, in particular, that firms tend to have greater leverage in the presence of investment bankers in their board of directors, but he does not provide a specific explanation for this finding.

However, Parsons and Titman (2008), provide some potential explanations for the results of Mehran (1992). More detailed, Parsons and Titman (2008) consider the case that investment bankers participate in a firm's board of directors in periods when firms have to raise debt. In that case, they either advise the firm about the financing, or even better, they achieve beneficial terms for financing for it. Another explanation suggested by Parsons and Titman is the case in which bankers have strong influence on firm's

financing decisions, especially in debt financing, which may not lead to the improvement of firm value.

In the literature, there is also a distinction between good and bad corporate governance. According to Jiraporn et al. (2012), good corporate governance as defined in institutional shareholder services, includes characteristics divided into eight categories: the board of directors, the director's educational level and her payment, the executive compensation scheme, the ownership, bylaws, audit, state of incorporation and the progressive practices. They support that CEO power inversely affects corporate capital structure. Hence, it is obvious that CEO with significant power in the firm tends to keep leverage at lower levels than a CEO with less power. This conclusion was reached after examining 1,264 firms over the period 1992–2004.

Morellec et al. (2013) focus on the effect of the quality of corporate governance on capital structure's speed of adjustment and affirm that firms with weak governance, in fear of the refinancing costs, tend to adjust towards optimal capital structure at a slower pace than firms with a well-built governance (Morellec, Nikolov & Urhoff, 2012).

In the same line of argument, Chang et al. (2014a) consider the effect of the quality of corporate governance<sup>11</sup> and explore the impact of shareholder and manager conflicts (agency conflict) on the speed of adjustment of capital structure. Their empirical study provides evidence that under-levered firms with weak governance tend to present a slower adjustment to the optimal capital structure than firms with strong governance. Also, they claim that weak corporate governance in firms facing takeover threats results in a debt increase, since debt is employed as a "takeover defense measure" (Chang et al., 2014a). They conclude that self-interested managers consider the benefits of each leverage option and adopt a leverage level according to their preferences, ignoring the optimal target leverage or avoiding adjustment to optimal structure, even in the case that these options would increase shareholders' wealth.

Another interesting consideration for managers is proposed by Gao et al. (2011). According to them, the social networking of managers seems to strongly affect financing decisions in the case of the headquarters of firms located in the same US metropolitan area. This result coincides with previous research, such as the one by John and

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<sup>11</sup> Chang et al. (2014) measure corporate governance quality by the strength of shareholders rights.

Kadyrzhanova (2008) and Mizruchi et al. (2006), stating that usual corporate procedures are influenced by peer behaviour. However, Mizruchi et al. (2006) state that the impact of social effect on firm decisions is time contingent.

### *2.6.1.3 Other firm-level determinants*

There are also other factors that can be considered as firm-level determinants of capital structure but cannot be included in the above sub-categories. In particular, credit ratings, a firm's geographic location, a firm's age, the relationship between the firm and its stakeholders and its products' uniqueness are parameters that have received attention from researchers and have been identified as crucial determinants of leverage.

As far as credit ratings are concerned, there is no doubt that the introduction of ratings in all financial transactions and also on borrowing firms leads to the issuance of more long-term debt, and in general in more debt usage, for higher ranked firms than for lower ranked firms, which focus on issuance of equity. Specifically, Tang (2009) draws this conclusion after an examination of Moody's 1982 credit ratings and their impact on firm's financing decision, investment strategies and access to market. In line with this conclusion, Deesomak et al. (2009) states that firms ranked as high-quality firms select short-term debt in order to eschew the payment of a market premium that is considered "too high" for their level of quality. In the opposite position are the firms ranked as low-quality firms (i.e. these companies choose debt with long maturities since the payable market premium on this debt maturity produces the possibility of defaulting less than their own rank). Faulkender and Petersen (2006) also provide evidence concluding that firms assigned with a credit rating experience higher debt ratios than those without rating.

Examining firm's geographical location, Gao et al. (2011) conclude that a firm's headquarter plays a notable role in the formation of its capital structure. By studying large US firms, the researchers reveal that the region in which corporate headquarter is located significantly affects capital structure for firms with easy access to financing methods, as well as with "well-established capital structures" (Gao et al., 2011). Also, it is obvious that the regions at which headquarters have been established provide a deterministic factor for interpreting the variation that arises in cross-sectional data in the

US, since the researchers note that companies located in the same metropolitan statistical area tend to exhibit comparable leverage ratios and cash holdings levels. The location of headquarters might be a notable determinant of firm leverage, since it seems to be related to investors' behaviour. More precisely, the characteristics of local customers (investors) may modify a firm's financing actions, due to the relationship between local clients' characteristics' proxies and financing policies, as found by Gao et al. (2011). Studying the geographical location with an emphasis on the distance of a firm's headquarter from the 10 American metropolitan cities (New York City, Los Angeles, Chicago, Washington-Baltimore, San Francisco, Philadelphia, Boston, Detroit, Dallas, and Houston), Wang et al. (2018) advocate that firms established in metropolitan cities tend to have lower leverage ratios than those established in other areas. They show that geographical location (measured by the distance of the headquarters of metropolitan cities) is positively correlated to corporate leverage ratios. At the same time, they show that this effect is more profound in cases of greater information asymmetries, as implied for firms with fewer financial analysts and no credit rating score.

Also concerned with the geographic location of firm headquarters, Brushwood et al. (2016) provide a different perspective on its effect on the cost of capital. They examine the effect of property crime on the cost of equity and debt capital in the USA and show that a higher property crime rate in the state in which a firm's headquarters is located results in a higher cost of equity and debt capital. Hence, the geographical location combined with its property crime rate affect cost of capital, and thus financial decisions.

Concerned with the age effect, Pfaffermayr et al. (2013), through the study of 405,000 firms of 35 European countries, reveals that debt ratio is positively related to corporate tax rate but negatively related to firm age. This fact implies that older firms tend to use less debt than younger ones. In addition, they find that firm age interacts positively with statutory corporate taxes, and this effect increases as the age of firm increases. Finally, they point out that a cut in corporate tax rate more significantly affects older firms. In opposition to the above findings, however, Denis and Milov (2003) conclude that the ratio of market debt to total debt increases with firm age.

The relationship between a firm and its employees and the relationship between the firm and other stakeholders<sup>12</sup> are two other relationships, which have been examined. On the side of suppliers, there is evidence that firms tend to use less debt when they are the only or the most critical customers of their suppliers. In other words, suppliers who sell most of their output to one customer lead that customer (the firm) to use less debt to finance operations and investments (Banerjee et al., 2008). Another aspect affecting customer's leverage is international sourcing, as examined by Eun and Wang (2016). Focusing on the different characteristics of the supplier company (foreign company) that affect customer leverage, they show that international sourcing negatively affects customer's corporate capital structure and this effect is more robust in cases when the customer's company requires from supplier to proceed to a "relationship-specific" investment. Still, they point out that the effect of international sourcing on corporate capital structure is alleviated in cases that the supplier is located in a country with a highly (or more highly) developed legal system, better access to external capital and a more competitive supplier market.

Demirci (2015) captures another aspect of the connection between suppliers and customers and its impact on capital structure of supplier's firm. According to that research, the higher the customer risk among the majority of a supplier's major customers, the lower the leverage of the supplier's firm. Supplier's firm tends to prefer equity over debt, when the major customer or customers experience financial distress.

On the side of the employee, there is strong evidence of the relationship between the use of debt by a firm and the unemployment insurance level. Specifically, Agrawal et al. (2013) find that the reduction of the expected labour risk cost through the increase of the unemployment insurance benefits leads to a significant increase in debt ratios. Furthermore, many studies have indicated that firms can use debt as a tool to pressure employees in order to achieve wage reduction. Firms may use debt and financial distress as a threat to cut employees' wages (Bradley & Lewis, 1986; Matsa, 2010). However, this threat is related to the power of the employees' union. More specifically, as Hennessy and Livdan (2009) conclude, an increase in the negotiating power of the employees' union leads to an increase in leverage, whereas leverage decreases when

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<sup>12</sup> The term "other stakeholders" mainly includes customers and suppliers.

human capital is used in the production process. A similar conclusion is reached by Benmelech et al. (2012) and by Pinto (2016). In detail, Pinto (2016) states that the positive relationship between leverage and labour union lies in positive valuation by bond markets of the existence of non-financial stakeholders with incentives to monitor firm's operations.

The point about the cost of firing employees and capital structure is captured by Serfling (2016). Based on the evidence obtained in his research on American firms between 1967 to 1995 (when wrongful discharge laws were passed<sup>13</sup>), he concludes that without any doubt, higher firing costs results in alterations in debt ratios, through the increase in financial distress. Serfling (2016) clarifies that market and book leverage decrease in the presence of higher firing cost especially, as derived by the exceptions of wrongful discharge laws.

Product uniqueness is another non-traditional factor that seems to affect firm's leverage, and it has not been broadly analysed. Bortoloni's (2013) research is concerned with whether or not there is bilateral causality between firm's leverage and its innovative output, with factors determining leverage and finally with the validity of pecking-order theory. Specifically, after examining Italian firms with data from 1996 –2003 with reference to Granger causality, Bortoloni concludes that there is a causal relationship running from innovative output and profitability to firm leverage, but there is no causality running from firm leverage to firm innovation. The results, overall, coincide with the pecking-order theory, as proposed by Myers and Majluf. Since the evidence implies that innovative firms prefer internal financing and are rigid in terms of causal direction between leverage, innovation and profitability.

Specifically, the statistical significance of asset tangibility and its positive effect on leverage signals the application of the pecking-order theory. Also, the examination of leverage determinants through a linear model revealed similar results to those achieved through Granger causality. In other words, both innovation and profitability seem to enhance a firm's ability to self-finance, whereas the positive relationship between

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<sup>13</sup> Wrongful Discharge Laws (WDL) adopted by US courts in an attempt to reduce unjustified job terminations. WDL provided three exceptions in the "at-will" employment existed in US. " At-will employment refers to a legal environment in which employers are free to terminate any employee for good reason, bad reason, or no reason at all, with or without prior notice, and without risk of legal liability." (Serfling, 2016)

leverage and financial efficiency implies the positive relationship between debt and intensity of interest.

In the line with product uniqueness, Titman and Wessels' (1988) study concludes that firms producing more unique products tend to experience low debt ratios, while firms producing less unique products tend to experience high debt ratios.<sup>14</sup> In addition, they argue that the financial health of a firm producing more unique products seems to concern non-financial stakeholders of the firm. According to their argument, the uniqueness of the product may require future technical support or service by the provider, and as a result, customers place great importance on the seller's financial health.

Aghion et al. (2004), through the examination of British industrial corporations from 1990–2002, advocate that there is an inverse relationship between a firm's leverage and its R&D projects. Specifically, firms that are intensively concerned with R&D projects seem to issue equity, whereas firms proceeding to innovative activities tend to use less debt than less innovative and R&D-intensive firms. In accordance with Aghion et al. (2004), Schlafer et al. (2004) conclude that more innovative firms tend to issue more equity, indeed, and seem to be opposed to debt for financing new projects, after examining high-tech firms operating in Germany (supporting the rationing hypothesis).

### **2.6.2 Industry-level determinants**

The importance of the inclusion of industry dummies in explaining leverage behaviour lies in its correlations with the exclusion of notable factors related to industry, when only firm-level determinants are considered. A number of studies have identified that there is significant differentiation in firm leverage depending on the industry in which a given firm operates. For example, firms operating in the utilities industry and real estate industry rely heavily on debt financing, while firms operating in more technological industries rely to a very small extent on that type of financing (Parsons & Titman, 2008).

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<sup>14</sup> They measure product uniqueness as R&D/Sales and Selling expenses/Sales, implying that high values of these ratios indicates the uniqueness of the product a firms sells.

Kayo and Kimura (2011) target industry effects in their study of firm leverage by inserting the variables of munificence<sup>15</sup> and dynamism. An industry with high munificence is characterized by plenty of resources, low competitiveness and significant profitability (Dess & Beard, 1984), whereas industry dynamism is connected with business risk, implying that higher industry dynamism leads to lower leverage ratios, so as riskier firms exhibit lower leverage (Kayo & Kimura, 2011). They find that these two industry variables are negatively related to leverage. However, the analysis of interactions among variables proves that industry munificence has an impact on profitability, leading to low levels of leverage.

In agreement, MacKay and Phillips (2005) provide sufficient evidence that a firm's leverage is determined by its position in the industry. Moreover, they find that firms operating in competitive industries with capital-labour ratios close to industry's medium level of the ratios tend to keep less leverage than those firms having capital-labour ratios far from the industry's median. Furthermore, many researchers have pointed out that in some cases, firms operating in the same industry are homogenous regarding their capital structures, while in others they are heterogeneous (Miao, 2005).

According to Almazan and Molina's (2005) claim, the restrictions in managerial behaviour determine the level of leverage dispersion. The realization of significant leverage dispersion derives from less restricted managerial behaviour. They also find that firms operating in a competitive industry and firms characterized by better governance practices present more or less the same leverage ratios (Almazan & Molina, 2005). Furthermore, they provide evidence for the effects of the technological development of the industry and the asset redeployment on leverage ratios. The same evidence is also found by MacKay and Phillips (2005) who show that firms in an industry obtain dissimilar capital structures if they exploit dissimilar technologies.

The inclusion, however, of industry variables (or dummies) in leverage regressions may not capture all the possible effects on the leverage of firms operating in the same industry. Industry characteristics have been found to significantly affect capital structure. However, the industry itself seems to be a critical determinant of firm leverage, since there is evidence that firms in different industries present different

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<sup>15</sup>“Munificence is the environment's capacity to support a sustained growth”(Kayo & Kimura, 2011).

financial behaviour and that different industries entail different factors affecting firms' capital structure. In other words, there is evidence that in an industry, firms tend to mimic other firms' behaviour as far as leverage decisions are concerned. This behaviour has been noted by MacKay and Phillips (2005), who state that the financing behaviour of a firm relates to the behaviour of the rest of the firms in the same industry, emphasizing the "industry interdependence" effect on capital structure. Furthermore, there are also cases, such as crises, that result in financially distressed firms throughout an industry. This event imposes sizeable limitations on firms' financial decisions and, of course, on their capital structures. Still, Shleifer and Vishny (1992) state that the optimal level of firm leverage is highly related to the optimal level of leverage for other firms operating in the industry. Simply put, an industry may possess an optimal level for debt, even in cases when firm itself does not.

On the other hand, Ovtchinnikov (2010) who examines the importance of deregulation in leverage decisions, provides evidence that alterations in the economic environment in which a firm operates also affect the relationship between leverage and its influential factors. Economic deregulation therefore seems to have substantial effect on corporate capital structure,<sup>16</sup> as revealed by the examination of non-financial firm data operating in deregulated industries<sup>17</sup> from January 1966 through December 2006. Further, the results of Ovtchinnikov (2010) highlight that corporate capital structure tends to change following changes in its operating environment. Moreover, firms seem to follow static trade-off intuitions driven by their profitability, growth opportunities and costs of financial distress. According to Ovtchinnikov (2010), the impact of industry's deregulation on firm's leverage is absolutely justifiable. Trade-off and pecking-order theories suggest variation of a firm's leverage as a result of the changes in profitability and investment opportunities. Since these two variables are influenced by the regulation and deregulation of an industry, the leverage varies in an anticipated way in the corresponding sample.

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<sup>16</sup> As economic deregulation, he states "economic deregulation is defined as deregulation of entry, exit, price and quantity" (Ovtchinnikov, 2010)

<sup>17</sup> The author distinguishes industries as entertainment, petroleum and natural gas, utilities, telecommunications and transportation industries (Ovtchinnikov, 2010)

### 2.6.3 Country-level determinants

Country-related factors are considered critical determinants of corporate financing decisions in firms, and as a result they have been extensively examined in the literature. These country-level determinants can be distinguished into three specific categories: macroeconomic factors, regulations and cultural characteristics.

The regulation category includes both legal determinants and other institutional characteristics, such as protection of investors' rights, regulations of firm operations, development of financing sources (e.g. banking sector, financial, bond and capital markets), bankruptcy costs and incentives, corruption and political connections (Alves & Ferreira, 2011; Gao et al., 2011; La Porta et al., 1997).

The subcategory of macroeconomics includes factors identified as determinants of capital structure, such as gross domestic product (GDP) growth, inflation, government expenditure, foreign direct investment (FDI), economic development in general, and the term structure of interest rates. Further, cultural dimensions include variables such as religion, power distance, uncertainty avoidance, and collectivism or individualism (Arosa et al., 2014; Baxamusa & Jalal, 2014; Antonczyk & Salzmann, 2014).

In the light of these effects on firm leverage, Joeveer (2006) analytically examines the available sources of corporate capital structure in transition economies, emphasizing country-specific determinants. According to Joeveer (2006), smaller and unlisted firms tend to be affected more by country-specific factors (GDP growth, inflation, domestic credit provided by the banking sector to GDP, stock market capitalization to GDP, share of foreign-owned banks, and government consumption to GDP). These findings suggest that firm-level characteristics in conjunction with country-level characteristics alter corporate capital structure. Kayo and Kimura (2011) advocate that GDP growth is negatively related to debt. Further, the development of the stock market is negatively associated with leverage, as is the development of the bond market.

De Jong et al.'s (2008) research confirms the country-related determinants proposed by Kayo and Kimura (2011). Specifically, their empirical study indicates that greater firm leverage is associated with more developed countries. They also provide evidence that in countries with developed stock markets, corporate leverage tends to be lower. In countries with an inefficient legal system, companies prefer debt financing in opposition

to equity financing, more specifically short-term debt over long-term debt. This behaviour is justified by the fact that a shorter debt maturity considerably constrains creditors' expropriation (Deesomsak et al., 2009).

In addition, De Jong et al. (2008) illustrate a significant negative relationship between firm liquidity and leverage, independent of the development of the stock market or the legal system. They also provide evidence that the effects of firm-level determinants on corporate capital structure differ across countries and that there are indirect effects of country-specific factors on it. More specifically, in the study of 42 countries and 12,000 firms, from 1997–2001, creditor rights protection was found to negatively affect firm leverage, in opposition to the findings of previous studies, while GDP growth and bond-market development were found to positively affect it. At the same time, stock and bond market development, a country's legal enforcement system and shareholder protection rights were found to have an implicit impact on firm-level determinants of corporate leverage.

Moreover, Temimi et al. (2016) find a negative impact of liquidity on corporate leverage that weakens in the presence of taxes after examining firms operating in GCC countries.<sup>18</sup> They highlight that firms with higher liquidity tend to hold less debt to avoid "expropriating liquid assets" by firms' stockholders .

In contrast to that evidence, Gungoraydinoglu and Öztekin (2011) remark that a decrease in debt's agency cost and an increase in equity's agency cost derive from larger liquidity ratios, so they obtain a positive relationship between liquidity and leverage. Also, they highlight that this relationship weakens in the presence of unsound institutional settings, and as a result improvement of creditor rights framework leads to effectively managing debt's agency costs in exchange for higher liquidity.

Numerous studies have further focused on the effect of the supply of capital on corporate capital structure (i.e. the available sources providing credit to firms). The supply side of capital structure has recently received some attention. The evidence that the source of capital influences firms' capital structure has led researchers to distinguish between those firms that borrow from banks and those that borrow from non-banking lenders. In that kind of borrowers' segmentation, credit ratings would not be left out. Specifically,

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<sup>18</sup> The region includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.[]

the examination focuses on how the ability of a firm to borrow from public markets affects its leverage. Faulkender and Petersen (2006) provide evidence of the constraints' effects imposed by capital markets on firms' financing decisions (referring to firms' ability to issue debt). According to their work, the accessibility of firms to bond markets offers them different prospects as far as financing is concerned, and firms with credit ratings experience higher debt ratios than those without ratings.<sup>19</sup> On the other hand, the examination of banks' dependent firms indicates that the existence of ratings for syndicated loans causes an increase in debt issuance and of course, in investments (Sufi, 2009).

Examining the supply side of capital, and how it affects corporate capital structure, Antzoulatos et al. (2016) focus on the country's financial development. Using a sample of US firms for the period 1970–2007, they test for convergence in corporate leverage to distinguish among the firms whose financing decisions are affected by the level of national financial development. After identifying the converging firms and their levels of convergence, they regress leverage towards financial development and other common determinants using only converging firms. As their evidence suggests, the leverage of firms belonging to converging group but with limited access to financial markets is not affected by such financial development. Also, their results coincide with Lemmon and Roberts (2010), who find that for low-investment grade firms, the supply of capital is not related to their leverage level. Overall, the researchers conclude that financial development is a significant determinant of corporate leverage (Lemon & Roberts, 2010).

At the same line, Koraczyk and Levy (2003) focus on the impact of macroeconomic conditions on capital structure decisions, during the first quarter of 1984 through to the third quarter of 1999, after separating firms into financially constrained and financially unconstrained groups. They conclude that the development level of a country can be a considerable factor for distinguishing the study on capital structure among firms. Fan et al. (2014) advocate that companies operating in developing countries usually employ a much lower level of long-term debt compared to companies in developed countries. Wang (2016) also advocates that the sovereign credit risk is negatively related to the

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<sup>19</sup> More detailed analysis for credit rating effect on capital structure is presented in Section 2.6.1.3.

leverage of large firms. More specifically, Wang provides sufficient evidence of a relationship that holds between the leverage of large firms and sovereign credit in the case of firm's refinancing, supporting that finding with firms' expectations for potential indirect government bailout. At the same time, Wang (2016) finds evidence of no correlation between leverage of small firms and sovereign credit risk.

On the contrary, Vasiliou and Daskalakis (2009), through an extensive investigation of Greek firms' financing behaviour, conclude that Greek firms seem to be concerned more with the drawbacks associated with debt financing. Those findings are justified by the fact that Greece is a bank-oriented country, implying high financial distress cost. They prove that there is a positive effect of corruption on leverage and that more profitable firms are less sensitive to corruption than less profitable ones. Furthermore, the comparison they provide between the Greek institutional setting and the international setting reveals that financial managers' decisions concerning capital structure do not seem to be affected by differences in institutional characteristics.

From another point of view of the legal systems, Jiraporn and Liu (2008) suggest that the 2002 Sarbanes-Oxley Act (SOX) may indirectly affect leverage, since the governance index (which measures shareholders' rights) is found to be positively associated with leverage. Furthermore, Hackbarth et al. (2007) show that in countries without strict bankruptcy codes, firms rely more on market debt. In addition, Chen and Hammes (2003) support that a bankruptcy framework which is more beneficial for creditors leads to the issuance of equity. In addition, tax shields benefits offered in the case of debt financing lead firms to obtain more debt. Overall, they conclude that country characteristics such as accounting rules and the legal environment affect capital structure orientation.

Moreover, Graham and Leary (2011) point out that the majority of empirical studies have concluded that debt tax-shields deductions do not significantly affect firm's financing choices and do not investigate whether or not there are important "off balance sheet" deductions (i.e. deductions that are not included in the balance sheets), but that they are nevertheless very important. Graham and Tucker (2006) find that in the presence of non-debt tax-shields that are not included in balance sheets, firms significantly decrease their debt ratios in years where "tax shelters" are present.

Political connections are another country characteristic identified as a determinant of capital structure. Of course, political connections are more profound in developing countries, where corruption levels are high and there are restrictions on foreign investment, but they also exist in open and transparent economies (Ebrahim et al., 2014). Focusing on Malaysia for a 12-year period (1998-2009), Ebrahim et al. (2014) observe an extreme differentiation in capital structure between firms that have political connections and those that do not, specifying connections as “political patronage”. However, the evidence is valid only in the case of the 1997 Asian crisis.

Cultural characteristics have received extensive attention in recent years, and there is evidence that religion, power distance, uncertainty avoidance, and collectivism or individualism significantly affect capital structure decisions (Arosa et al., 2014; Baxamusa & Jalal, 2014; Antonczyk & Salzmann, 2014).

The recent study by Arosa et al. (2014) reveals the significant impact of the above cultural factors on corporate capital structure. Arosa et al. (2014) collected data for more than 15,000 enterprises worldwide during the period between 2001 and 2011 and examined the relationship among power distance, uncertainty avoidance and leverage. As they point out, firms tend to hold less debt in cases of greater uncertainty, since uncertainty avoidance is found to negatively affect leverage. The results for power distance are similar to those obtained for uncertainty avoidance. Furthermore, Chen et al. (2015) observe variations that cannot be explained by the known corporate governance mechanisms. Their research reveals a significant impact of uncertainty avoidance and individualism on cash holdings in the US region. Focusing on the degree of individualism in a country, Antonczyk and Salzmann (2014) provide evidence that countries with a high degree of individualism present higher debt ratios. According to the researchers, managers working in firms that operate in those countries are overconfident and overly optimistic, leading to biased perceptions of debt ratios (Antonczyk & Salzmann, 2014).

Baxamusa and Jalal (2014), on the other hand, focus on another cultural characteristic of a region: religion. The relationship between religion and debt has been discussed since the early 1900s. The first attempt was to relate Christians and finance, and next to separate Protestants and Catholics (separation of Christians) and identify their

relationships with financial decisions. This separation is derived from the different views that these two religion movements have for ownership; Protestants consider that property belongs to owner, whereas Catholics consider that property is a social good. So, the study of US regions revealed the differences in leverages between firms operating in Protestant-majority countries and firms operating in Catholic-majority countries. An increase in Protestant religiosity in countries leads to a decline of leverage and to less frequent issuance of debt for enterprises operating in those areas. Firms in Protestant areas adjust the leverage to their targets at faster pace if the firm's leverage is above the target, while firms in Catholic areas adjust their leverage more quickly if the firm's leverage is below the target.

Overall, Belkhir et al. (2016) highlight the significance of a country's institutional infrastructure on corporate capital structure choices. Especially, through their study of Middle East and North Africa (MENA) countries from 2003–2011, they find that corporations tend to use a greater amount of debt in countries characterized by better institutional quality, and more precisely, by more developed financial systems, better rule of law and more efficient regulatory regimes.

#### **2.6.4 Board diversity**

Board diversity is a controversial characteristic of board of directors, from the point of view that its definition remains ambiguous. Many studies have tried to capture board diversity, but they have emphasized different aspects of diversity, such as gender, age, country of origin, racial diversity and other characteristics that may produce heterogeneity in a firm's board (Miller et al., 2013, Delis et al., 2016). Board diversity is a promising field for explaining firm behaviour, especially in the case of corporate capital structure's determination, where existing empirical research evidence is scarce.

The presence of women in a boardroom, in particular, has recently gained intense attention, mainly as a result of legal changes in some countries, obliging firms to instil a minimum proportion of women on their boards of directors. However, existing research mainly focuses on firm performance, and its impact on capital structure has received considerable less attention. On that issue, Alves et al. (2015) examine whether the presence of women in a board of directors affects risky assets related to capital

structure. According to their results, the greater the number of women, proportional to the total number of directors in boardroom, the larger the ratio of risky securities included in firm's capital structure. This evidence partly contradicts Cole's (2013) and Faccio et al.'s (2016) conclusions about the presence of women managers that reduces leverage levels.

Also, a similar conclusion is reached by Rossi et al. (2017). Their empirical study of public Italian firms reveals a positive relationship between female presence in boardroom and corporate debt level. They advocate that considering debt as a financing option, the relationship between gender diversity and debt level implies the additive contribution of women in the corresponding agency costs of debt. However, the former statement seems to contradict previous findings (also referred in earlier sections) about women CEOs and directors who are considered as risk averse (Faccio et al., 2016; Cole, 2013). On the other hand, they conclude that the increasing number of women family members in the boardroom decreases debt usage (Rossi et al., 2017).

Ahern and Dittmar (2012) are also interested in women's presence in the boardroom and its impact on firm valuation. Concerned with the influence of an alternation in Norwegian law, in 2003, requiring at least 40% presence of women as directors in all public limited firms, they employ panel data including the periods before and after the law's application and examine the effect of the women directors in a board on the firm's value and other firm measures. Their findings suggest the negative impact of women's presence increase in firm value (measured by Tobin's  $Q$ ) and also a positive impact on corporate leverage. Furthermore, Abad et al. (2017) examine the relationship between gender diversity in the boardroom and the degree of information asymmetry in equity markets in Spanish firms, finding a negative relationship. They claim that this result indicates favourable gains in the equity market, through reduction of information-related risk and improvement of stock liquidity. They also affirm that the legal changes regarding the increase of women's presence on boards of directors have resulted in that outcome, implying a similar effect to that observed from Norwegian law.

In contrast to the above evidence on Tobin's  $Q$  measure, Nguyen et al. (2015) show a positive relationship between increased women directors in boards and Tobin's  $Q$  measure of firm performance, after studying publicly listed Vietnamese firms between

2008–2011. They add that firms with more than one woman in their boardrooms have significantly higher financial performance compared to those with no woman in their boards. At the same time, however, researchers conclude that there might be a point at which greater presence of women in the boardroom, at about 20%, above which the positive relationship may not hold.

Delis et al.'s (2016) study emphasizes the diversity of the country of origin of members constituting the board of directors. They research the connection between the genetic diversity in the country of origin of each member of a board of directors of a firm and its performance. Collecting information about board members' nationalities, they conclude that genetic diversity in the country of origin matters for firm performance and that the impact is positive.<sup>20</sup>

Focusing also on board heterogeneity, Hafsi and Turgut (2013) introduce a board diversity index, based on director's characteristics, such as gender, age, nationality, tenure and experience, in order to analyse its effect on "corporate social performance". They find that only the diversity of companies inside the board of directors matters.<sup>21</sup> They fail to provide evidence of direct impact of the diversity of the board on CSP, but conclude that it may be more optimal to capture a board's heterogeneity ratio in relation to characteristics, additional to gender.

Miller and Triana (2009) hypothesise that board diversity (gender and racial<sup>22</sup>) affects firm performance through innovation and reputation. To test their hypotheses, they use gender and racial diversity as indicators, presented originally by Blau (1977), as well as the fraction of race-related minorities<sup>23</sup> or women's presence to the overall composition of board members. The employed Blau index calculates the fraction of members in each race ( $p_i$ ) and assigns a value of zero in case of total homogeneity and higher values in case of diversity. The higher the value it assigns the greater the board diversity.

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<sup>20</sup> Delis et al. (2016) measure board diversity by calculating a diversity score, considering the standard deviation of genetic diversity in each firm year, based on each individual country's diversity score, following the measure of diversity among a country's population, as proposed by Ashraf and Galor (2013).

<sup>21</sup> Hafsi and Turgut (2013) examine both "diversity in boards" (i.e. the heterogeneity inside a firm's board, and "diversity of board", i.e. the dissimilarities among board of directors of different companies).

<sup>22</sup> Miller and Triana (2009) collected the data for gender and race from Investor Responsibility Research Center (IRRC) and distinguished member of board of directors into the 4 racial categories: Asian, Black, Hispanic or White.

<sup>23</sup> They used as minorities, the member of all racial categories apart from Caucasian.

$$\text{Blau diversity index} = \left(1 - \sum p_i^2\right) \quad (1)$$

Highlighting the significance of heterogeneity inside a board of directors, they prove that only racial heterogeneity affects a firm's reputation. At the same time, however, researchers fail to accept their initial hypotheses that innovation and reputation act as intermediaries between board heterogeneity and firm performance, since they provide sufficient evidence for innovation only as an intermediary between racial heterogeneity in board and firm performance.

Concerned with cultural distance among the members of the board of directors, Frijns et al. (2016) compute the average national distance in the board of directors, based on the well-known work of Hofstede (1984) on cultural dimensions (uncertainty avoidance, power distance, masculinity and individualism, as mentioned in an earlier section) and examine its effect on firm performance. They firstly compute a cultural distance score between each two board directors, and then they compute the average cultural diversity of all the cultural distance calculated scores. The result is the cultural diversity of board of directors' measure. Collecting data about directors-members of boards of firms operating in UK from 2002–2014, Frijns et al. (2016) deduce that cultural diversity has a significant and negative effect on firm performance, measured by Tobin's  $Q$ . That effect is justifiable by the management literature, as it is claimed that cultural diversity is "double-edged sword," since from one side it enhances creativity and innovation (positive effect), while on the other side, it causes disagreements, misunderstandings and diminishes overall communication among members (negative effect). Therefore, the researchers advocate that cultural diversity's negative effect surpasses its positive effect in their sample, implying that a more diverse board, in terms of culture, leads to reduced firm performance.

Their results hold, even after controlling for other board characteristics and also after using ROA as measure of firm performance. However, in the case of ROA, the level of significance falls to 10%. Furthermore, they examined separately the effect of various dimensions of cultural diversity (i.e. uncertainty avoidance, power distance, masculinity and individualism) on firm performance. They prove that although all cultural dimensions show a negative impact, only masculinity and individualism are significant,

indicating that not only are material rewards and competitive behaviour preferred by society, but also individual values, rights and duties are considered as superior when compared to those of society, thus generating disputes in the boardroom.

Overall, the evidence of the existing literature suggests a negative effect of board diversity, either measured by nationality, race or gender, on firm performance (e.g. Rossi et al., 2017). Many researchers have highlighted the dual effect of board diversity on firm outcomes. The only conclusion that can be relied upon concerning board diversity and capital structure is in the case of gender diversity, where the limited evidence suggests a positive impact of women's boardroom presence on capital structure. No single conclusion can be drawn about the impact of nationality or racial diversity in boards on capital structure.

#### **2.6.5 Managerial quality or efficiency**

The importance of management for successful firms is undoubted nowadays. Management quality, as derived from the managerial practices and executives' ability seems to influence not only firm performance but also other firm characteristics. Bloom et al. (2014) advocate that managerial practices are the drivers of firms' total factor productivity (TFP). The most common measures used to capture a firm's managerial quality are corporate financial characteristics, such as firm size, past performance, and CEOs' characteristics, such as tenure, compensation scheme and education level.

Among those who have examined managerial efficiency are Demerjian et al. (2012), who introduce another measure of it, namely managerial ability. Aiming to distinguish efficient from inefficient firms, they used an efficient frontier on firm's efficiency developed through data envelopment analysis (DEA) and then regressed the firm's efficiency towards certain firm characteristics to obtain the equation residual. That residual is used as a managerial ability score, depicting manager's ability to improve firm performance. The residual is the managerial ability score following the intuition that since all important quantitative variables were included in the regression model, the "left-over" of the regression is the proportion attributable to management team.

Moving a step further, Francis et al. (2016) are concerned with the effect of "relative peer quality" (RPQ) on firm performance. Following the scores assigned to firms by

Demerjian et al. (2012), Francis et al. (2016) calculate the CEO's "relative peer quality" of a selected firm by using the proportion of peer firms with higher managerial ability compared to that firm. Furthermore, the proportion of peer firms includes only those firms that have a higher managerial ability score than that firm. In addition, the data collected included only US firms in which the CEO's compensation and bonus scheme are determined by at least three peer firms, as confirmed by the firms. This work differs from research concerned with industry behaviour related to firms' tendency to "mimic" the behaviour of the firms in an industry, since after Francis et al. (2016) excluded firms from the same industry, RPQ remained significant. They conclude that there exists a significant relationship between RPQ and firm performance and further that peer behaviour seems to affect firms' financial choices. Finally, Francis et al. (2016) underline that the gap of managerial quality between a firm and its peer, may become a motivation for CEO's incentive schemes to provoke greater levels of effort, a desirable outcome of shareholders.

Koester et al. (2016) relate managerial ability to tax avoidance. Specifically, through the manipulation of managerial ability scores that Demerjian et al. (2012) introduced, they examine the effect of managerial ability scores on tax avoidance, proving that more able managers<sup>24</sup> tend to undertake actions for tax avoidance and, finally, to achieve corporate tax payments reduction.

Another study by Demerjian et al. (2013) examines managerial ability's effect on firm's earnings quality. Emphasizing the importance of managerial ability for firm's performance, Demerjian et al. (2013) confirm that more able managers produce higher-quality earnings. At the same time, they provide sufficient evidence that firms recruiting a new, more able CFO experience improvement in the quality of earnings.

Using the managerial ability score proposed by Demerjian et al. (2012), Bonsall et al. (2016) show that firms with more able managers obtain better credit ratings. Specifically, better managerial ability is also related to lower variability in firms' future performance, which signals to credit rating agencies a firm with lower default risk. The validity of the results is also examined in case of a CEO turnover, indicating that the replacement of one CEO with another with a higher managerial ability score leads to an

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<sup>24</sup>Including all, CEO, CFO, COO, etc.

improved credit rating score. Measuring credit spread as the excess yield over the closest maturity treasury bond yield, they show that more able managers lead to lower levels of credit risk provided by bond investors, signalling additional information to credit rating scores for credit market investors.

Francis et al. (2016b) focus on the corporate cost of bank financing and its possible association with managerial ability. Measuring the cost of bank lending as the additional rate above the interbank rate (LIBOR) that the borrower should pay for every dollar of bank loan, they relate increasing managerial ability to the decreasing cost of bank lending (including bank loan price, loan covenant and maturity). Their findings underline a significant adverse effect of managerial ability on bank loan spread, proving that the relationship between information opacity and managerial ability might be the cause of this adverse effect. The same relationship is present for the effect of improved managerial ability following CEO turnover on bank loan spread. However, they suggest that since managerial ability tends to improve firm performance, the reduction of bank loan spread will follow. In other words, improving performance might be another channel through which managerial ability affects bank loan spread. In the case of bank loan terms, loan covenants and maturity, only loan covenants were found to be related to managerial ability. Furthermore, managerial ability was found to negatively affect the choice of bank loans as a financing method. Instead, more able managers tend to choose public bonds.

Bloom and Van Reenen (2007;2010) and Sadun et al. (2017) have introduced another measure of managerial quality, the management practices index. Under the World Management Survey (WMS) project they developed an index based on the management practices that firm follow in four areas, namely, operations, monitoring, target setting and people's management. Collecting data through phone interviews they constructed an index ranging from 1 (worst management practices) to 5 (best management practices) based on the answers of interviewees in 18 questions related to the above mentioned areas. The average score of these answers is the management practices index.

Employing this index, Bloom and Van Reenen (2007) study medium size-firms in four countries (USA, UK, Germany and France) and conclude that better management practices have a strong positive impact on firm's productivity, profitability, Tobin's Q

and survival rates. Also, Bloom and Van Reenen (2010) studying firms in 18 countries drive the same conclusion about the relationship between management practices and profitability.

Sadun et al. (2017) collected observations of 12,000 firms operating in 34 countries showing that if firms adopt better management practices, both growth rates and profitability increase whilst probability of default decreases. More specific, they prove that a shift from the worst 10% to the best 10% of firm management practices, is related to a 15 million dollars' increase in profits, a 25% faster annual growth and 75% higher level of productivity. Still, Sadun et al. (2017) suggest that firms following better management practices tend to attract more talented employees.

In sum, the existing evidence is limited regarding the effect of top executives' ability on leverage. Any conclusion arrived at may be related to other CEO or CFO characteristics that have been identified as determinants of corporate leverage, such as his age, tenure and social network.

## **2.7 Capital structure and crisis**

Financial crises seem to provoke specific behaviour in firms, as far as their capital structure is concerned. Many economists have pointed out that during the 2007 financial crisis, only firms that had made the “right” capital structure decisions had the power to survive in the USA.

According to Proenca et al. (2014), who examine SMEs in Portugal, firms were found to increase their debt during the crisis period, since there is a positive relationship between crisis variable and debt ratios, but to reduce them in post-crisis period<sup>25</sup>. In agreement, Ebrahim et al. (2014) claim that during crisis periods firms prefer to reduce their debt instead of increasing their equity. In addition, it has been found that the impact of some variables (such as size) on capital structure during crisis periods is much more intense than during regular periods (Ebrahim et al., 2014).

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<sup>25</sup> It should be mentioned that the authors acknowledge the need for more post-crisis periods to derive reliable results.

Kahle and Stulz (2013) also point out the increase of debt usage during the first half of the crisis, 2007–2008 and its decline after 2008. Further, Zeitun et al. (2017), through the examination of financial crises' effects on capital structure in GCC countries from 2003 to 2013, conclude that firm-specific characteristics, such as, size, growth opportunities and firms' industry prospects, have significant effects on the determination of corporate capital structure in post-crisis periods, whereas other variables, such as earnings variability, do not impact it. At the same time, their results highlight the importance of both supply of and demand for credit in post-crisis periods. Their research shows that in pre-crisis periods only the demand of credit determines the firm's debt level, whilst in post-crisis periods, both supply and demand are critical for leverage ratio determination. In addition, they provide evidence that the effects on leverage ratios as a result of financial crisis differ among the countries in their sample. However, they do not find significant alterations in leverage ratios in pre- and post-crisis periods in the pooled sample (Zeitun et al., 2017).

Demirguc-Kunt et al. (2015) study the impact of the financial crisis on capital structure, focusing on the 2004–2011 time-period and a sample of 277,000 firms from 79 countries. They find profound evidence of firm leverage and debt maturity decrease during crisis and post-crisis periods. They highlight, however, that the decrease is more evident among privately held companies and SMEs, whilst in publicly traded firms, the decrease effect is much weaker, and in other cases (e.g., of large firms), there is an increase in both leverage ratio and debt maturity. They also conclude that applying policies targeting financial infrastructure significantly affects corporate capital structure. In detail, they provide evidence that a sound banking system and a well-built institutional environment reduce the effects of financial and economic volatility, as well as a legal system for bankruptcy, quality of credit information and the absence of barriers in bank entries affecting leverage.

However, the evidence on the effects of the crisis on firms' leverage should be considered with caution. More specifically, the research of Pavlov et al. (2016), which is concerned with current financial crisis' effects on US real-estate investment trusts (REITs), highlights that the policies applied prior to crisis by REITs' managers who managed to identify the risks related to crisis were effective in the case of US REITs, but were ineffective in the case of European REITs.

## 2.8 Conclusion

Following the insights of the trade-off theory, taxes and bankruptcy are the key factors for firms choosing debt, while following the pecking-order theory, the key factor is the adverse selection problem. However, through a review of empirical research on capital structure, it is easily highlighted that there is not a single model found to accurately describe or explain corporate financing decisions. In many studies the relationships between dependent and independent variables are not clearly supported by one well-known theory. Of course, the difficulty of summarizing on all actual determinants of capital structure into a one empirical model arises from the fact that capital structure is quite complex and may be too complex to be captured by a single model. It seems that a theory that would describe more efficiently the effects of various variables on capital structure, and the behaviour of capital structures could be derived from the combination of the pecking-order and the trade-off theories.

In addition, the factors presented so far are those that have gained the mass attention of researchers in their effort to shed light on corporate capital structure determination. Firm-level variables seem to be the critical determinants, followed by industry and country-level determinants. According to Gungoraydinoglu and Öztekin (2011), leverage variability is mainly explained, about 66%, by firm- and industry-related variables, including among others firm size, tangible assets, sector leverage, assets' ability to transform into cash (liquidity) and earnings before interest and taxes (EBIT) divided by total assets, and about 34% by country-related variables.

In sum, specific factors do determine corporate capital structure. The studies presented above conclude that there are certain capital structure determinants which, however, are differentiated based on specific firm characteristics, such as size, age, location and so on. So far, the most critical determinants appear to be as follows: firm size, profitability, liquidity, asset tangibility, market-to-book ratio, stock returns and cash flow volatility. Yet, other firm characteristics remain unexplored or they have received limited attention. The empirical chapters that follow aim to close this gap, and enhance our understanding of the determinants of firm capital structure.

## Chapter 3: Board Diversity and Capital Structure

### 3.1 Introduction

The present chapter aims to examine whether and how the corporate capital structure is influenced by diversity in the firm's board of directors. I differentiate my work from past studies by measuring board diversity in terms of genetic diversity in the directors' country of origin. Section 3.2 outlines the data sources. Section 3.3 discusses the construction of the board of diversity index and the rest of the variables, and presents descriptive statistics and correlation coefficients. Sections 3.4 and 3.5 present the empirical identification and the methodologies, respectively. Sections 3.6 and 3.7 present and discuss the empirical results. Finally, section 3.9 concludes the chapter.

### 3.2 Sample

The examination of the board diversity's effect on corporate capital structure uses the index of genetic diversity developed by Delis et al. (2016). The data are in general the same as the ones used in Delis et al. (2016), and were initially drawn from multiple sources.

For firm-level data, the BoardEx, Thomson Reuters', Worldbank and Datastream databases were used. In particular, the BoardEx<sup>26</sup> database includes data on corporate governance characteristics. This specific database contains the vast majority of data (more than 800,000 organisations) associated with corporate governance features and specifically board of directors' and executives' characteristics—it is the major database containing abundant information about the characteristics of boards of directors, and is thus of primary interest. Further, Thomson Reuters', Worldbank and Datastream<sup>27</sup> are well-known databases for data on firms' financial characteristics, and they are commonly used for research in the field of finance. In addition, the construction of the board diversity index, based on genetic heterogeneity score, is derived from data presented by Ashraf and Galor (2013).

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<sup>26</sup> <http://corp.boardex.com>

<sup>27</sup> <http://extranet.datastream.com/Data/Worldscope/index.htm>,  
<http://extranet.datastream.com/User%20Support/PubDoc/Advance.htm>.

Companies were selected based on the stock exchange in which they trade, and only those listed in London Stock Exchange or any stock exchange in North America were chosen. Thus firms are mainly headquartered in the US and the UK, whereas there is a minority of firms are operating in the another 18 countries.

*Table 3.1- Firms' headquarters*

1	Australia
2	Bermuda
3	Canada
4	Cayman Islands
5	Cyprus
6	Falkland Islands
7	Gibraltar
8	Guernsey
9	Isle Of Man
10	Israel

11	Jersey
12	Luxembourg
13	Malaysia
14	Netherlands
15	Republic Of Ireland
16	Singapore
17	South Africa
18	Switzerland
19	United Kingdom
20	United States

Figure 3.1 below depicts the number of firms by year over the period of the analysis and Figure 3.2 presents the distribution of firms by sector. The sample consists of 1,783 firms over the period 1999-2012 resulting in 5,851 firm-year observations.<sup>28</sup>

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<sup>28</sup> The initial dataset consisted of 11,125 firm-year observation from 2,198 firms. The final sample was obtained after excluding financial and real-estate sector operating firms, firms with missing observations, and variables lying below the first percentile and above on 99th percentile.

Figure 3.1- Firms examined per year

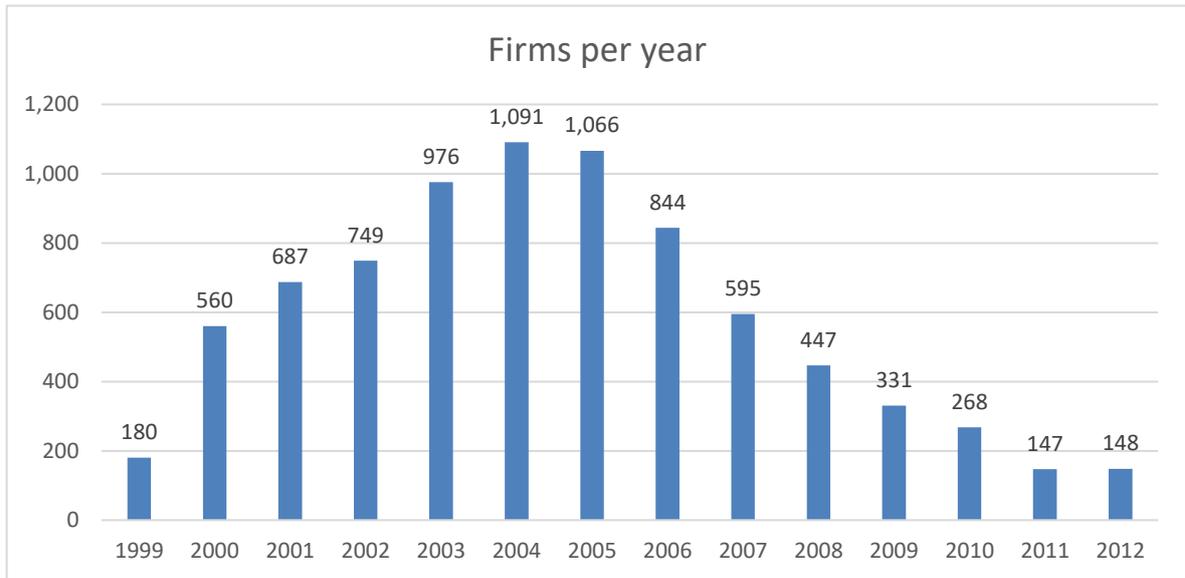
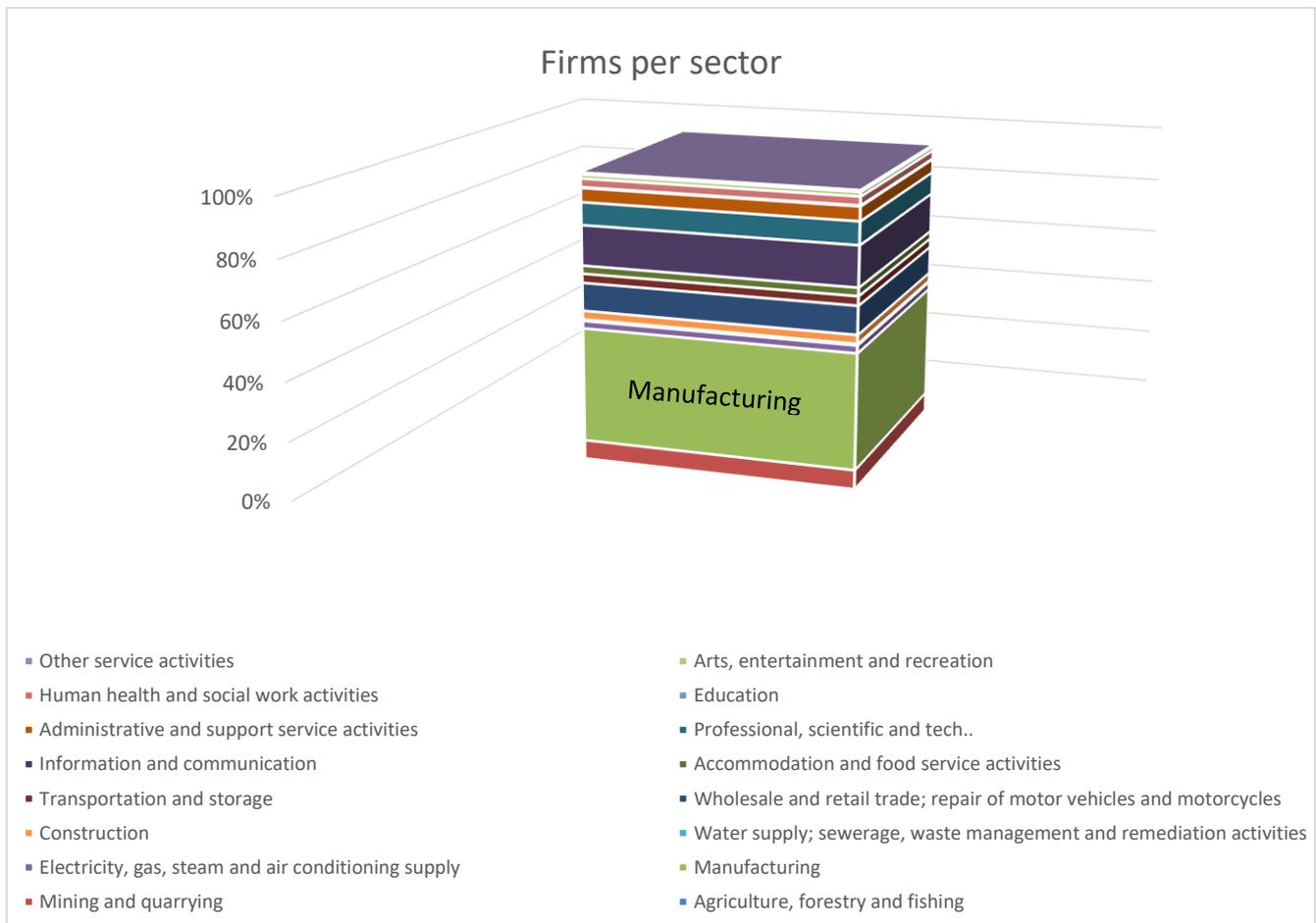


Figure 3.2. Firm distribution by sector



### 3.3 Variables in the model

The capital structure literature discusses a number of variables as potential determinants of corporate leverage, ranging from financial to managerial and other qualitative characteristics. For the purposes of the current analysis, the control variables included in the models are firm size, profitability, current ratio, market-to-book ratio, total number of directors in the board, risk-adjusted returns, the cultural characteristics of masculinity, individuality, uncertainty avoidance, power distance, and long-term orientation, and other corporate governance variables (e.g. tenure, board's age etc.). As observed by Gungoraydinoglu and Öztekin (2011) up to 63% of overall variation in leverage may be related to liquidity, asset tangibility, firm size, profitability and sector leverage. The selected variables are discussed below, while Table 3.2 provides an overview.

*Table 3-2 Variables' definitions*

<b>1</b>	<b>Leverage</b>	<b>LA</b>	<b>Total liabilities /Total assets</b>
<b>2</b>	Genetic diversity deviation	SPDIV	Standard deviation of the genetic diversity score
<b>3</b>	Firm Size	LNTA	Ln(Total assets) or Ln(Total sales)
<b>4</b>	Profitability	PROF	Operating Income(EBIT)/Total assets
<b>5</b>	Size of Board of Directors	LNTD	Ln(Number of directors in board)
<b>6</b>	Liquidity	CUR	Current Assets/ Current Liabilities
<b>7</b>	Market to Book ratio	MB	Market /Book valued of equity
<b>8</b>	Independent directors	IND	Proportion of independent directors in board
<b>9</b>	CEO's dual role	DUAL	Dummy=1 if CEO is also Chairman of the board of directors and 0 otherwise
<b>10</b>	Board's age	AGE	Average age of directors

11	Independence of audit committee	INDA	Percentage of independent non-executive board members in audit committee
12	Director's network	NET	Board's average network size in terms of externally connected directors
13	Director's tenure	TEN	Average of directors' years in role
14	Previous roles' independence	PIND	Percentage of independent directors having previous roles in the board
15	Cultural diversity	CD	Standard deviation of cultural index
16	Political diversity	PD	Standard deviation of polity index
17	Trust- level diversity	TD	Standard deviation of the trust score
18	Legal diversity	LD	Standard deviation of legal score
19	Development diversity	DD	Standard deviation of GDP per capita
	<i>Instruments</i>		
I	Ultraviolet Exposure	LUV	Intensity of Exposure to Ultraviolet Rays
II	Migratory Distance	LDA	Ln(Migratory Distance from East Africa)

### 3.3.1 Definitions and hypotheses development

#### 3.3.1.1 Capital structure definition

One of the concerns, when examining firms' capital structure, is the choice of the most appropriate variable of leverage. The problem arises from choosing between market and book values of assets to scale debt.

Scaling with market values takes advantage of the information for future expectations on significant parameters, such as financial distress cost, taxation gain, and so on. However, a vast number of researchers seems to prefer book values of assets to scale debt, since market

values tend to be included in the structure of parameters often used as capital structure determinants (e.g. size). As Titman and Wessel's (1988) evidence suggests, there are relations between the market leverage and its determinants that tend to be scaled by market values. Also, according to Graham and Harvey's (2011) study, managers tend to be more interested in book leverage. However, the use of either market or book value of leverage does not affect the results and their applicability. As Antonczyk and Salzmann (2014) point out, there are many studies using both calculations of leverage (book and market value) leading to similar results in both cases.

Still, there is a concern for the measurement of debt ratio. According to Welch (2007), researchers should focus only either on scaling debt with capital or on scaling total liabilities with total assets. As Parsons and Titman (2008) argue, the use of various debt measures may reflect the advantages that each type incorporates, which may explain the fact that many empirical studies employ multiple formulas.

Following many papers in the literature, in the present Thesis, leverage is measured by the ratio of total liabilities to total assets (Antoniou et al., 2013; Aghion et al., 2004; Ahern & Dittmar, 2012; Faulkender & Petersen, 2006)

### *3.3.1.2 Genetic diversity of board of directors*

Diversity in the boardroom, as already mentioned, can either harm or benefit a firm in terms of enhancing firm performance and assisting in decision making. Differentiation among directors in a board, regarding gender or nationality, has been found to affect both firm performance and corporate leverage (Hafsi & Turgut, 2013; Miller & Triana, 2009; Ahern & Dittmar, 2012; Rossi et al., 2017).

Genetic diversity relates to factors affecting individuals' behaviour not captured by geographical, institutional and cultural aspects. Concerning genetic diversity, Ashraf and Galor (2013) emphasize the migratory distance between East Africa and the current residence of individuals. East Africa is considered the point of origin of humankind, where the first species one recognized as the predecessor of humans, the Homo Sapiens, initially lived, before spreading to the rest of the world. As mentioned in their work, there are only 53 ethnic groups covering the populations around the globe, and these groups are closely related to their current location, while any genetic distortion from other ethnic groups has been excluded. The index called "expected heterozygosity" estimates the level of diversity

in genes among individuals belonging to the same ethnic group. Calculating the expected heterozygosity for an ethnic group requires the calculation of the statistical possibility of two individuals chosen by chance to vary regarding a specific gene, and then taking the average for several genes. According to Ashraf and Galor (2013), there is an adverse relationship between migratory distance from East Africa and genetic diversity. In their work they developed the genetic diversity index, which includes genetic diversity for 145 countries, through the calculation of the migratory distance from Addis Ababa to each of those countries.

Relying on that county-level index, the genetic diversity among directors in a boardroom is calculated by Delis et al. (2016), as a three-step process:

*Step 1:* Collect information about each director's nationality via BoardEx.

*Step 2:* Attach the score of a country's genetic diversity from Ashraf and Galor (2013) to each director, based on this nationality obtained in Step 1.

*Step 3:* Estimate the standard deviation of genetic diversity for each year for each firm (i.e. board) using the results of steps one and two, as follows:

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^n (d_i - m)^2} \quad (2)$$

where,  $\sigma$  is the standard deviation,  $n$  is the number of board directors,  $m$  is the mean diversity score of the firm's board, and  $d_i$  is the individual diversity score of each board member (Delis et al., 2016).

Therefore, the standard deviation calculated here represents the heterogeneity in the genetic diversity score of the board of directors and it is estimated on a firm-year basis. Hence, the above-constructed scale is the depiction of the extent of heterogeneity inside the boardroom regarding the genetic diversity in the countries of its members (Hafsi & Turgut, 2013).

For a more comprehensive view of the construction of the index, consider the case of a British firm's board of directors consisting of five directors, two of them being British, two being American and one being Argentinean. Based, as mentioned, on country's diversity scores, the directors from Great Britain have an average score 0.73, the Americans, 0.63, and the Argentinean, 0.57. So, the deviation in diversity for that board is 0.062. In contrast, if all

of them where from the same country (e.g. Britain), the deviation of genetic diversity would be zero.

Based on the evidence on the effect of nationality or racial diversity in the boardroom on firm performance and the existence of a negative relationship between gender diversity and capital structure, the following hypothesis is formed:

*Hypothesis:* Genetic diversity of board of directors negatively affects leverage.

### 3.3.1.3 Control variables

#### 1) Firm financial characteristics

##### Lagged dependent variable

Aiming to capture the dynamic relationship between leverage and its determinants, its lagged value is included. Following the previous literature, a positive coefficient is expected (Maghyereh, 2005; Cook & Tang, 2010; Ebrahim et al., 2014).

##### Firm size

According to the previous literature, the effect of firm size on corporate capital structure is ambiguous. There is strong evidence for both positive (Titman & Wessels, 1988; Kayo & Kimura, 2011; Faulkender & Petersen, 2006) and negative effects (Mehran, 1992; Gonzalez & Gonzalez, 2012) of firm size on leverage.

Parsons and Titman (2008) emphasize two issues that might justify this ambiguity. The first relates to the cost of refinancing, which may be higher for smaller firms than for larger firms, since it costs less to be under- than over-leveraged. The second states the nonexistence of an actual effect of firm size on leverage. Rather, as it is stated that certain omitted parameters related to leverage correlate with firm size, giving the false impression of a relationship between size and leverage. The latter explanation suggests firm diversification and technological and governance-related costs that may be more profound in smaller firms.

Some studies link the effect of the size on corporate leverage to be differentiated regarding firm size own values (i.e. if firm is large, the size effect on leverage may be positive but it

may be negative if firm is small), emphasizing also the degree of information asymmetry. Larger firms are considered better able to manipulate information asymmetries and reduce borrowing cost than smaller ones (Antoniou et al., 2013). Specifically, there is sufficient evidence of a positive influence of the variable of size on leverage, in the presence of large firms (Faulkender & Petersen, 2006; Comment & Jarrell, 1995). That finding directly indicates that the larger the firms, the greater the debt levels.

The two measures widely used in the literature for firm size are the natural logarithm of a firm's total assets (An, Li & Yu, 2016; Chen & Hammes, 2003; Temimi et al., 2016) and the natural logarithm of a firm's total sales (Antoniou et al., 2013; Chui, Kwok & Zhouc, 2016; Faulkender & Smith, 2016; Kayo & Kimura, 2011). In our study, where the vast majority of firms under examination are manufacturing firms, there are no limitations in the use of either measure. For that reason, the natural logarithm of total assets is used as a proxy for the effect of size, but the natural logarithm of total sales is also used in further analysis to examine the robustness of the results.

#### Profitability

Profitability follows a pattern similar to firm size. In other words, profitability has been found to both negatively (Proença et al., 2014; González & González, 2012; Hanssens et al., 2016; Margaritis & Psillaki, 2010) and positively affect leverage. As the pecking-order theory states, more profitable firms tend to employ retained earnings, whereas external financing is the last resort (Myers, 1984). There is some evidence that for large firms, profitability relates positively to firm leverage (Faulkender & Smith, 2016); however, larger firms are more able to access external financing. Therefore, I use the operating income (i.e. EBIT) of total assets to measure profitability (Faulkender & Smith, 2016; Hanssens et al., 2016; De Jong et al., 2008).

#### Market-to-book ratio

The market value to book value of equity ratio is used as proxy for firm's growth opportunities and indicates any presence of underinvestment issues (Zheng et al., 2012). The literature suggests that the market-to-book ratio may have either an inverse (Frank & Goyal, 2004) or positive (Hovakimian, 2004) effect on capital structure.

## Current ratio

The current ratio (i.e., the ratio of current assets to current liabilities) is used as proxy for firm's liquidity (De Jong et al., 2008, Temimi et al., 2016). A significant negative influence of liquidity on firm leverage is evident in the literature (De Jong et al., 2008; Temimi et al., 2016), whereas there is also some evidence of a positive influence (Gungoraydinoglu & Öztekin, 2011).<sup>29</sup>

## 2) Board characteristics

### Size of board of directors

The number of directors in a firm's board (i.e. board of directors' size) is defined as the logarithm of the total number of directors on a board (Berger et al., 1997 ).

As already stated, board size is considered a critical factor for firm operations, due to its oversight role and its ability to manage behaviour and conflicting stakeholder interests. Yermack (1996) claims that boards with numerous directors tend to experience difficulties in having effective conversation and making effective decisions, resulting in an ineffective board in terms of its monitoring role. However, Coles et al. (2008) state that in firms with more complex operations that have larger boards, board size is positively related to its efficiency.

In the capital structure literature, overall, there is mixed evidence about the influence of the size of the board on firm leverage (Berger et al., 1997; Rossi et al., 2017; Alves et al., 2015). Alves et al. (2015) obtain a positive relationship between board size and long-term debt, explained as the reduced information asymmetries effect, whilst a negative one persists in the case of short-term debt. However, based on Berger et al.'s (1997) findings, there is an inverse association between leverage and board size.

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<sup>29</sup> The positive sign of liquidity coefficient obtained by Gungoraydinoglu and Öztekin (2011) is mainly driven by the creditor rights framework, as underlined in their work.

## Gender

The presence of women at the executive level or on the board of directors has, in recent years, been associated with improved firm performance, reduced risk-taking and lower leverage levels (Cole, 2013; Faccio et al., 2016).

In the current study, the effect of gender is captured by the percentage of men presence in the boardroom. Earlier studies using the presence of women in the board report a negative association with capital structure (Faccio et al., 2016; Cole, 2013). Thus, I expect a positive sign for the proxy that I use.

## Chief executive officer's dual role

Another feature of corporate governance that has been identified as a factor influencing capital structure is the power of the chief executive officer (CEO). In particular, the CEO's power is related to his or her dual role (i.e., being both an executive chairman and CEO). The duality of the CEO enhances this person's power in corporate decisions and it seems to alter the decisions taken.

Holding the position of CEO may be associated with information asymmetry in relation to the rest of the board members, since CEOs have greater access to firm's operations and may, as usually happens, keep hidden certain information. At the same time, the presence of a CEO as Chairman of the board may lead a board of directors to be forced into specific decisions by the CEO and the hidden information he obtains. Also, the interest of the CEO and other executive members to prolong their tenure has been emphasized in the management literature. That goal results in more conservative choices in terms of risk, choosing safer options than others.

The CEO's dual role is captured through a dummy variable, taking the value of 1 in the presence of the CEO as Chairman in boardroom and a value of 0 otherwise.

## Board's age

The age of the director signals critical features of his or her personality, apart from professional experience in business. Previous research on organizational psychology directly connects directors' age with work-related behaviour. The age is related to the director's open-mindedness and knowledge, implying at a corporate level an ability to welcome new ideas concerning board operations, and hence an ability to better communicate among

members when differing points of views. The average age of directors in the boardroom is calculated to capture the age effect (Delis et al., 2016).

#### Director's tenure

Another feature of expertise on the field and better knowledge of the firm is their tenure as directors (Hafsi & Turgut, 2013). However, a longer tenure may reduce monitoring ability and independence in decision making, since the longer the director in the role, the higher the probability the director's decisions will be influenced by the firm's managers (Anderson et al., 2004). Managers' preference for lower leverage levels may drive directors' decision. Therefore, following Delis et al. (2016), to control for the effect of tenure I use the average of the director's years in the role.

#### Board independence

External directors may alter the decisions of the board and as such it has been recognized as a significant determinant in corporate decisions (Estélyi & Nisar, 2016). Therefore, board independence affects the quality of corporate governance. According to Morellec et al. (2012) better-governed firms offset the trend of limited debt usage, and Anderson et al. (2004) advocate that the cost of debt negatively relates to the number of independent directors.

I define board independence as the proportion of independent board members to total number of board members.

#### Independence in past roles

The presence of independent members with past experience, such as CFOs or finance directors, may affect certain corporate decisions, including debt choices, due to the ability of these experienced members to provide better guidance in financial decisions (Güner et al., 2008).

The proxy I use to capture that effect is the percentage of independent directors having previous roles in the board.

### Audit committee independence

Apart from board independence, audit committee independence also matters for leverage choices, since it is the committee who suggests external auditors to the board and monitors them. The audit committee's independence, as proxied by the percentage of non-executive board members, has been found to negatively affect cost of debt. according to Anderson et al., (2004) this illustrates that creditors rely on the audit committee for trustworthy financial statements.

### Director's network

Social networking has been identified as a way to improve information acquisition (Rodan & Galunic, 2004). This information affects certain corporate variables, including leverage choices. For example, social connections may provide information on financing options and may make easier access to external financing. Therefore, the information and the potentials gained by social networking may lead either to increase or to decrease of debt usage. Therefore, to capture such issues, I use information on the director's network as measured by his or her connection to outside directors, and take the average over the entire board.

## 3) Other control variables

### Cultural diversity

Cultural diversity is another incremental factor affecting boardroom decision making both through its effects on trust levels inside the boardroom but also through duty and communication conflicts arising among its members (Frijns et al., 2016).

Cultural dimensions, specifically differences in societies concerning cultural qualities, have been extensively researched by Hofstede (1984), who surveyed six main characteristics in 50 different countries around the world. Those characteristics are competitiveness, power orientation, individualism, long-term targeting and insecurity in the society from which the researcher provides the cultural indices. The literature suggests that such factors alter firm's financing decisions (Zheng et al., 2012; Li et al., 2011; Huang et al., 2016)

Masculinity (MAS), the degree of competitiveness in a society, is calculated versus femininity. Hofstede (1984) defines masculinity in a society as features defining males, and especially as the desire for accomplishment, boldness action and materialistic rewards as

favourable outcomes. In contrast, femininity relates to the features typically associated with women and includes the quality of life, the concern for weak members of society, humility and collaboration. There are signs that masculinity in a society relates to opportunistic behaviour (Doney et al., 1998). Haq et al. (2017) are concerned with cultural dimensions' effect on bank leverage. They examine 791 listed banks from European and American continents, and they prove that masculinity has a positive effect on bank leverage.

The power distance index (PDI) gauges to the extent that weaker members of society, in terms of power, accept and expect the unequal power distribution taking place in their society. A high value of power distance indicates that members in a society comply with the existing positions of all members, with no controversy and accept the hierarchical rank, whereas a low value of in the index implies the non-acceptance of the inequality in power allocation and the existing hierarchical order by society members who require an equal distribution of power. It is claimed that between people on the upper edge of the power level and people in the lower edge, there is no understanding and social trust (Bjørnskov, 2008). That lack of trust in societies ranked high on the power distance index justifies, according to Zheng et al. (2012), the evidence found in those countries for more short-term debt manipulation by firms. Through their study of 40 economies around the world, they find a negative relationship between debt maturity and power distance, supposed to occur because of the high transaction costs incurred by longer debt maturities, as derived from lack of trust.

Further, the individualism (IND) dimension of society refers to how much, roughly, a society's members care about only themselves (including close family members) and pose great significance in covering their rights and their needs, whereas collectivism concerns loyalty and care about family and closely related people. The index is individualism versus collectivism, and a higher value indicates a more individualistic society (i.e. a society where its members define themselves in terms of "I" and not of "We"). Chui et al. (2010) highlight that the presence of individualism in societies is closely related to overconfidence, implying that overconfident members tend to believe that the information they access is the most accurate. This trend implies the underestimation of any false decisions made based on that available information by the members of a highly individualistic society.

The next cultural aspect of a society is the uncertainty avoidance index (UAI), which relates to people's feelings of insecurity about the future, which cannot be predict and which derives from their society's current structure. The question answered for the construction of the index is whether people should try to formulate the future or not. Societies with higher ranks on

the UAI index present more stable and inflexible ethical and legal codes, do not accept any unconventional attitudes and, in general, society members prefer stable and predictable interactions that reduce uncertainty (so they are risk averse). On the opposite side, societies with low rank on this index are not concerned much about the unpredictable future, so they are more flexible and rely more on actions and not on codes.

The stress arising in cases of uncertainty, therefore, are recorded by high levels in the UAI index, which may explain the negative relationship between uncertainty avoidance and corporate debt maturity found by Zheng et al. (2012). They argue that borrowers seem to be driven to short-term debt by creditors, since this form of debt may provide information for the credibility of borrowers, which in societies with significant uncertainty level is highly valued. Focusing on banking institutions, on the other hand, Haq et al. (2017) obtain an inverse relationship between leverage and a society's tolerance for ambiguity as justified by the opposition to uncertain situations (risk and financial results) associated with higher levels of leverage.

The long-term orientation (LTO) versus short-term orientation are two other dimensions of culture, connected with previous, current and future views of society's development and the degree to which societies are attached more to the future than to past and present. Short-term-oriented societies rely on maintaining past traditions and norms and resist change, whilst long-term-oriented societies promote long-term goal setting and precaution in monetary matters. Actually, LTO captures a different way of thinking between Western and Eastern countries (Hofstede & Minkov, 2010). The short-term goals set under short-term-oriented societies seem to lead to opportunistic behaviour, while at the same time, long-term goals set by long-term-oriented societies seem to reduce the chances of that kind of behaviour in firms (Doney et al., 1998). Bigger gains, and therefore engaging in riskier choices seems to be the preference of short-term-oriented managers, hence increasing leverage, whilst reduced possibilities for insolvency and secure job positions seem to be the preferences for long-term-oriented managers (at least in the case of banks) (Haq et al., 2017).

The cultural diversity is calculated with the exact same approach as the genetic diversity discussed in Section 3.3.1.2

### Diversity in Trust

Diversity in a country's level of trust may be another aspect capturing heterogeneity in a board of directors, and its significance has already been underlined in the current work. Overall, trust is seen as a critical factor of social capital contributing to achieving, among other things, economic development. Calculating the standard deviation of trust levels as related to the country of nationality of each director in a board assists in presenting an additional dimension of directors' heterogeneity. The index of diversity in trust is calculated with the exact same way as the genetic diversity index.

The data on trust come from the World Value Survey (WVS)<sup>30</sup> website, which includes, among other things, data collected at the country level about the degree of trust in each country. In general, increased levels of trust among board members reduce conflicts and foster better decision making in favour of a firm's stakeholders.

### Political diversity

Along with cultural dimensions, political dimensions are also critical in determining corporate decision-making. As underlined by Öztekin and Flannery (2012), the capital structure of a company does not follow a specific theory, but it is influenced by the culture of the company itself, the legal system in the operating country, institutions, taxation, corporate governance and various other factors. Qi et al. (2010) examine the impact of both political and legal institutions on the credit market and advocate that political stability also affects legal systems and information diffusion, in general, which assists in creditors' supervision of debtors. The diffusion of information and its connection with legal and political features is also highlighted by Bushman et al. (2004).

Political diversity is calculated as the standard deviation of the Polity IV Index for each director in a boardroom, following the same procedure with the calculation of the genetic diversity score. In detail, Polity IV is a quantitative project run by EDAC<sup>31</sup> and provides annual information concerning regime and authority features. It includes all independent nations worldwide covering the time period from 1800–2015.<sup>32</sup> Furthermore, focusing on

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<sup>30</sup> The WVS estimates level of trust in a country through personal interviews at interviewees' places, and the answers are recorded either on computer software or on a paper questionnaire. <http://www.worldvaluessurvey.org/WVSContents.aspx>

<sup>31</sup> EDAC: European Data Center for Work and Welfare.

<sup>32</sup> [http://www.edac.eu/indicators\\_desc.cfm?v\\_id=63](http://www.edac.eu/indicators_desc.cfm?v_id=63)

nations with population aggregating at least 500,000, it now includes 167 nations.

The database of Polity IV includes the “Polity Score” which provides the polity of the nations, ranging from autocracy to democracy. To develop this score, a 21-scale index is constructed, ranging from -10 to +10. Countries scoring between -10 and -6 are considered as “autocracies”, between -5 and +5, as “anocracies” and between +6 and +10 as “democracies”. Overall, highest values illustrate more democratic regions, that could enhance discussion inside the board and subsequently improve decision making. However, high diversity as captured by the index of standard deviation would imply that there are directors with diverse opinions, autocratic and democratic, possibly exercising an adverse impact on decision making.

#### Legal diversity

The literature on capital structure has been concerned with a country’s legal systems and institutions as another substantial factor in determining leverage. Common or civil law-focused countries and laws protecting investors’ rights are two legal considerations identified as determinants of corporate leverage (Alves & Ferreira, 2011; La Porta & López, 1998).

At the same time, the legal system and in general, how the law and order are being formed in each country are critical not only for the firm’s operations but also for the country’s residents and their ethical development. Thus, the existing legal system in the country of origin of each person also determines that person’s financial decisions. Therefore, the board diversity score of the legal environment is calculated as the standard deviation score the of law and order dimension, taken by the International Country Risk Guide (ICRG) (Delis et al., 2016).<sup>33</sup>

The values of the law and order dimension of the ICRG vary from 0 to 6. This dimension is segmented into two parts, law and order, each taking a maximum value of 3. The summation of these sub-scores results in the overall law and order score for a country. Concerning the component of law, the dominance and the unbiased level of a country’s judicial system is evaluated, whilst by the component of order, a country is evaluated on the compliance with law by population. In rough lines, prior research findings demonstrate that improved

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<sup>33</sup><https://www.prsgroup.com/about-us/our-two-methodologies/icrg>

institutional infrastructure and rule of law negatively affect debt levels (Belkhir et al., 2016; De Jong et al., 2008).

#### Country's development diversity

The level of economic development of a country has been also related to corporate leverage in prior research. Among other things, a country's development relates to firms financial development, and both positive and negative effects on corporate leverage have been observed (Kayo & Kimura, 2011; De Jong et al., 2008).

Given that it is, in general, very difficult to capture all the country-related characteristics of a board member and consequently the heterogeneity of the board, I also use a very broad indicator of diversity in the overall development in the country of origin of each director. More detailed, I rely on the GDP per capita in the director's home country and calculate the standard deviation as in the cases discussed so far (Delis et al., 2016).

#### Crisis dummies

To capture the effects of the crisis I use a dummy variable that takes the value of 1 during the years of the crisis and 0 otherwise. Laeven and Valencia (2013) present a database for banking crises occurring in the last 40 years. Using certain criteria (such as the signalling of distress in the financial sector and policy intervention in that sector), they suggest that the recent crisis was initiated in 2007 in the US and became systemic in 2008. At the same time, Berger and Bouwman (2013) defined the crisis period, as the period between the third quarter of 2007 and the fourth quarter of 2009, Bekaert et al. (2014) defined it between August 2007 and March 2009, and Dungey and Gajurel (2015) define it between June 2007 and May 2009. Given that the data of the present Thesis are annual, we construct two dummy variables as follows. The first denotes the years of the crisis and takes the value of 1 for the years 2007 to 2009 and 0 otherwise. The second denotes the post-crisis period and takes the value of 1 for the years 2010 to 2012, and 0 otherwise. The omitted category is the period prior to the crisis (i.e. 1999-2006).

Existing evidence suggests that the crisis tends to positively affect leverage (i.e. it suggests the increase of debt levels during that period) (Alves & Francisco, 2015; Fosberg, 2012). Following the literature, I expect a positive sign for the crisis dummy and either a positive or negative sign for the post-crisis dummy on leverage.

### 3.3.1.5 *Instrumental variables*

Following Delis et al. (2015), to deal with endogeneity problems, I use the same two variables as instruments - i.e. ultraviolet exposure and the migratory distance. Ultraviolet exposure includes the exposure to the ultraviolet rays in the country of origin of each director, whereas migratory distance is the logarithmic form of the distance between the board member's country of origin and East Africa.

### 3.3.2 **Summary statistics**

The following tables present the descriptive statistics and the correlation coefficients of the variables included in the models.

The figures in Table 3-3 show that the mean ratio of leverage is 50%, revealing an average reliance of firms on debt. Also, its minimum value of 2% and maximum of 136% imply a sizeable variation among firms. In the case of genetic diversity, the mean of the standard deviation is 0.01. Its minimum value is zero, a value realized in boards with complete homogeneity (all directors coming from the same country). The maximum value is 0.08. The rest of the diversity measures boast large variations between minimum and maximum values.

Concerning firm size, the average value of total assets is \$4.54 billion, with the size of the board varying from 3 to 16 directors. Males in board represent at least 20% and in some cases there are no women at all in the boardroom. According to the summary statistics, the vast majority (about 93%) of board of directors are men, whilst only 50% of CEOs in the sample are also Chairmen on the board of directors. At the same time, almost 60% of directors in the board are independent.

The reported profitability is, on average, positive, with a mean value of 0.07; however, there are firms in the sample with negative profitability, as depicted by the minimum values. Liquidity has a mean value of 2.39, implying well-positioned firms, regarding their ability to cover their current liabilities, whereas, market-to-book ratio's average value is 2.88, indicating that firms' assets may be overvalued. Market-to-book ratio ranges from -8.41 to 22.05.

The correlation coefficients in Table 3-4 are in general low and they do not raise multicollinearity concerns. The only exception is the correlation between firm size and the director's network size, which is 0.606

*Table 3-3 Models' variables*

<b>Variables</b>	<b>Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Leverage</b>	5,654	0.49	0.22	0.02	1.36
<b>Diversity deviation</b>	5,654	0.01	0.02	0	0.08
<b>Firm size</b>	5,654	13.19	2.16	8	19.36
<b>Profitability</b>	5,654	0.06	0.13	-0.72	0.35
<b>Current ratio</b>	5,654	2.44	3.14	0.28	67.15
<b>Market to book ratio</b>	5,654	2.87	2.84	-8.41	22.05
<b>Number of directors in board</b>	5,654	2.02	0.32	0.69	3.09
<b>Gender</b>	5,654	92.98	9.45	20	100
<b>Legal diversity</b>	5,654	0.1	0.25	0	2.26
<b>Political diversity</b>	5,654	0.11	0.76	0	27.51
<b>Cultural diversity</b>	5,654	0.03	1.75	-3.12	12.76
<b>Development diversity</b>	5,654	0.07	0.23	0	2.4
<b>Trust level diversity</b>	5,654	2.59	5.49	0	41.95
<b>Independent directors</b>	5,654	57.29	22.17	0	100
<b>CEO's dual role</b>	5,654	0.53	0.5	0	1
<b>Board's age</b>	5,654	57.33	5.27	38.17	77.75
<b>Independent in audit committee</b>	5,654	90.16	23.38	0	100
<b>Director's network</b>	5,654	368.5	305.26	5.33	1817.64
<b>Director's tenure</b>	5,654	6.01	3.37	0.12	23.3
<b>Previous roles' independence</b>	5,654	7.79	9.62	0	75
<b><i>Instruments</i></b>					
<b>Ultraviolet exposure</b>	5,654	4.52	0.4	3.78	5.34
<b>Migratory distance</b>	5,654	2.45	0.52	1.51	3.11

Table 3-4 Pearson's correlations

	Leverage	Diversity	Firm size	Prof/bility	Current ratio	Market- book	No of directors
Leverage	1.00						
Diversity deviation	0.0069	1.00					
Firm size	0.3336*	0.2065*	1.00				
Prof/bility	0.0980*	0.0262	0.3409*	1.00			
Current ratio	-0.3727*	-0.0033	-0.0824*	-0.0902*	1.00		
Market- book ratio	0.0355*	0.0862*	0.0573*	0.1054*	0.0048	1.00	
No of directors in board	0.2509*	0.2102*	0.6818*	0.2316*	-0.0806*	0.1132*	1.00
Ind. directors	0.0741*	0.0161	0.4694*	0.1580*	-0.0037	0.0879*	0.3340*
Gender	-0.0977*	-0.0281*	-0.2865*	-0.0914*	0.0338*	-0.1169*	-0.2788*
CEO's dual role	-0.0186	-0.0696*	0.1207*	0.0971*	-0.0184	-0.0008	0.0581*
Board's age	0.0481*	-0.0335*	0.3045*	0.1484*	0.0003	-0.0407*	0.2046*
Ind. in audit committee	0.0790*	0.0051	0.3548*	0.1476*	-0.0102	0.0308	0.2487*
Director's network	0.1075*	0.2088*	0.6063*	0.1264*	-0.0333*	0.2229*	0.4632*
Director's tenure	-0.0596*	-0.1286*	0.0362*	0.1536*	-0.0101	-0.0462*	0.0154
Past roles' ind.	0.0730*	0.0770*	0.1722*	0.0132	-0.0181	0.0449*	0.0863*
Legal diversity	0.0137	0.4924*	0.1975*	0.002	0.0023	0.0728*	0.1869*
Political diversity	-0.0370*	0.1830*	0.0651*	0.0002	0.0072	0.004	0.0486*
Cultural diversity	-0.0322*	0.1665*	0.3873*	0.1140*	-0.004	0.1171*	0.3070*
Development diversity	-0.0328*	0.3833*	0.1412*	0.0008	0.0121	0.0454*	0.1159*
Trust level diversity	0.0493*	0.6099*	0.2226*	0.0062	0.0007	0.0621*	0.1778*
Ultraviolet exposure	-0.0492*	0.0354*	0.3373*	0.1195*	0.0054	0.0809*	0.2714*
Migratory distance	-0.0370*	-0.0109	0.3296*	0.1207*	-0.0042	0.0826*	0.2747*

	Ind. directors	Gender	CEO's dual role	Board's age	Ind. in audit committee	Director's network	Director's tenure
Ind. directors	1.00						
Gender	-0.2468*	1.00					
CEO's dual role	0.1529*	-0.0641*	1.00				
Board's age	0.4311*	-0.0830*	0.2232*	1.00			
Ind. in audit committee	0.7138*	-0.1156*	0.1131*	0.2337*	1.00		
Director's network	0.4396*	-0.3416*	0.1069*	0.1934*	0.2058*	1.00	
Director's tenure	0.1604*	-0.0067	0.2408*	0.5267*	0.1181*	-0.0448*	1.00
Past roles' ind.	0.3381*	-0.0911*	-0.0735*	0.0746*	0.2424*	0.1817*	-0.0659*
Legal diversity	-0.0414*	-0.0064	-0.0597*	-0.0285*	-0.0495*	0.1447*	-0.1255*
Political diversity	-0.0007	0.0124	-0.0081	0.0033	-0.0026	0.0461*	-0.0375*
Cultural diversity	0.5411*	-0.1934*	0.3132*	0.4489*	0.2660*	0.3533*	0.2179*
Development diversity	-0.0029	-0.0059	-0.0043	-0.0108	-0.0301*	0.1246*	-0.0758*
Trust level diversity	-0.0117	-0.0137	-0.1205*	-0.0416*	-0.0033	0.1460*	-0.1479*
Ultraviolet exposure	0.6031*	-0.2158*	0.3791*	0.5070*	0.2978*	0.3480*	0.2866*
Migratory distance	0.6261*	-0.2277*	0.3926*	0.5192*	0.3189*	0.3469*	0.3127*

	Past roles' ind.	Legal diversity	Political diversity	Cultural diversity	Development diversity	Trust level diversity	Ultraviolet exposure
Past roles' ind.	1.00						
Legal diversity	0.006	1.00					
Political diversity	-0.0169	0.3539*	1.00				
Cultural diversity	0.1093*	0.2161*	0.2128*	1.00			
Development diversity	-0.0076	0.7280*	0.6304*	0.3131*	1.00		
Trust level diversity	0.0714*	0.6297*	0.2698*	0.2237*	0.4867*	1.00	
Ultraviolet exposure	0.1121*	0.0616*	0.0682*	0.8535*	0.1227*	-0.0223	1.00
Migratory distance	0.1243*	-0.0977*	-0.015	0.8173*	-0.0377*	-0.1318*	0.9446*

### 3.4 Empirical identification

The static model to be estimated is follows:

$$Y_{i,t} = b_0 + b_1 D_{i,t} + b_2 X_{i,t} + u_{i,t}, (3)$$

where  $Y_{i,t}$  is the leverage of firm  $i$  at year  $t$ ,  $D_{i,t}$  is the constructed diversity score (equation [1]),  $X_{i,t}$  is the vector of the rest regressors and  $u_{i,t}$  is the disturbance term.

The disturbance term is derived from the following equation:

$$u_{i,t} = v_i + \varepsilon_{i,t}. (4)$$

In all regressions, I use year-fixed effects to capture any time-variant parameters influencing all firms.

The dynamic model to be estimated is as follows:

$$Y_{i,t} = a_0 + a_1 Y_{i,t-1} + a_2 D_{i,t} + a_3 X_{i,t} + u_{i,t}, (5)$$

where  $Y_{i,t-1}$  is the lagged dependent variable.

### 3.5 Methodology

Panel data have significant advantages over the other types of data i.e. time-series and cross-sectional. First of all, they give the researcher a larger number of data points, while enabling the examination of more complicated issues compared to time-series or cross-sectional data. In addition, the examination of dynamic alternations in variables and their relationships becomes easier under panel-type data, through the higher degrees of freedom and the offset of any potential multicollinearity issues (Brooks, 2008).

According to Hansen (1982), the employment of panel data induces the use of advanced econometric techniques, and the GMM is one of them. Aiming, therefore, at capturing the dynamic relationship between leverage and its determinants, two methods are employed: the GMM and the limited information maximum likelihood (LIML) with instrumental variables. Estimation with OLS and the fixed-effects models are also presented in the current chapter.

### 3.5.1 Ordinary least squares

The well-known ordinary least squares (OLS) method estimates the parameters of the equation by minimizing the sum of squared residuals. In the simple equation,

$$Y_i = \beta_0 + \beta_1 X_i + u_i, \quad (6)$$

where  $u_i$  is the error term and OLS method finds the estimators of  $b_0$  and  $b_1$ , minimizing the following equation:

$$B(\beta_0, \beta_1) = \sum_{i=1}^n u_i^2 = \sum_{i=1}^n (Y_i - \beta_0 - \beta_1 X_i)^2. \quad (7)$$

Although simple in estimation, the application of the OLS method is limited by certain assumptions, whose violation leads to misleading results.

*First assumption:* The linear regression model has only linear parameters.

*Second assumption:* The sample observations are randomly chosen.

*Third assumption:* The expected mean value of the error term is zero.

*Fourth assumption:* The error terms are homoscedastic, constant variance, and there is no auto-correlation.

*Fifth assumption:* The error term should be normally distributed (Wooldridge, 2002).

Ordinary least squares applications in the finance and economics literature are broad, ranging from macroeconomic issues to financial issues and from portfolio choice to capital-structure decisions. However, failure to satisfy the assumptions has lead researchers to use methods with fewer limitations and more freedom in the sample properties.

### 3.5.2 Fixed-effects model

In the presence of panel data, the use of either fixed or random effects models is, in general, preferred. Generally, in fixed-effects models, the constant term varies across sections but not over time, and the constant slope coefficients vary in both sections and time. Fixed effects capture especially any unobserved effect considered as time invariant (Wooldridge, 2002). Rather, random effects capture time-variant effects, but they should be identified, which is usually difficult, resulting in omitted-variable bias:

$$Y_{i,t} = a + b X_{i,t} + u_{i,t}. \quad (8)$$

To overcome the problems arising in simple OLS regressions, the fixed-effects model proceeds on separating the disturbance term,  $u_{i,t}$ , into two terms:

$$u_{i,t} = v_i + \varepsilon_{i,t}. \quad (9)$$

The first term,  $v_i$  captures the individual-related impact, which fluctuates only across individuals and not across time, whilst the second term,  $\varepsilon_{i,t}$ , captures all effects not explained by the first term, fluctuating across both sections and time. The regression now estimated under the fixed-effects models combines (8) and (9) (Brooks, 2008):

$$Y_{i,t} = a + b X_{i,t} + v_i + \varepsilon_{i,t}. \quad (10)$$

The first assumption of the fixed-effects model is the complete exogeneity of the independent variable on  $v_i$ , that is,

$$E(u_{i,t} | X_{i,t}, v_i) = 0 \quad (11). \quad (\text{Wooldridge, 2002}).$$

A method for estimating the new equation is through the within-fixed-effects estimator, which implies the deduction of the mean value from the known values, as calculated for each firm. The mean value of a variable generated by time for every individual is as follows:

$$\bar{y}_i = \frac{1}{T} \sum_{t=1}^T y_{i,t}, \quad (12)$$

where  $T$  is the number of years. That average value is deducted from each individual, leading to a new regression with the transformed variables. The new transformed equation can be written as follows:

$$y_{it} - \bar{y}_i = \beta (x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i. \quad (13)$$

That transformation results in obtaining zero values, ruling out any time-invariant factors. In general terms, fixed-effect methods within a transformation count the within-section heterogeneity, whilst any cross-section variations driven by unobserved variables are dropped out (Brooks, 2008). The second assumption of the fixed-effects estimator requires a fixed rank of the demeaned, independent variables' matrix, to assure asymptotical consistency (Wooldridge, 2002). Another method of estimating (10) is to use the between-estimator concerned with mean values between cross-sections; however, it is not consistent under the first assumption of the fixed-effects model.

The properties of the fixed-effects model make it popular among researchers analysing firm choices (Drobetz et al., 2013; Brushwood et al., 2016). For example, it is employed by Dittmar and Duchin (2016) to capture the impact of managers' professional experience on several corporate policies, including debt usage, but also by Serghiescu and Văidean (2014), who analyse the determinants of debt ratio, and by Alves and Francisco (2015) in a crisis context.

### 3.5.3 Generalized method of moment

The generalized method of moments (GMM) is a statistical technique, formulated by Hansen (1982), which is becoming more and more popular in the exploration of economic and financial data. Its popularity arises from the fact that it is very well adapted to the exact type of information derived from the economic model.

Its key idea is that the information about the unknown parameters derives from the population moments conditions. Actually, the intuition behind GMM comes from the analogy principle, which states that a parameter can be estimated by replacing population moment condition with its sample analogue. Moreover, the asymptotic properties of the GMM estimator are consistency, asymptotic normality and asymptotic efficiency (Hansen, 1982).

For GMM estimation, the population moment's conditions are set first, followed by the identification stage that determines whether the use of GMM estimator must be applied or not, and in the last stage, the GMM estimator is applied if it is required by the identification stage.

To clarify, suppose a function  $V_t$  and a parameter  $\theta$ , with the population moment to be its expectation, and the population moment condition to be as follows:

$$E(f(V_t, \theta_o)) = 0. (14)$$

In that case, the first moment (i.e., the mean of the parameter  $\theta$ ), and the second moment (i.e., the variance) are calculated as follows:

*first moment:*

$$\hat{\theta}_T = T^{-1} \sum_{t=1}^T V_T, (15)$$

*second moment:*

$$E(V_t^2) - \theta_0^2 - 1 = 0. (16)$$

Therefore, there are now two sets of equations with only one unknown, the parameter  $\theta$ .

As mentioned, the identification stage follows. At this stage, the number of parameters ( $k$ ) to be estimated and the number of equations (15), (16) are compared. From this comparison, three possible outcomes emerge:

1.  $l = k$  (i.e. the number of equations equals the number of unknown parameters, exact identification). In this case, there is one unique solution, resulting from the solution of  $E(f(V_t, \theta_o)) = 0$ , so  $f_t(\theta_t) = 0$ . The same result is also given using an OLS estimator.
2.  $l < k$  (i.e. the equations are less than the unknowns). Any possible solutions result in inconsistent estimators (under-identification).
3.  $l > k$  (i.e. more equations than unknowns—over-identification). In this case, there is not a unique solution; there is more than one solution. In detail, the GMM estimator selects that value of  $\theta$ , which leads to the minimization of the following quadratic equation:<sup>34</sup>

$$\hat{\theta}_T = \operatorname{argmin} Q_t(\theta) \text{ for all } \theta \in \Theta (17),$$

where

---

<sup>34</sup> Note that the same process can be followed in the presence of exact identification, leading to the same results, since the weighting matrix choice does not affect the outcome in the case of  $l=k$ .

$$Q_t(\theta) = T^{-1} \sum_{t=1}^T f(V_T, \theta)' W_T T^{-1} \sum_{t=1}^T f(V_T, \theta), \quad (18)$$

and  $W_T$  is called the weighting matrix.

$Q_t(\theta)$  measures the distance of the sample model from zero for different values of  $\theta$ . Also, the following condition should hold:  $Q_t(\theta) \geq 0$  (19).

Specifically, the crucial identification condition is

$$E(f(V_t, \theta_0)) \neq 0 \text{ for all } \theta \neq \theta_0 \quad (20),$$

since  $E(f(V_t, \theta_0)) = 0$  only for  $\theta = \theta_0$  (exact identification).

Therefore,  $Q_t(\theta)$  can be made exactly equal to zero in the exact identified case, but it is strictly positive in the over-identified case.

Furthermore, the choice of the weighting matrix,  $W$ , is also critical to the GMM estimation process. The optimal selection of the  $W$  leads to obtaining the most information available from the specific population moment condition. In addition, the  $W$  choices allow one to overcome the problems of heteroscedasticity, correlation, clustering and other features of the error term.

The definition of the weighting matrix incorporates the following large sample properties of the GMM:

- The large sample distribution of  $\hat{\theta}_T$  is normal.
- The sample is centred on  $\theta_0$ .
- The variance is  $v$ .

As such,

$$W = S^{-1},$$

where  $S$  is the population variance of the sample moments.

However, in order to construct  $S_t$ , the parameter  $\theta_0$  has to be estimated. A two-step GMM estimation is thus adopted: firstly, a sub-optimal  $W_T$  is used, such that  $W_T \rightarrow \hat{\theta}_T(1) \rightarrow S_T^{-1}$ , and secondly, solve  $W_T = S_T^{-1} \rightarrow \hat{\theta}_T(21)$ .

In sum, the most critical questions to answer for finding the best solution to our problems using GMM concern: (i) whether population moment conditions include a satisfying amount of information for successful estimation, (ii) how the most available information from a given population condition can be inserted in the model, and (iii) what the most informative selection of the moment condition is. Model identification, optimal selection of weighting matrix and optimal selection of moment conditions are the answers to the above questions, respectively. We must underline, at this point, that of course the larger the information set used, the more asymptotically efficient the GMM estimator is; however, the inclusion of extra moments' conditions leads to an improved asymptotic efficiency if and only if the extra moments provide additional information to that already included in the existing moment conditions. The GMM estimator's critical advantage is that it does not necessitate overall knowledge of data distribution.

Further, the GMM estimator has been used in several studies concerned with capital structure determination, such as the effects of country-specific factors (Fan et al., 2012), firm-specific factors (Gungoraydinoglu & Öztekin, 2011), corporate governance (Huang et al., 2016), and the Asian financial crisis (Deesomsak et al., 2009).

In the above-mentioned studies, both differenced and system GMM have been used. Specifically, dealing with endogeneity under a differenced form of GMM requires the first difference transformation of the data formed to eliminate the fixed effects. The system GMM (or sys-GMM), however, introduced by Arellano and Bover (1995) and Blundell and Bond (1998), seems to be preferable to differenced GMM.

The sys-GMM estimator controls for omitted variable bias, endogeneity, measurement issues and unobserved heterogeneity (Bond et al., 2001). Equations are also used as a combination of both their levels and their first differences, whilst in differenced GMM, only the first differences are used. Meanwhile, sys-GMM employs lagged differences as instruments of variables in level equations and level values of variables in differenced equations.

Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), suggest certain tests to check the specification of a GMM model. The first, the Sargan-Hansen over-identification test, checks the validity of the instruments in the model. The null

hypothesis under that test is the joint exogeneity of the instruments in the model, and its acceptance implies the correct selection of the exogenous instruments. The second test is employed to capture any serial correlation arising between the error term of the differenced regression and the variables in the model. The rejection of second order, namely AR (2), serial correlation is the desirable outcome under the GMM estimator. By construction, the differenced error term is expected to present first-level serial correlation AR (1).

### **3.5.4 Limited information maximum likelihood estimation**

The limited information maximum likelihood (LIML) estimation, also used in capturing dynamics, manipulates instruments to correct any present correlations between the independent variables and the error term of the regression. It was initially presented by Anderson and Rubin (1949), and it is similar to two-stages least squares (TSLS or 2SLS), although the LIML development preceded the TSLS development. However, LIML performs better than TSLS, since TSLS is biased in the presence of small samples and weak instruments, a bias that is removed by the LIML estimator. In the finance literature, it has been used to examine, among other things, the factors determining firm-level performance (Delis et al., 2016)

## **3.6 Empirical results & discussion**

### **3.6.1 Ordinary least squares and fixed effects estimations**

Tables 3-5 and 3-6 present the results obtained from OLS and panel fixed effects, estimated for comparison purposes. Also, in order to avoid any potential bias causing inconsistent results, none of the models (OLS or fixed effects) includes the lag-dependent variable as an explanatory variable. Furthermore, there are five different specifications estimated with each method (including GMM and instrumental variables-LIML methods). Usually, the first includes only the board diversity score and certain firm-level determinants of capital structure (the most well-recognised in the literature). In the rest of the specifications, apart from firm-level determinants, I also include corporate governance and cultural variables.

Table 3.5. Estimation results OLS models

	Specification 1	Specification 2	Specification 3	Specification 4	Specification 5
	OLS estimator				
	<i>Total liabilities/ total assets</i>				
<b>Diversity deviation</b>	-0.743***	-0.768***	-0.841***	-1.195***	-0.850***
	(-4.420)	(-4.547)	(-4.992)	(-5.575)	(-3.989)
<b>Firm size</b>	0.031***	0.030***	0.046***	0.038***	0.047***
	(24.201)	(16.911)	(22.280)	(27.532)	(22.420)
<b>Prof/bility</b>	-0.145***	-0.144***	-0.162***	-0.145***	-0.170***
	(-6.770)	(-6.696)	(-7.501)	(-6.883)	(-7.912)
<b>Market-book ratio</b>	0.004***	0.004***	0.007***	0.005***	0.008***
	(4.142)	(4.093)	(7.417)	(5.340)	(8.239)
<b>Current ratio</b>	-0.016***	-0.016***	-0.016***	-0.015***	-0.015***
	(-27.037)	(-26.978)	(-26.056)	(-25.793)	(-25.529)
<b>No of directors in board</b>		0.016	0.019*		0.024**
		(1.414)	(1.663)		(2.113)
<b>Gender</b>		0.000	-0.001**		-0.001**
		(0.901)	(-1.974)		(-2.461)
<b>Ind. directors</b>			-0.001***		0.000
			(-5.229)		(-0.465)
<b>CEO's dual role</b>			-0.006		0.012**
			(-1.140)		(2.135)
<b>Board's age</b>			0.001		0.002***
			(1.283)		(3.548)
<b>Ind. in audit committee</b>			0.000		-0.000**
			(0.440)		(-1.999)
<b>Director's network</b>			-0.000***		-0.000***
			(-12.108)		(-12.167)
<b>Director's tenure</b>			-0.006***		-0.005***
			(-6.705)		(-5.651)
<b>Past roles' ind.</b>			0.001**		0.000
			(1.969)		(1.337)
<b>Legal diversity</b>				0.001	0.000
				(0.056)	(0.017)
<b>Political diversity</b>				-0.004	-0.006
				(-1.034)	(-1.496)
<b>Cultural diversity</b>				-0.024***	-0.023***
				(-14.595)	(-10.500)
<b>Development diversity</b>				0.007	0.015
				(0.372)	(0.806)
<b>Trust level diversity</b>				0.003***	0.002***
				(4.291)	(2.715)
Observations	5,845	5,845	5,709	5,816	5,686
Adj.R-square	0.219	0.220	0.263	0.248	0.275

Notes: \* p<0.10, \*\*p<0.05, \*\*\* p<0.01. Standard error in parenthesis.

Table 3.6. Fixed-effects models

	Specification 1	Specification 2	Specification 3	Specification 4	Specification 5
	<b>Fixed effects</b>				
	<i>Total liabilities/ total assets</i>				
<b>Diversity deviation</b>	-0.556**	-0.599***	-0.580***	-0.581**	-0.641**
	(-2.541)	(-2.729)	(-2.635)	(-2.337)	(-2.558)
<b>Firm size</b>	0.001	-0.001	-0.004	-0.002	-0.004
	(0.172)	(-0.201)	(-0.874)	(-0.573)	(-0.992)
<b>Prof/bility</b>	-0.234***	-0.234***	-0.232***	-0.234***	-0.231***
	(-11.759)	(-11.720)	(-11.494)	(-11.731)	(-11.406)
<b>Market-book ratio</b>	0.006***	0.006***	0.006***	0.006***	0.006***
	(7.854)	(7.778)	(7.829)	(7.726)	(7.757)
<b>Current ratio</b>	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	(-4.845)	(-4.792)	(-4.710)	(-4.666)	(-4.691)
<b>No of directors in board</b>		0.029**	0.030**		0.030**
		(2.416)	(2.423)		(2.390)
<b>Gender</b>		0.000	0.000		0.000
		(0.205)	(0.785)		(0.794)
<b>Ind. directors</b>			0.000		0.000
			(0.392)		(0.414)
<b>CEO's dual role</b>			0.020***		0.019***
			(3.304)		(3.216)
<b>Board's age</b>			0.002**		0.003**
			(2.491)		(2.528)
<b>Ind. in audit committee</b>			0.000		0.000
			(0.285)		(0.250)
<b>Director's network</b>			-0.000*		-0.000*
			(-1.661)		(-1.697)
<b>Director's tenure</b>			-0.002*		-0.002*
			(-1.715)		(-1.831)
<b>Past roles' ind.</b>			0.000		0.000
			(0.921)		(0.955)
<b>Legal diversity</b>				0.006	0.001
				(0.356)	(0.085)
<b>Political diversity</b>				0.001	0.001
				(0.296)	(0.276)
<b>Cultural diversity</b>				0.002	0.001
				(0.478)	(0.224)
<b>Development diversity</b>				0.014	0.017
				(0.757)	(0.899)
<b>Trust level diversity</b>				-0.001	0.000
				(-0.975)	(0.393)
Observations	5,845	5,845	5,709	5,816	5,686
R-within	0.061	0.062	0.068	0.061	0.068

Notes: \* p<0.10, \*\*p<0.05, \*\*\* p<0.01

According to the results, genetic diversity negatively affects leverage, and this effect is statistically significant. In all three models, that effect is significant at the 1% level, but in the case of the simple OLS model, the coefficient of genetic diversity seems to present a larger negative impact on leverage.

The OLS estimations also reveal that firm size, as measured by the natural logarithm of total assets, is positively related to firm leverage. In all the OLS specifications, firm size's effects are almost constant in terms both of magnitude and sign. Firm size ranges from 3.00% to 4.60% in all three cases. The most critical is its significance, at the 1% level, which holds for all models, even in the presence of cultural variables. In contrast, in the fixed-effect estimations, firm size has a negative effect on corporate leverage; albeit, statistically insignificant in all cases.

On the contrary, profitability has a statistically significant and negative effect. This holds for the all models at the 1% significant and for both OLS and fixed effects. Although the resulting effect is always negative, the magnitude of the variable differs between the two methods. In the OLS estimations, profitability is around 14.5%, and in the fixed-effects model, it is about 23.4%. The effect of market-to-book ratio realized on corporate leverage is positive and also statistically significant at the 1% level for all OLS and fixed-effects estimations. Its magnitude varies from 0.4% and 0.8%.

As the findings from OLS and fixed-effects estimation indicate that, liquidity, as proxied by the current ratio, is inversely related to leverage, and statistically significant at the 1% level in all cases. However, the coefficient, in the case of the simple OLS regression, is much higher (0.016) compared to the fixed- and random-effects regressions (0.006) for all model specifications, and it coincides with previous findings in the literature.

I find a positive association between the number of directors in a board and corporate leverage, which is consistent with the results of earlier studies. In the case of the OLS estimations, the statistical significance varies between the 1% and 5% level of significance, whereas in the fixed-effects estimations the association is statistically significant at the 1% level. Furthermore, the magnitude of the effect is larger in fixed-effects estimations than in OLS. Moreover, the director's network exhibits a persistently significant effect, although the magnitude of that effect is close to zero.

In addition, the gender diversity, the number of independent directors, independence of the audit committee, the CEO's dual role, board's age, director's network, tenure and director's

previous roles' independence do not have a robust effect, since they are statistically significant in some of the specifications only. Furthermore, cultural and trust diversity variables are significant at the 1% level, whereas legal, political and development diversity do not have a statistically significant effect in any of the models<sup>35</sup>.

### **3.6.2 Instrumental variables – Limited information maximum likelihood estimations**

Employing instrumental variables under the LIML method (Table 3.7) shows a negative effect of board diversity on leverage. The effect is significant at the 10% level, but it is persistent. Still, the lagged dependent variable has a positive and statistically significant effect at the 1% level. Additionally, the market-to-book ratio and firm profitability are statistically significant at the 1% level, consistent with the results obtained by the OLS and fixed-effects models, whilst firm size and current ratio are insignificant. Furthermore, certain corporate governance characteristics, such as CEO's dual role and board's age, are significant at the 10% level. The magnitude of the effects of all variables coincide roughly with those obtained under OLS and fixed-effects estimations.

It is worth mentioning that all the specifications have successfully passed all the tests: under-identification test (Kleinbergen-Paap LM statistic), over-identification test (Hansen-J statistic) and weak instruments test (Cragg-Donald Wald F statistic). All specifications reject the null hypothesis of under-identified regressors ( $p$ -value around 0.00) and do not reject the null hypothesis of the over-identification test ( $p$ -value obtains value of 0.25 and more), implying that the instrumental variables are relevant and valid (i.e. uncorrelated with the error term and uncorrelated with the regressors). Further, following the results of the Cragg-Donald Wald  $F$  statistic that exceed the 10% maximal IV values of the Stock and Yogo (2005), the instrumental variables used under these frameworks are very strong.<sup>36</sup>

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<sup>35</sup> Table A.2 in Appendix A (Chapter: Board Diversity) presents additional results after re-estimating specification 5 of table 3.5, with bootstrapping using 1000 replacements. The results are the same.

<sup>36</sup> If the Cragg-Donald Wald  $F$  statistic exceeds 10% maximal IV of Stock and Yogo (2005) then instruments are very strong, if it is between 10% and 15% maximum IV values then the instruments are strong. If it is between 15% and 20% maximum IV value then the instruments are of medium power, whereas between 20% and 25% they are weak.

Table 3.7. Estimation results: IV-LIML

	Specification 1	Specification 2	Specification 3	Specification 4	Specification 5
<b>IV-LIML</b>					
<b>Total liabilities/ total assets</b>					
Diversity deviation	-0.722*	-0.764*	-0.778*	-0.756	-0.819*
	(-1.707)	(-1.787)	(-1.778)	(-1.575)	(-1.660)
Lagged Dependent	0.447***	0.447***	0.446***	0.444***	0.446***
	(14.797)	(14.961)	(14.332)	(14.548)	(14.362)
Market-book ratio	0.003***	0.003**	0.003**	0.003**	0.003**
	(2.576)	(2.531)	(2.545)	(2.508)	(2.518)
Firm size	-0.001	-0.002	-0.005	-0.003	-0.005
	(-0.119)	(-0.289)	(-0.674)	(-0.329)	(-0.732)
Prof/bility	-0.153***	-0.152***	-0.151***	-0.153***	-0.151***
	(-5.053)	(-5.061)	(-4.967)	(-5.058)	(-4.947)
Current ratio	0.000	0.001	0.002	0.003	0.004
	(0.205)	(0.278)	(-0.528)	(0.371)	(0.513)
No of directors in board		0.022	0.024		0.023
		(1.073)	(1.174)		(1.115)
Gender		0.000	0.000		0.000
		(0.378)	(0.684)		(0.644)
Ind. directors			0.000		0.000
			(0.347)		(0.337)
CEO's dual role			0.013*		0.013*
			(1.801)		(1.72)
Board's age			0.002*		0.002*
			(1.777)		(1.802)
Ind. in audit committee			0.000		0.000
			(0.287)		(0.314)
Director's network			0.000		0.000
			(0.804)		(0.798)
Director's tenure			-0.001		-0.001
			(-0.895)		(-1.013)
Past roles' ind.			0.000		0.000
			(0.017)		(0.042)
Legal diversity				0.002	-0.001
				(0.145)	(-0.058)
Political diversity				0.000	0.000
				(0.044)	(0.022)
Cultural diversity				0.006	0.006
				(1.132)	(1.046)
Development diversity				0.01	0.012
				(0.52)	(0.614)
Trust level diversity				0.000	0.000
				(0.380)	(0.065)
Observations	5,621	5,621	5,496	5,592	5,473
(Kleibergen-Paap rk LM	47.030	47.220	46.648	45.752	45.194
Underidentification	0.000	0.000	0.000	0.000	0.000
statistic_p-value					
Hansen_J statistic	0.037	0.037	0.068	0.816	1.274
Hansen J statistic_p-	0.848	0.847	0.794	0.366	0.259
value					
Weak identification test					
(Kleibergen-Paap rk Wald	93.172	92.890	90.669	73.628	71.555
F statistic)					

Note: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Standard errors in parentheses.

### 3.6.3 System-Generalized methods of moments estimations

In the case of the sys-GMM method, the results in Table 3.8 show that the effect of board diversity is also negative and significant at the 5% level. Still, the lagged dependent variable has a coefficient with a positive sign that is significant at 1% level. The firm size coefficient has a positive value, whereas profitability and current ratio have negative coefficients, all being significant at the 1% level. The impact of the independent directors and the director's network are also significant at the 1% level. The negative effect of cultural diversity coincides with the results of the OLS estimator. The trust level diversity is not significant, consistent with the results obtained by fixed effects, although it contradicts the OLS ones. In addition, consistent with the results obtained by the OLS and fixed effects estimations, the legal, development and political diversity are not significant in any model estimated by sys-GMM.

The tests used to verify the validity of the models run under sys-GMM are the Arrelano-Bond test for serial correlation, the Hansen *J*-statistic for over-identification, and the difference Hansen test for exogeneity of the instruments. In the case of serial correlation, the second-order correlation is more critical, since AR (2) detects autocorrelation in levels. In all the sys-GMM specifications, the Arrelano-Bond results suggest the acceptance of  $H_0$  (i.e. no second-order correlation; *p*-value in all specifications is above 30%). Further, the values of the Hansen *J*-statistic are 13.40%, 65.0% and 77.70%, suggesting the acceptance of the initial hypothesis that all instruments as a group are exogenous, and hence supporting the validity of the chosen instruments. Also, the results of the Hansen test for exogeneity lead to the acceptance of the initial hypothesis in all three specifications. Also, the table 3.9 shows the elasticities of the independent variables (based on OLS specification 5).

Table 3.8. Estimation results: sys-GMM (board diversity)

	Specification 3	Specification 4	Specification 5
<b>sys-GMM</b>			
<i>Total liabilities/total assets</i>			
<b>Lagged Dependent</b>	0.785*** (29.266)	0.767*** (25.055)	0.759*** (26.305)
<b>Diversity deviation</b>	-0.249** (-2.119)	-0.374** (-2.457)	-0.193 (-1.349)
<b>Firm size</b>	0.016*** (3.989)	0.017*** (6.637)	0.019*** (4.238)
<b>Profitability</b>	-0.125*** (-4.005)	-0.129*** (-4.151)	-0.141*** (-4.481)
<b>Market-book ratio</b>	0.002 (1.387)	0.003* (1.700)	0.003* (1.816)
<b>Current ratio</b>	-0.003*** (-3.117)	-0.003*** (-2.933)	-0.003*** (-3.041)
<b>No of directors in board</b>	-0.011 (-0.811)		-0.009 (-0.677)
<b>Ind. directors</b>	-0.000** (2.421)		0.000 (0.519)
<b>Gender</b>	0.000 (0.217)		0.000 (0.000)
<b>CEO's dual role</b>	-0.006 (-0.920)		0.013* (1.776)
<b>Board's age</b>	0.000 (0.607)		0.000 (0.061)
<b>Ind. in audit committee</b>	0.000 (0.37)		0.000 (0.601)
<b>Director's network</b>	-0.000*** (-3.175)		-0.000*** (-3.596)
<b>Director's tenure</b>	-0.001* (-1.704)		-0.001* (-1.648)
<b>Past roles' ind.</b>	0.000 (0.812)		0.000 (0.533)
<b>Legal diversity</b>		-0.011 (-1.115)	-0.003 (-0.280)
<b>Political diversity</b>		-0.001 (-0.342)	-0.003 (-0.810)
<b>Cultural diversity</b>		-0.011*** (-6.387)	-0.008*** (-4.959)
<b>Development diversity</b>		0.019 (1.272)	0.012 (0.935)
<b>Trust level diversity</b>		0.000 (0.807)	0.000 (0.422)
Observations	5,677	5,783	5,654
AR2_test	-0.994	-0.997	-0.969
AR2_pvalue	0.320	0.319	0.332
Wald_test	118,948.900	94,938.290	105,362.000
Wald test p-value	0.000	0.000	0.000
No of Instruments	750	558	755
Hansen-J statistic	706.660	570.320	693.190
Hansen-J statistic	0.651	0.134	0.774

Note: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Standard Errors in parentheses.

*Table 3.9. Elasticities of independent variables*

Variable	Elasticity (ey/ex)	P_Value
Diversity deviation	-0.014	0.000
Firm size	1.248	0.000
Prof/bility	-0.022	0.000
Market-book ratio	0.044	0.000
Current ratio	-0.079	0.000
No of directors in board	0.098	0.035
Gender	-0.133	0.014
Ind. directors	-0.011	0.642
CEO's dual role	0.013	0.033
Board's age	0.271	0.000
Ind. in audit committee	-0.055	0.046
Director's network	-0.107	0.000
Director's tenure	-0.064	0.000
Past roles' ind.	0.006	0.181
Legal diversity	0.000	0.987
Political diversity	-0.001	0.135
Cultural diversity	-0.001	0.000
Development diversity	0.002	0.420
Trust level diversity	0.010	0.007

#### 3.6.4 Robustness check

As mentioned earlier in the chapter, the other definition of firm size, logarithmic form of total sales, is used to verify the robustness of the so far obtained results. Therefore, Table 3.10 presents the same IV-LIML estimations with Table 3.7, but with  $\ln(\text{sales})$  as the proxy of firm size.

As depicted, there are no significant changes in the results. Genetic diversity is negative and statistically significant, whereas the results for the remaining regressions are the same.

Table 3.10. IV-LIML (size: *lnsales*)

	Specification 1	Specification 2	Specification 3
	IV-LIML		
	<i>Total liabilities/total assets</i>		
<b>Diversity deviation</b>	-0.758*	-0.806*	-0.907*
	(-1.719)	(-1.817)	(-1.784)
<b>Lagged Dependent</b>	0.435***	0.435***	0.436***
	(14.228)	(14.295)	(13.973)
<b>Market-book ratio</b>	0.003**	0.003**	0.003**
	(2.551)	(2.510)	(2.547)
<b>Firm size (lnsales)</b>	0.002	0.002	0.001
	(0.235)	(0.175)	(0.063)
<b>Profitability</b>	-0.162***	-0.161***	-0.158***
	(-4.973)	(-5.016)	(-4.829)
<b>Current ratio</b>	0.001	0.001	0.001
	(0.495)	(0.548)	(0.662)
<b>No of directors in board</b>		0.018	0.020
		(0.865)	(0.947)
<b>Gender</b>		0.000	0.000
		(0.823)	(1.189)
<b>Legal diversity</b>			0.002
			(0.117)
<b>Political diversity</b>			0.000
			(0.075)
<b>Cultural diversity</b>			0.003
			(0.614)
<b>Development diversity</b>			0.013
			(0.641)
<b>Trust level diversity</b>			0.000
			(0.111)
<b>Ind. directors</b>			0.000
			(0.043)
<b>CEO's dual role</b>			0.013*
			(1.874)
<b>Board's age</b>			0.002*
			(1.655)
<b>Ind. in audit committee</b>			0.000
			(0.494)
<b>Director's network</b>			0.000
			(0.748)
<b>Director's tenure</b>			-0.001
			(-1.025)
<b>Past roles' ind.</b>			0.000
			(0.256)
<b>Observations</b>	5,495	5,495	5,359
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	45.662	45.841	45.437
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000
<i>Hansen J statistic</i>	0.005	0.004	0.752
<i>Hansen J statistic p-value</i>	0.944	0.948	0.386
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	89.863	89.580	73.268

Note: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Standard errors in parentheses.

The model specifications estimated in the current chapter suggest the existence of a negative and statistically significant effect of board diversity on corporate capital structure. The higher the degree of diversity inside the board, in terms of differentiation of country of origin among its members, the lower the firm's debt level. This contradicts the view that board diversity, as captured by age, gender and independent members, signals a better-monitored company with reduced borrowing expenses by banks and hence an increase of corporate debt (Fields et al., 2012), since the board diversity metric of the present study leads to a reduction in debt usage.

In the research up to now, board diversity in terms of nationality has been examined for its effect on firm performance, corporate social responsibility, innovation and firm reputation (Delis et al., 2016; Frijns et al., 2016; Hafsi & Turgut, 2013; Miller & Triana, 2009) Regarding board heterogeneity's effect on corporate leverage, only gender diversity (percentage of women in the boardroom) was found to negatively affect leverage, suggesting that the presence of women on the board of directors results in more conservative and safe decisions, leading to opposition to debt financing (Rossi et al., 2017; Faccio et al., 2016; Cole, 2013).

The results support the view that dissimilarities among board members due to their origins may cause disputes in the boardroom. In the case of leverage, these disputes inside the boardroom can either be bad signs for lenders, making them sceptical of the monitoring role of the board and thus the firm's prospects, or they can be a reason for board members to make more conservative decisions, leading to more secure options, such as equity over debt, in order to mitigate those conflicts. There is a view supporting that stakeholders' and clients prefer board heterogeneity, since it is considered as a board that makes decisions complying with their interests (Luoma & Goodstein, 1999; Wang & Dewhirst, 1992). It is possible that the effect of board diversity should be interpreted in conjunction with other board heterogeneity measures, such as gender diversity.

Turning to the control variables, the results show that firm size has a positive effect on leverage, in accordance with the extant literature. This result is possibly due to the ability of larger firms to access credit channels. Antoniou et al. (2002) underline, that the larger the size, the smaller the probability of default, eventually enhancing the ability of larger firms to acquire more debt, and exploit tax shields. In addition, the presence of a higher degree of transparency in sizeable firms and their ability to substantially allocate any costs related to borrowing due to its high volume, drive the above effect (Byoun, 2008). Warner (1977)

suggests that the higher debt usage of sizeable firms relates to the smaller transaction expenses that they experience. Further, profitability has an inverse relationship with corporate leverage, a finding that coincides with OLS findings and previous research (Chen, 2004; Kayo & Kimura, 2011). The negative relation is supported by the pecking-order theory, so the current evidence strongly supports this theory. Since the issuance of debt seems to decrease with increases in the size of the retained earnings and in accordance with the pecking-order theory, less profitable firms tend to choose debt as their financing option, while more profitable firms tend to choose equity.

In the case of the market-to-book ratio, the findings contradict previous evidence of a negative effect on firm leverage. The positive effects might signal the ability of a firm to acquire more debt when the market overvalues its assets. It seems that the management teams of the firms are able to present firms as more valuable than they really are for increasing their debt usage. It also seems that higher growth prospects result in lower financial distress costs.

The negative relationship between current ratio, that is, firm's liquidity, and corporate leverage is in accordance with the results of previous studies (Antoniou et al., 2002; De Jong et al., 2008). This result supports the asymmetric information view that, the more liquid the assets a firm possesses, the higher the chance of financing through its accumulated cash and other liquid asset and hence experiencing a lower leverage ratio.

Regarding the size of the board of directors, a larger board relates to better monitoring and management effectiveness. As capable of that, a large board is likely to appear efficient to external investors, leading the firm to gain access to the debt market. Therefore, increasing the size of a board increases debt usage. However, the positive effect of board size realized in the current study is statistically significant in static models, but not in dynamic ones.

The majority of previous research has suggested that women's presence in a board negatively affects corporate leverage (Cole, 2013; Faccio et al., 2016), whereas here, male presence in boardroom negatively affects it. There is however, some evidence of a positive effect of women's boardroom presence on leverage (Rossi et al., 2017), which coincides with the evidence here, but the effect of male presence is insignificant in almost all models (both static and dynamic).

The economic significance of the board independence is small since the value its coefficient is close to zero. Specifically, obtaining a negative but almost-zero value for the coefficient of the number of independent members on the board of directors limits the interpretation.

However, prior research has suggested a positive association between board independence and leverage. In addition, the past roles of board members' found not to have any impact on leverage, since in almost all models (OLS, fixed effect, IV-LIML and sys-GMM), it is statistically insignificant. In the only case that it is significant, the value of the coefficient equals 0.0001. Furthermore, the effect of the audit committee's independence is insignificant in all cases but one, in which case its magnitude is almost zero. Therefore, the audit-committee's independence does not seem to have an important economic effect on corporate leverage.

The results for the effect of the director's network are almost identical to the ones of board independence. In cases where there is a statistically significant impact, the coefficient is almost zero (-0.0002), suggesting a small economic effect. The evidence almost confirms the initial hypothesis of a negative relationship with leverage. That relationship illustrates that the connection between CEO and members with long tenure in the board leads to decisions in favour of him, such that, less debt usage that ensures regular firm performance with no risk to the CEO's tenure. Moreover, the evidence that the power of the CEO increases debt usage contradicts the findings of previous studies (Jiraporn et al., 2012) Specifically, prior research has suggested that in order to maximize their tenures, CEOs prefer equity over debt. The results obtained in the current study suggest either a negative and insignificant effect of CEO's dual role or a positive and statistically significant one, at the 10% level of significance. Therefore, the effect of the CEO's power should be interpreted with caution.

With respect to the effect of board members' age, the results suggest that an increase in age leads to a higher leverage ratio. No prior research has been concerned with the effect of board's age on leverage; however, Bertrand and Schoar's (2003) suggestion that older CEO's are connected to more conservative choices seems not to be confirmed in the case of boards directors.

The effect of legal diversity in the boardroom on firm's leverage is insignificant in all cases, suggesting no effect of the legal system based on director's nationality on corporate leverage. In addition to legal diversity, development diversity was not found to affect leverage levels. Furthermore, trust level's effect on corporate leverage is limited, since only the OLS estimations suggest a significant effect. The results also show that the political diversity, based on each director's country of origin, has no effect on corporate capital structure. However, cultural heterogeneity, has a negative effect on leverage. This evidence accords with the results obtained for the board genetic diversity index, highlighting that indeed

heterogeneity among board members reduces corporate leverage. In a way, the negative effect of cultural diversity confirms the overall evidence of the current study.

### **3.7 Crisis results**

Examining the effect of the crisis requires the inclusion of dummy variables, as discussed in section 3.3. Tables 3.11 and 3.12 below present the findings obtained with the IV-LIML and sys-GMM methods, while including dummies for the crisis and post-crisis periods.

The inclusion of the crisis dummy does not affect the relationship between genetic diversity and leverage, which continues to be negative, significant and similar in magnitude, even after controlling for the effects of the crisis. The same results are also observed in the of the sys-GMM specifications, with negative and significant coefficient, albeit smaller in magnitude than the coefficient in IV-LIML specifications. However, the difference in magnitude is also evident in previous specifications, as presented in Tables 3.8 and 3.9.

Turning to the crisis dummy, its coefficient carries a positive sign in all the specifications (Alves & Francisco, 2015; Fosberg, 2012); however, it is insignificant in all cases. The Post-crisis effect, on the other hand, is negative and statistically significant in five out of seven cases, showing a decrease in the debt level in the aftermath of crisis.

This evidence coincides with actual evidence on corporate debt levels, since the global experience illustrates that the irrationally high debt levels existing in the beginning of the crisis began to decline as the crisis continued.

Table 3.11. Crisis effects: IV-LIML specifications

	Specification 6	Specification 7	Specification 8	Specification 9
	<b>IV-LIML</b>			
	<i>Total liabilities/total assets</i>			
<b>Lagged dependent</b>	0.446*** (14.332)	0.446*** (14.597)	0.446*** (14.574)	0.446*** (14.362)
<b>Diversity deviation</b>	-0.778* (-1.778)	-0.719 (-1.643)	-0.814* (-1.649)	-0.819* (-1.660)
<b>Crisis dummy</b>	0.002 (0.276)	0.004 (0.846)	0.004 (0.772)	0.002 (0.200)
<b>Post- crisis dummy</b>	-0.012 (-1.127)	-0.015** (-2.185)	-0.016** (-2.277)	-0.012 (-1.131)
<b>Market-book ratio</b>	0.003** (2.545)	0.003*** (2.709)	0.003*** (2.693)	0.003** (2.518)
<b>Firm size</b>	-0.005 (-0.674)	0.001 (0.215)	0.001 (0.120)	-0.005 (-0.732)
<b>Prof/bility</b>	-0.151*** (-4.967)	-0.152*** (-5.115)	-0.152*** (-5.096)	-0.151*** (-4.947)
<b>Current ratio</b>	0.000 (0.528)	0.000 (0.307)	0.000 (0.282)	0.000 (0.513)
<b>No of directors in board</b>	0.024 (1.174)	0.019 (0.912)	0.018 (0.878)	0.023 (1.115)
<b>Ind. directors</b>	0.000 (0.347)	0.000 (0.522)	0.000 (0.504)	0.000 (0.337)
<b>Gender</b>	0.000 (0.684)	0.000 (1.141)	0.000 (1.091)	0.000 (0.644)
<b>CEO's dual role</b>	0.013* (1.801)	0.011 (1.495)	0.01 (1.448)	0.013* (1.720)
<b>Board's age</b>	0.002* (1.777)	0.003** (2.484)	0.003** (2.504)	0.002* (1.802)
<b>Ind. in audit committee</b>	0.000 (0.287)	0.000 (0.595)	0.000 (0.618)	0.000 (0.314)
<b>Director's network</b>	0.000 (0.804)	0.000 (0.406)	0.000 (0.409)	0.000 (0.798)
<b>Director's tenure</b>	-0.001 (-0.895)	-0.001 (-0.936)	-0.001 (-1.038)	-0.001 (-1.013)
<b>Past roles' ind.</b>	0.000 (0.017)	0.000 (0.554)	0.000 (0.551)	0.000 (0.042)
<b>Legal diversity</b>			-0.003 (-0.190)	-0.001 (-0.058)
<b>Political diversity</b>			0.000 (0.030)	0.000 (0.022)
<b>Cultural diversity</b>			0.005 (0.932)	0.006 (1.046)
<b>Development diversity</b>			0.008 (0.413)	0.012 (0.614)
<b>Trust level diversity</b>			0.000 (0.367)	0.000 (0.065)
Year fixed effects	Yes	No	No	Yes
Clustered by	Company	Company	Company	Company
Obsesrvations	5,496	5,496	5,473	5,473
Underidentification (Kleibergen-)	46.648	46.207	45.144	45.194
Underidentification statistic_p-value	0.000	0.000	0.000	0.000
Hansen J statistic	0.068	0.035	1.052	1.274
Hansen J statistic_p-value	0.794	0.852	0.305	0.259
Weak identification test (Kleibergen)	90.669	89.978	70.014	71.555

Notes: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Standard errors in parentheses.

Table 3.12. Crisis effects: Sys-GMM specifications

	Specification 6	Specification 8	Specification 10
	<b>sys-GMM</b>		
	<i>Total liabilities/total assets</i>		
<b>Lagged dependent</b>	0.781***	0.759***	0.755***
	(28.847)	(26.321)	(25.221)
<b>Diversity deviation</b>	-0.250**	-0.151	-0.244*
	(-2.182)	(-1.111)	(-1.732)
<b>Crisis dummy</b>	0.002	0.002	0.001
	(0.411)	(0.592)	(0.382)
<b>Post- crisis dummy</b>	-0.014***	-0.013***	-0.016***
	(-2.768)	(-2.624)	(-3.459)
<b>Firm size</b>	0.016***	0.015***	0.010***
	(3.686)	(3.414)	(8.134)
<b>Prof/bility</b>	-0.107***	-0.115***	-0.098***
	(-3.520)	(-3.763)	(-3.116)
<b>Market-book ratio</b>	0.002	0.002*	0.002
	(1.485)	(1.686)	(1.437)
<b>Current ratio</b>	-0.002***	-0.002***	-0.003***
	(-2.779)	(-2.818)	(-3.289)
<b>No of directors in board</b>	-0.011	-0.004	
	(-0.740)	(-0.283)	
<b>Ind. directors</b>	-0.000**	0.000	
	(-2.538)	(0.566)	
<b>Gender</b>	0.000	-0.001**	
	(1.266)	(-2.300)	
<b>CEO's dual role</b>	-0.009	0.010	
	(-1.283)	(1.238)	
<b>Board's age</b>	0.000	0.000	
	(0.214)	(0.512)	
<b>Ind. in audit committee</b>	0.000	0.000	
	(0.316)	(0.416)	
<b>Director's network</b>	-0.000***	-0.000***	
	(-3.107)	(-3.424)	
<b>Director's tenure</b>	-0.001**	-0.001**	
	(-2.178)	(-2.290)	
<b>Past roles' ind.</b>	0.000	0.000	
	(0.498)	(0.351)	
<b>Legal diversity</b>		-0.004	-0.006
		(-0.392)	(-0.600)
<b>Political diversity</b>		-0.002	-0.002
		(-0.879)	(-0.964)
<b>Cultural diversity</b>		-0.007***	-0.008***
		(-4.369)	(-6.408)
<b>Development diversity</b>		0.012	0.012
		(0.970)	(0.998)
<b>Trust level diversity</b>		0.000	0.001*
		(0.845)	(1.818)
Observations	5,677	5,654	5,783
AR2_test	-1.148	-1.141	-1.199
AR2_pvalue	0.251	0.254	0.231
Wald_test	111,371.500	98,343.510	86,257.280
Wald test p-value	0.000	0.000	0.000
Instruments	739.000	744.000	547.000
Hansen-J statistic	711.224	696.257	561.344
Hansen J-statistic p-value	0.605	0.748	0.200

Notes: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Standard errors in parentheses.

### **3.8 Conclusion**

There is no doubt that the diversity of the board of directors in terms of genetic heterogeneity in the country of their origin affects corporate leverage. This result holds when I control for other attributes of board diversity and firm financial characteristics.

Further, the significance of genetic diversity holds when I control for the crisis and post-crisis periods. Overall, the evidence strongly supports that selecting directors with different origins decreases a firm's reliance on debt.

## Chapter 4: Managerial Ability and Capital Structure

### 4.1 Introduction

The present chapter examines the influence of managerial ability – as measured by Demerjian et al. (2012) - on corporate leverage. The sample consists of a set of firms operating in the US over the period 1995–2015, offering the opportunity to investigate the potential effect of managerial ability in both regular and crisis periods. Data sources, the sample, and the chosen variables along with descriptive statistics and correlation coefficients are presented in Sections 4.2 and 4.3. The methodology is discussed in Sections 4.4. and 4.5. Section 4.6 presents and discusses the results, whilst Section 4.7 concludes the chapter.

### 4.2 Sample

The collection of the data for this work involved two steps.

- First, all the data including managerial ability scores from 1995–2015 are collected from Peter Demerjian’s website (<http://faculty.washington.edu/pdemerj/data.html>).
- Second, I collected the financial data for those firms.

The dataset includes 15,491 firms and a total of 122,401 firm-year observations. The distribution of the observations among industries, and over the years, is illustrated in Table 4.1 and Figure 4.1.

*Table 4.1- Number of firms per industry*

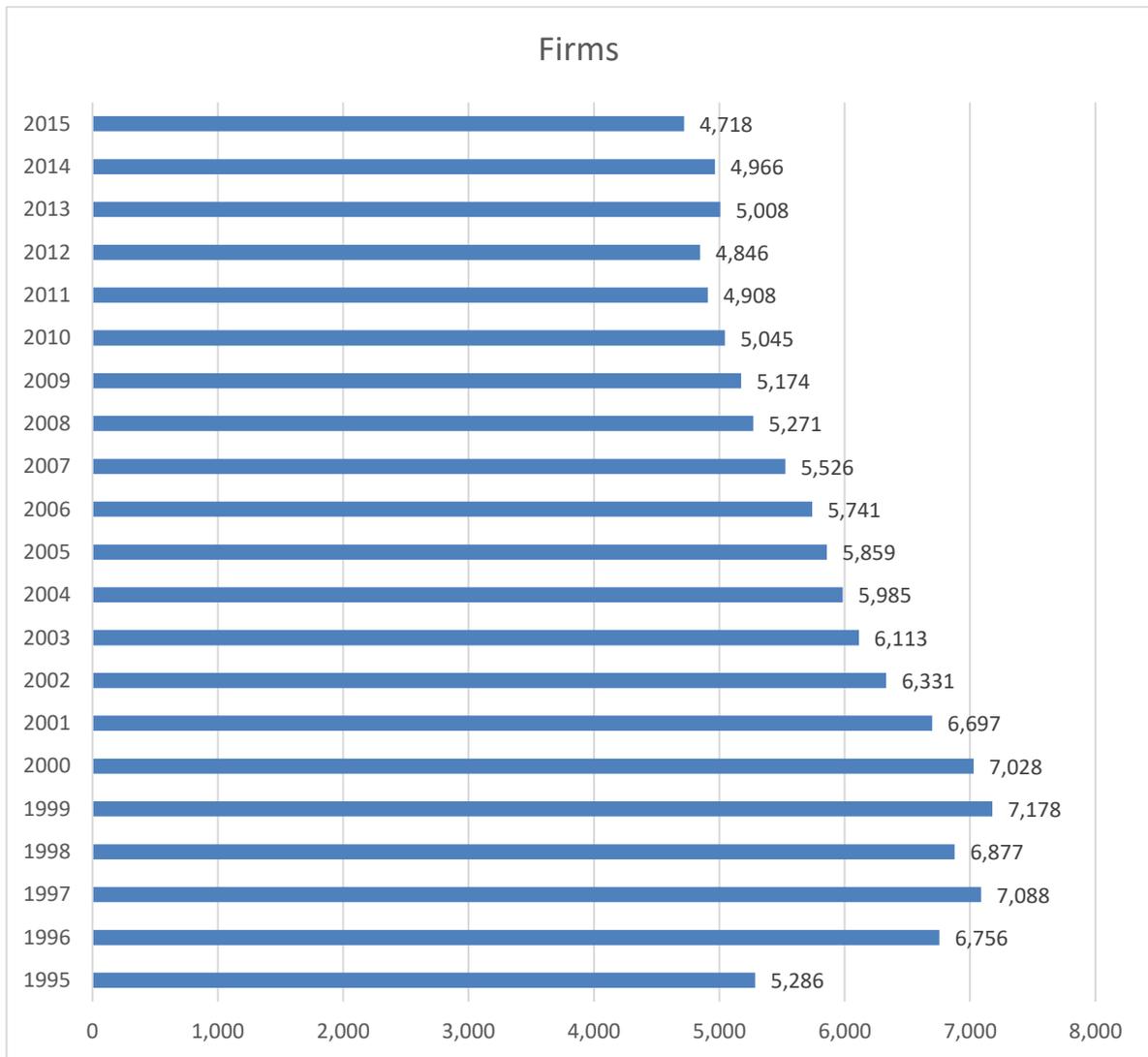
<i>Industry</i>	<i>No of Firms</i>
<b>Agriculture</b>	523
<b>Food Products</b>	2,284
<b>Candy &amp; Soda</b>	426
<b>Beer &amp; Liquor</b>	615
<b>Tobacco Products</b>	181

<b>Recreation</b>	1,063
<b>Entertainment</b>	2,302
<b>Printing &amp; Publishing</b>	952
<b>Consumer Goods</b>	2,090
<b>Apparel</b>	1,662
<b>Healthcare</b>	2,406
<b>Medical Equipment</b>	4,439

<b>Pharmaceutical Products</b>	7,427
<b>Chemicals</b>	2,676
<b>Rubber &amp; Plastic Products</b>	1,183
<b>Textiles</b>	515
<b>Construction Materials</b>	2,701
<b>Construction</b>	1,556
<b>Steel Works Etc.</b>	1,951
<b>Fabricated Products</b>	413
<b>Machinery</b>	4,300
<b>Electrical Equipment</b>	1,429
<b>Automobiles &amp; Trucks</b>	2,716
<b>Aircraft</b>	2,107
<b>Shipbuilding, Railroad Equipment</b>	666
<b>Defense</b>	237

<b>Precious Metals</b>	208
<b>Non-Metallic and Industrial Metal Mining</b>	1,496
<b>Coal</b>	1,405
<b>Petroleum &amp; Natural Gas</b>	350
<b>Utilities</b>	8,354
<b>Personal Services</b>	5,647
<b>Business Services</b>	1,453
<b>Computer Hardware</b>	18,380
<b>Computer Software</b>	5,248
<b>Electronic Equipment</b>	8,290
<b>Measuring &amp; Control Equipment</b>	2,622
<b>Business Supplies</b>	1,699
<b>Shipping containers</b>	387
<b>Transportation</b>	4,115
<b>Wholesale</b>	4,847

Figure 4.1 Firms' distribution per year



Furthermore, the periods in the sample are distinguished as follows:

- *pre-crisis period*: 1995–2006,
- *crisis-period*: 2007–2009 (following Berger & Bouwman, 2013; Bekaert et al., 2014; Dungey & Gajurel, 2015), and
- *post-crisis period*: 2010 to 2015.

### 4.3 Variables in the model

As discussed in Chapter 3, the literature has identified a number of potential determinants of capital structure. Therefore, in order to examine the impact of the managerial ability on corporate capital structure, I also use various control variables like firm size (Lnta), profitability (PROF), and current ratio (CR). Table 4.2 summarizes the variables used in the analysis.

*Table 4.2- Variables' definition*

	<b>Variables</b>	<b>Shortcuts</b>	<b>Definition</b>
1	Leverage	LA	Total liabilities /Total assets
2	Leverage	DA	Total debt /Total assets
3	Managerial ability score	MA_score	Residual of firm efficiency regression (Demerjian et al., 2012)
4	Managerial ability rank	MA_rank	Managerial ability score calculate per industry and year
5	Firm Size	LNTA	Ln(Total assets)
6	Profitability	PROF	Operating Income(EBIT)/ Total assets
7	Liquidity	CUR	Current Assets/ Current Liabilities

#### 4.3.1 Definitions and hypotheses development

##### 4.3.1.1 Dependent variable

In the current chapter, two of definitions of corporate leverage are employed: the ratio of total liabilities to total assets and ratio of total debt to total assets (Antoniou et al., 2013; Faulkender & Petersen, 2006; Fan et al., 2008; Demirguc-Kunt et al., 2015; MacKay &

Phillips, 2005). In the latter case, total debt includes both long-term and short-term interest-bearing debt (Arsov & Naumoski, 2016; Antzoulatos et al., 2016; Fan et al., 2012).<sup>37</sup>

#### 4.3.1.2 *Managerial ability score*

Demerjian et al. (2012) introduce a measure of managerial ability by combining different aspects of both firms' financial and management characteristics. I use this indicator as the key variable of interest to investigate the impact of managerial ability on firm leverage. Specifically, the measure introduced by Demerjian et al. (2012) aims to examine whether more able managers tend to produce higher revenues conditional on the available resources, by comparing output, the firm's revenue, to inputs used, the firm's resources, for each firm within its industry. The score is calculated by firm and year. The procedure of obtaining the score includes two steps.

In the first step, through data envelopment analysis, they obtain an efficiency measure for each firm, in each industry by comparing its output to its inputs. In that model, the individual firms are the decision-making units (DMUs). The output is the firm's revenues while the inputs include several corporate variables from R&D expenditures to sales, administrative and general expenditures, from property and equipment and acquired goodwill to inventory cost, and from intangible assets to operating lease (Demerjian et al., 2012). The efficiency scores take values between 0 and 1, with higher values indicating higher efficiency. Overall, total firm efficiency is estimated through an optimization procedure allowing varying weights for each input and output.

In a second step, they identify the fraction of a firm's efficiency attributed to managerial ability. More detailed, they regress the firm's efficiency against the firm characteristics that affect it, and the residual of that regression is the measure of managerial ability. They estimate the following regression using a logit methodology:

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<sup>37</sup>The definitions and the intuition of the variables are discussed in detail in the previous chapter, in Section 3.3.1.

### *Firm Efficiency*

$$\begin{aligned} &= a_0 + a_1 \text{Ln}(\text{Total Assets}) + a_2 \text{Market Share} \\ &+ a_3 \text{Positive Free Cash Flow} + a_4 \text{Ln}(\text{Age}) \\ &+ a_5 \text{Business Segment Concentration} \\ &+ a_6 \text{Foreign Currency Indicator} + \text{Year Indicators} + \varepsilon. \end{aligned} \quad (22)$$

Among others, Demerjian et al. (2012) provide evidence of the association between the managerial ability score and manager-fixed effects, as well as the positive coefficient of the interaction term between managerial ability and equity financing. According to the authors, this evidence indicates that a higher managerial ability score tends to diminish the adverse relationship between external financing and subsequent abnormal returns. Therefore, Demerjian et al.'s (2012) justification, leads to:

*Hypothesis:* Managerial ability has a positive effect on corporate leverage.

#### *4.3.1.3 Managerial ability rank*

In further analysis, Demerjian et al. (2013) manipulated the managerial ability score to better capture the time and industry differences and reduce any effect of the largest observations. In particular, they calculated the decile ranks of that score by year and industry. The impact of managerial ability rank on capital structure is also examined in the current chapter in order to verify that the obtained results are not driven by industries with disproportionate changes in managerial ability score.

*Hypothesis:* Managerial ability rank has a positive effect on corporate leverage.

#### *4.3.1.4 Control variables*

##### *1) Firm controls*

As in Chapter 3, I control for firm size, profitability and liquidity.

##### *2) Crisis effects*

To examine whether the relationship between managerial ability and capital structure holds when we control for turbulent periods, I use a dummy variable for the crisis period. Following past research, the crisis dummy receives a value of 1 for 2007–2009 and 0

otherwise.<sup>38</sup> In addition, I create a post-crisis dummy that receives the value of 1 for 2010–2015 and 0 otherwise. Therefore, the omitted category is the period prior to the crisis.

The crisis effect on capital structure during crisis periods has been found to be positive, which suggests an increase of debt level during that period (Alves & Francisco, 2015; Fosberg, 2012).

Aiming to examine whether the effect of managerial ability on leverage differs between normal and crisis I include in the regressions the interactions between the crisis dummy and managerial ability score, and the post crisis dummy and managerial ability score. The results expected with the interaction term are those expected for managerial ability score during periods of normal economic activity. Therefore, a positive effect of managerial ability interaction term with crisis on corporate leverage is expected. The same rationale for crisis interaction is followed for post-crisis dummy interaction and managerial ability score.

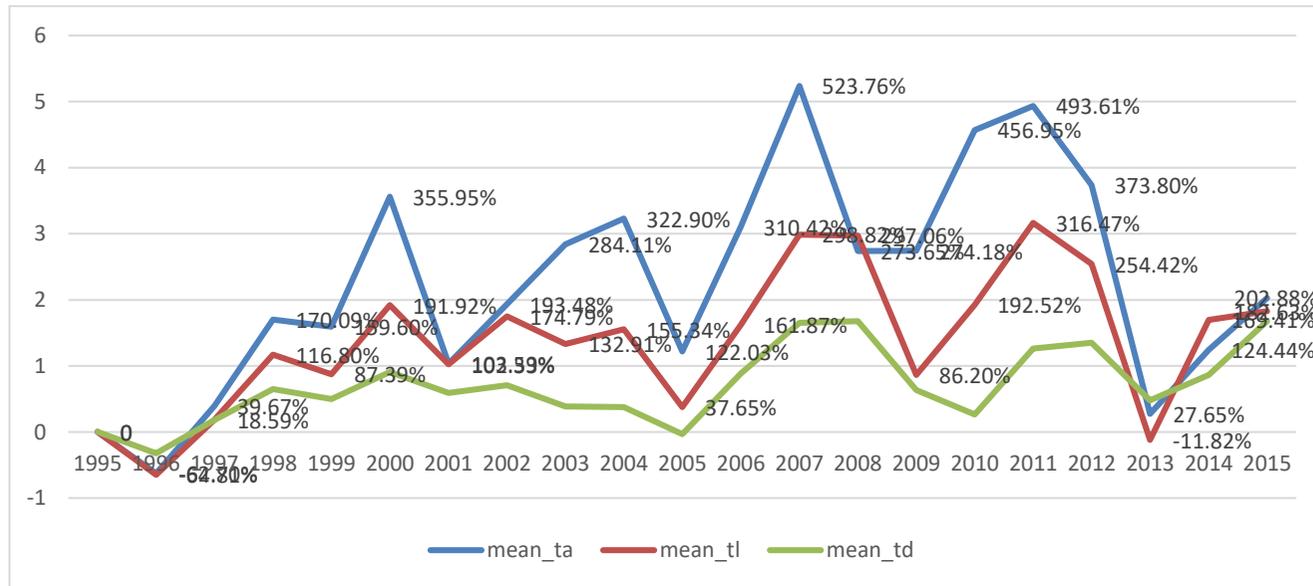
#### **4.3.2 Descriptive statistics**

The descriptive statistics and the Pearson correlations are presented in the Tables 4-3 and 4-4, after winsorizing the data at 1% and 99%. Further, Figure 4-3 depicts the mean values of total assets (ta), total liabilities (tl) and total debt (td) for the period examined. According to Figure 4.2, mean values of total assets, total liabilities and total debt begin to decrease in 2007, and this trends changes starting in 2010, capture the crisis period between 2007 and 2009

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<sup>38</sup> A helicopter looks at the values of the ratios of total liabilities to total assets and of total debt to total assets reveals the existence of deviations in their values during the period years, confirming the crisis period.

Figure 4.2. Differences in means of total liabilities, total debt and total assets in year by year



Regarding the Pearson correlations, the results are presented in Table 4.4. Apart from the correlation level, the statistical significance of the correlations at the 1% level is reported. The correlations among the majority of variables can be considered as moderated ( $r < 0.30$ ), following Cohen (1988). However, profitability seems to be highly correlated with leverage - measured as total liabilities to total assets- whilst it is only moderately correlated with the ratio of total debt to total assets.

As it concerns the descriptive statistics, the firms in the sample have an average leverage (tl/ta) of about 61%, which drops to about 28% when leverage is measured as total debt to total assets. The latter result is also evident in Frank and Goyal (2009) and in Graham et al. (2015), who obtain an average leverage of 29% in the case of American firms studied over the last 90 years (1920-2010).

Regarding the independent variables, the mean value for managerial ability score (MA\_score) is  $-0.001$ , slightly higher than the mean value of  $-0.004$ , reported in Demerjian et al. (2012). It ranges between  $-0.294$  and  $0.6336$ , whereas the standard deviation is  $0.1236$ , slightly lower than in their work. The MA\_score has been found to vary within firms over years. Changes in managerial ability score in a firm can thus be realized over years. These changes may be attributed to numerous reasons. Firstly, managers shift behaviours in order to face unexpected external incidents affecting firms, such as macroeconomic disturbances or pressure from competition. Secondly, changes inside the management team can affect the value of the MA\_score (Demerjian et al., 2012). The mean value of firm size is  $5.27$ , whereas the one of profitability is  $-5.4\%$ .<sup>39</sup>

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<sup>39</sup> Large firms may be better able to report less profits for tax-reduction purposes, usually through leverage (Cole, 2013).

Table 4.3. Descriptive statistics

<i>Variables</i>	<b>Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<i>Total debt/ total assets</i>	122,401	0.2816	0.3706	0.0000	2.5439
<i>Total liabilities/ total assets</i>	122,401	0.6117	0.6328	0.0534	5.0788
<i>Managerial ability _score</i>	122,401	-0.0010	0.1236	-0.2942	0.6336
<i>Managerial ability _rank</i>	122,401	0.5512	0.2855	0.1000	1.0000
<i>Firm size</i>	122,399	5.2684	2.4289	-0.7459	10.9242
<i>Current ratio</i>	122,358	2.6409	2.7491	0.0782	17.6761
<i>Profitability</i>	122,264	-0.0546	0.4132	-2.7618	0.3663
<i>Crisis dummy</i>	122,401	0.1305	0.3368	0.0000	1.0000
<i>Crisis &amp;MA_score interaction</i>	122,401	-0.0001	0.0492	-0.2942	0.5945
<i>Crisis &amp; MA_rank interaction</i>	122,401	0.0719	0.2122	0.0000	1.0000
<i>Post-crisis dummy</i>	122,401	0.2409	0.4277	0.0000	1.0000
<i>Post-crisis &amp; MA_score interaction</i>	122,401	-0.0003	0.0644	-0.2548	0.6336
<i>Post-crisis &amp; MA_rank interaction</i>	122,401	0.1327	0.2740	0.0000	1.0000

Table 4-4. Pearson's correlation

	<b>Total debt/ total assets</b>	<b>Total liabilities/ total assets</b>	<b>Managerial ability _score</b>	<b>Managerial ability _rank</b>	<b>Firm size</b>	<b>Profitability</b>	<b>Current ratio</b>
<i>Total debt/ total assets</i>	1						
<i>Total liabilities/ total assets</i>	0.8401*	1					
<i>Managerial ability _score</i>	-0.0421*	0.0426*	1				
<i>Managerial ability _rank</i>	-0.0298*	0.0459*	0.7959*	1			
<i>Firm size</i>	-0.1006*	-0.2227*	0.0226*	-0.0467*	1		
<i>Profitability</i>	-0.3646*	-0.5430*	0.0612*	0.0860*	0.4735*	1	
<i>Current ratio</i>	-0.2942*	-0.3420*	0.0177*	-0.0052	-0.1082*	0.0719*	1
<i>Crisis period</i>	-0.0027	0.0069	-0.0004	-0.0006	0.0555*	0.0071	-0.0068
<i>Crisis &amp; MA_score interaction</i>	-0.0039	0.0198*	0.3977*	0.2827*	0.0045	0.0249*	0.0153*
<i>Crisis &amp; MA_rank interaction</i>	-0.0048	0.0144*	0.1509*	0.1749*	0.0392*	0.0235*	-0.0015
<i>Post-crisis period</i>	0.0095*	0.0293*	-0.0012	-0.0009	0.1431*	-0.0072	-0.0077*
<i>Post-crisis &amp; MA_score interaction</i>	0.0261*	0.0700*	0.5213*	0.3841*	0.0123*	-0.0180*	-0.0093*
<i>Post-crisis &amp; MA_rank interaction</i>	0.0212*	0.0596*	0.2076*	0.2499*	0.1086*	-0.0147*	-0.0144*

	<b>Crisis period</b>	<b>Crisis &amp;MA_score interaction</b>	<b>Crisis &amp; MA_rank interaction</b>	<b>Post-crisis period</b>	<b>Post-crisis &amp; MA_score interaction</b>	<b>Post-crisis &amp; MA_rank interaction</b>
<i>Crisis period</i>	1					
<i>Crisis &amp;MA_score interaction</i>	-0.0078*	1				
<i>Crisis &amp; MA_rank interaction</i>	0.8741*	0.3735*	1			
<i>Post-crisis period</i>	-0.2182*	0.0017	-0.1908*	1		
<i>Post-crisis &amp; MA_score interaction</i>	0.0018	0	0.0016	-0.0085*	1	
<i>Post-crisis &amp; MA_rank interaction</i>	-0.1876*	0.0015	-0.1640*	0.8595*	0.3929*	1

\* $p < 0.01$  (significance level)

#### 4.4 Empirical identification

The initial model to be estimated is as follows:

$$Y_{i,t} = b_0 + b_1M_{i,t} + b_2X_{i,t} + \text{Year fixed effects} + \text{Firm (or Industry)fixed effects} + \varepsilon_{i,t}, \quad (23)$$

where,  $Y_{i,t}$  is the leverage of firm  $i$  at year  $t$ ,  $M_{i,t}$  is the managerial ability score (Demerjian et al., 2012),  $X_{i,t}$  is the vector of control variables, and  $\varepsilon_{i,t}$  is the error term.

The model incorporating crisis and post-crisis effects is:

$$Y_{i,t} = \alpha + \beta_1M_{i,t} + \beta_2X_{i,t} + \mu_0Crisis_{0709,t} + \mu_1Post - Crisis_{1015,t} + \gamma_0Crisis_{0709,t} * M_i + \gamma_1Post - Crisis_{1015,t} * M_i + \text{Year fixed effects} + \text{Firm or Industry fixed effects} + \varepsilon_{i,t}. \quad (24)$$

In (24),  $\mu_0$  and  $\mu_1$  capture the crisis and post-crisis periods' effects on corporate leverage, whilst the coefficients  $\gamma_0$  and  $\gamma_1$  capture the effect of managerial ability during crisis and post-crisis period on leverage. Therefore,  $\beta_1 + \gamma_0$  show the overall effect of managerial ability on leverage during crisis periods.

The inclusion of firm-fixed effects in our model captures the average effect of the omitted non-time-variant features of the firm. Furthermore, year-fixed effects capture omitted time-variant industry or varied economic features' average effects.

#### 4.5 Methodology

The fixed-effects model is used in the current study to capture any unobserved effects of firm and year, but also to detect any endogeneity problems that might arise. For that reason, I use robust standard errors clustered at the firm level.

The use of instrumental variables equation under a 2SLS method would have not detect the above mentioned problem, since this latter method requires the choice of valid instruments for every explanatory variable that may be connected endogenously with the dependent variable (Wooldridge, 2002). For this reason, the fixed-effects model is preferred in this study. All the benefits arising from use of the fixed-effect model have been extensively

analysed in Section 3.5. Furthermore, employing the Hausman test to examine the appropriateness of fixed-effects versus a random-effects model results in the use of the former.

## **4.6 Empirical results & discussion**

### **4.6.1 Fixed-effects models estimation**

In our sample, despite its large size, the use of certain firm-level characteristics may not completely capture the hidden individual heterogeneity leading to biased estimates, due to endogeneity issues. This problem is solved with fixed-effects models and the within transformation, which drops any omitted time-constant fixed effects.

Table 4.5 depicts the results obtained from the fixed-effects models with robust standard errors, to account for serial correlation and heteroscedasticity. Serial correlation and heteroscedasticity, however, are not a problem in our case, since the large sample, in the dimensions of both cross-section and time ( $T = 21$ ), does not cause notable issues for models' estimates and overall performance (Wooldridge, 2002). The models include firm- and year-fixed effects. Still, the models do not include industry fixed effects, since the inclusion of firm-individual effects accounts for industry differences.

Table 4.5. Empirical results: Fixed effects models

	Specification (1)	Specification (2)	Specification (3)	Specification (4)
<i>Fixed Effects</i>				
Dependent Variable	<i>Total debt /total assets (td/ta)</i>		<i>Total liabilities /total assets (td/ta)</i>	
<i>Managerial ability score</i>	0.117*** (8.382)	0.102*** (6.757)	0.386*** (16.994)	0.376*** (15.563)
<i>Firm size</i>	-0.027*** (-8.089)	-0.027*** (-8.096)	-0.120*** (-20.729)	-0.120*** (-20.695)
<i>Current ratio</i>	-0.019*** (-27.357)	-0.019*** (-27.375)	-0.040*** (-36.555)	-0.040*** (-36.568)
<i>Profitability</i>	-0.244*** (-21.424)	-0.244*** (-21.390)	-0.554*** (-28.601)	-0.554*** (-28.554)
<i>Crisis period</i>		0.072*** (9.242)		0.235*** (18.321)
<i>Crisis &amp; MA_score interaction</i>		0.055** (2.122)		0.045 (1.174)
<i>Post-crisis period</i>		0.114*** (12.583)		0.320*** (21.277)
<i>Post-crisis &amp; MA_score interaction</i>		0.020 (0.821)		0.010 (0.246)
<i>Constant</i>	0.410*** (27.777)	0.411*** (27.727)	1.159*** (46.166)	1.160*** (45.939)
<i>Year fixed effects</i>	YES	YES	YES	YES
<i>Firm fixed effects</i>	YES	YES	YES	YES
<i>Observations</i>	122,000	122,000	122,000	122,000
<i>Clusters</i>	15,461	15,461	15,461	15,461
<i>F-test</i>	84.984	78.517	136.749	126.581
<i>R-within</i>	0.122	0.122	0.264	0.264

Notes: \* p<0.10, \*\* p<0.05 \*\*\* p<0.01. Robust standard errors in parentheses.

In the case of the models in which I measure leverage by the ratio of total debt to total assets, the managerial ability score is positive and statistically significant at the 1% level in all the models. Further, the magnitude of the managerial ability score is 0.117 in specification (1) and 0.102 in specification (2), Turning to the effect of size, all the specifications indicate the existence of a negative relationship with leverage, which is statistically significant at a 1% level. The impact of the current ratio on capital structure is statistically significant at a 1% level and it is negative across all the models and its impact is -1.9%. A negative effect on capital structure is also found in case of firm profitability. It is statistically significant at the 1% level with a coefficient of -0.244.

Regarding the effect of crisis and its interaction with managerial ability, both variables enter the regressions with a positive and statistically significant coefficient, as illustrated in Table 4.5. The positive interaction indicates that the impact of managerial ability on capital structure is higher during the period of the crisis (0.157). Furthermore, the post-crisis effect is statistically significant at a 1% level, whilst the post-crisis interaction effect is insignificant. The *R*-within is around 12% in all the models, and the *F*-test indicates the joint significance of the coefficients.

Table 4.5 also presents the results when I use the ratio of total liabilities to total assets as the dependent variable. As before, the managerial ability score is positive and statistically significant at the 1% level. The results for firm size, profitability and current ratio are also consistent with the ones obtained earlier.

The crisis and post-crisis dummy variables carry a positive coefficient that is statistically significant at the 1% level. However, the interaction of these variables with managerial ability are insignificant. This finding contradicts the results, where total debt to total assets is the dependent variable, as for the impact of the interaction with the crisis, indicating that the results are not robust to the use of alternative metrics of leverage. The *R*-within is above 26% in all models, and the coefficients are jointly significant, as indicated of the *F*-test. Overall, the results are identical in the case of industry- and firm-fixed effects.

In the analysis that follows, I use another approach to examine the impact of managerial ability and other firm-characteristics on leverage, during different time periods. Instead of using the interaction of managerial ability with the time-periods dummy as in Table 4.6, I split the sample in three datasets, on the basis of the following time periods: pre-crisis, crisis and post-crisis periods. This allows the coefficients for all independent variables to vary and it is therefore similar to running a fully interacted regression. There are two model specifications for each time period, one with industry- and one with firm-fixed effects. Half of the specifications include year-fixed effects and half do not; however, there is almost no difference between those specifications. Therefore, the initial model is estimated separately for each time period, and there are no differences in the magnitude of the coefficients between industry- and firm-fixed effects (apart from standard errors).

In all the specifications presented in Table 4.5, the managerial ability score has a positive sign; however, this is insignificant during the crisis period for some specifications. As it concerns its economic significance, the coefficient in the pre-crisis period is almost double than the one of the post-crisis period, those being 0.096 and 0.045, respectively. The remaining variables have a negative impact on leverage that is statistically significant at the 1% level, a finding that is robust across the three periods.

In contrast to the above findings, when I capture firm leverage by the ratio of total liabilities to total assets, the managerial ability score is statistically significant at the 1% level in all three periods, including the crisis periods (Table 4.6). As before, the highest coefficient is being recorded in the pre-crisis period, followed by the post-crisis period, and finally the crisis period. The results for the remaining variables do not change<sup>40</sup>.

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<sup>40</sup> Table B.3 in Appendix B (Chapter: Managerial ability) presents additional results after re-estimating Specifications (1)- (4) of Table4.5 with bootstrapping using 1000 replacements. The results are the same.

Table 4.6. Empirical results—sub-samples: Fixed effect (td/ta)

	<i>Pre-crisis period</i> (1995-2006)		<i>Crisis period</i> (2007-2009)		<i>Post-crisis period</i> (2010-2015)	
Dependent Variable	Specification (5)	Specification (6)	Specification (7)	Specification (8)	Specification (9)	Specification (10)
	<i>Total debt /total assets (td/ta)</i>					
<i>Managerial ability _score</i>	0.096***	0.097***	0.015	0.012	0.045**	0.046**
	(5.781)	(5.884)	(0.673)	(0.566)	(2.232)	(2.263)
<i>Firm size</i>	-0.026***	-0.016***	-0.092***	-0.093***	-0.052***	-0.033***
	(-6.662)	(-5.129)	(-6.284)	(-6.305)	(-6.360)	(-4.398)
<i>Current ratio</i>	-0.017***	-0.018***	-0.011***	-0.012***	-0.014***	-0.015***
	(-23.266)	(-24.496)	(-6.479)	(-6.783)	(-8.883)	(-9.293)
<i>Profitability</i>	-0.225***	-0.237***	-0.141***	-0.146***	-0.225***	-0.244***
	(-17.802)	(-18.779)	(-4.184)	(-4.306)	(-10.131)	(-10.946)
<i>Constant</i>	0.404***	0.392***	0.806***	0.825***	0.656***	0.509***
	(23.253)	(25.158)	(9.728)	(9.889)	(13.057)	(11.082)
<i>Year fixed effects</i>	YES	NO	YES	NO	YES	NO
<i>Firm fixed effects</i>	YES	YES	YES	YES	YES	YES
<i>Observations</i>	76,809	76,809	15,951	15,951	29,461	29,461
<i>Clusters</i>	12,420	12,420	6,240	6,240	6,968	6,968
<i>F-test</i>	94.236	293.931	40.149	36.203	60.945	72.399
<i>R-within</i>	0.115	0.110	0.107	0.101	0.123	0.108

Notes: \* p<0.10, \*\* p<0.05 \*\*\* p<0.01. Robust standard errors in parentheses.

Table 4.7. Empirical result—sub-samples: Fixed effect (tl/ta)

Dependent Variable	Pre-crisis period (1995-2006)		Crisis period (2007-2009)		Post-crisis period (2010-2015)	
	Specification (11)	Specification (12)	Specification (13)	Specification (14)	Specification (15)	Specification (16)
	<i>Total liabilities /total assets (tl/ta)</i>					
<i>Managerial ability _score</i>	0.372*** (13.558)	0.371*** (13.289)	0.118*** (3.284)	0.113*** (3.153)	0.183*** (6.126)	0.185*** (6.118)
<i>Firm size</i>	-0.127*** (-18.068)	-0.082*** (-15.268)	-0.248*** (-9.851)	-0.249*** (-9.837)	-0.181*** (-13.161)	-0.153*** (-11.994)
<i>Current ratio</i>	-0.034*** (-28.319)	-0.037*** (-30.960)	-0.031*** (-10.337)	-0.031*** (-10.568)	-0.034*** (-14.365)	-0.035*** (-14.828)
<i>Profitability</i>	-0.508*** (-23.408)	-0.541*** (-24.486)	-0.358*** (-6.359)	-0.366*** (-6.500)	-0.540*** (-13.371)	-0.568*** (-14.077)
<i>Constant</i>	1.174*** (38.723)	1.076*** (39.265)	2.059*** (14.577)	2.088*** (14.684)	1.822*** (21.52)	1.603*** (20.847)
<i>Year fixed effects</i>	YES	NO	YES	NO	YES	
<i>Firm fixed effects</i>	YES	YES	YES	YES	YES	
<i>Observations</i>	76,809	76,809	15,951	15,951	29,461	29,461
<i>Clusters</i>	12,420	12,420	6,240	6,240	6,968	6,968
<i>F-test</i>	150.871	507.4747	74.006	74.79596	95.742	160.0234
<i>R-within</i>	0.254	0.2314775	0.243	0.2375907	0.264	0.2521077

Notes: \* p<0.10, \*\* p<0.05 \*\*\* p<0.01. Robust standard errors in parentheses.

The managerial ability score is persistently significant and positive, as shown in the specifications with firm fixed-effects. These findings indicate that corporate capital structure is explained by managers' characteristics, as is also suggested in the corresponding literature (Berger et al., 1997; Bertrand & Schoar, 2003; Faccio et al., 2016). Analytically, the positive effect supports the conclusion that improving the decision-making abilities of top-level corporate executives, and thus firm efficiency, results in higher corporate debt levels. The results are persistent independently of the proxy used for measuring leverage (i.e. either total debt to total assets or total liabilities to total assets).

The observed impact coincides with previous evidence concerning managerial ability, although limited, but it contradicts previous evidence concerning capital structure. Specifically, Francis et al. (2016b) find that a higher managerial ability score leads to reduced bank loan spread, while it increases long-term loans in bank loan contracts. These researchers suggest the relationship between information opacity and managerial ability as a potential reason for this.

So far, the corresponding literature has concluded that managers are opposed to debt financing for reassuring their tenures (Berger et al., 1997; Novae, 2003; Jensen, 1986). However, this research suggests that in the presence of more able managers, firm debt increases, leading to the view that more able managers, who increase firm efficiency, are not sceptical about debt. Hence, a new strain for relating managerial behaviour and choices to corporate capital structure rises.

Turning to the control variables, the impact of firm size is negative, indicating that larger firms prefer internal rather than external financing (as pecking-order theory states), as it is evident in the literature (Antoniou et al., 2002; De Jong et al., 2008). Rajan and Zingales (1995) attributes this to the existence of lower information asymmetries in sizeable firms, which provides them the chance for new equity issuance without any revision to their market values.

The influence of the current ratio on corporate leverage is persistently negative, as concluded by both static and dynamic analyses in this thesis. Examining either the board of directors' or the managers' characteristics, this impact remains robust. Therefore, holding numerous liquid assets by increasing the use of retained earnings as financing options reduces leverage levels (De Jong et al., 2008; Temimi et al., 2016; Deesomsak et al., 2004). Furthermore, the impact of profitability on leverage is negative and holds in all the cases, suggesting that as profitability rises the debt levels fall. This finding is consistent with prior research (Alves &

Francisco, 2015; Rajan & Zingales, 1995). It seems that more profitable firms can raise equity more easily than less profitable firms, which may be explained by the eagerness of stakeholders to further invest in a more profitable firm.

In crisis context, the finding that debt (liabilities) increases during the period of the crisis, affirms the related literature (Alves & Francisco, 2015; Fosberg, 2012). Using a crisis dummy that takes the value of 1 during 2007 and 2009, Alves and Francisco (2015) underline that the most significant outcome of their research is the positive relationship between the crisis and firm leverage.

Overall, the effect of managerial ability on corporate leverage is positive. The impact of managerial ability on leverage during periods of crisis is not clear. It seems that the different definitions of leverage and the different ways of capturing the effect of managerial ability's influence the results. Total liabilities are used in the first definition of leverage, while only interest-bearing liabilities (debt) are used in the second definition. Specifically, the statistically significant relationship between the interaction of the crisis with managerial ability and leverage (specification 10), which shows the marginal effect of managerial ability on leverage, highlights the importance of managerial ability on leverage, especially on interest-bearing liabilities (debt) during periods of crisis. At the same time, splitting the sample into three different time periods indicates the insignificance of the managerial ability score during crisis periods. In addition, the interaction of the crisis with the managerial ability score is insignificant when the ratio of total liabilities to total assets is used to measure leverage. In contrast, the separation of the time periods suggests that the managerial ability score is statistically significant during periods of crisis.

Furthermore, the positive and statistically significant post-crisis coefficient indicates an increase in corporate leverage following a crisis period whereas the interaction of the post-crisis period with managerial ability is insignificant.

The existing literature suggests that the positive effect of managerial ability on leverage appears to be driven by the higher reliance on long-term rather than on short-term debt. Demircuc et al. (2012) show a positive impact of the crisis dummy on long-term debt for large firms in high income countries, although Alves and Francisco (2005) indicate that during crisis, firms replace long-term debt with short-term debt. At the same time, however, Francis et al. (2016b), who focus on bank loans granted to US public firms, state that managerial ability increases the rate of long-term loans and reduces short-term loans in bank loan contracts.

#### 4.6.1.1 Additional study

Further, to verify that the above results are not driven by industry specific attributes, I also employ an industry-year ranking. As before, the results are obtained through a fixed-effects model with robust errors. Both year- and firm-fixed effects are included; whereas industry-fixed effects are also considered in additional regressions. The results with the industry-fixed effects are quite similar and are not presented to conserve space. In general, the results are similar to the models with the managerial ability score.

In Table 4.8, the managerial ability rank affects positively the ratio of total debt to total assets, an affect that is significant at the 1%. The value of the coefficient in both models is around 0.04. The rest of the regressors, firm size, current ratio and profitability are statistically significant at a 1% level, and the obtained signs are identical to the ones of the previously developed models. The crisis and post-crisis dummies are positive and statistically significant at a 1% level. The interactions of these variables with the managerial ability rank are positive; albeit insignificant.

Table 4.8. Empirical result—MA\_rank: Fixed effects models

	Specification (17)	Specification (18)	Specification (19)	Specification (20)
Dependent Variable	<i>Total debt /total assets (td/ta)</i>		<i>Total liabilities /total assets (td/ta)</i>	
<i>Managerial ability rank</i>	0.043*** (8.643)	0.041*** (6.987)	0.146*** (17.909)	0.145*** (15.266)
<i>Firm size</i>	-0.026*** (-7.929)	-0.026*** (-7.922)	-0.117*** (-20.432)	-0.117*** (-20.398)
<i>Current ratio</i>	-0.019*** (-27.277)	-0.019*** (-27.279)	-0.040*** (-36.465)	-0.040*** (-36.457)
<i>Profitability</i>	-0.244*** (-21.328)	-0.244*** (-21.298)	-0.554*** (-28.497)	-0.554*** (-28.453)
<i>Crisis period</i>		0.064*** (7.167)		0.222*** (15.552)
<i>Crisis &amp; MA_rank interaction</i>		0.011 (1.118)		0.014 (0.887)
<i>Post-crisis period</i>		0.111*** (11.185)		0.315*** (19.647)
<i>Post-crisis &amp; MA_rank interaction</i>		0.002 (0.223)		-0.002 (-0.143)
<i>Constant</i>	0.384*** (26.679)	0.385*** (26.16)	1.069*** (44.273)	1.070*** (43.308)
<i>Year fixed effects</i>	YES	YES	YES	YES
<i>Firm fixed effects</i>	YES	YES	YES	YES
<i>Observations</i>	122,221	122,221	122,000	122,000
<i>Clusters</i>	15,461	15,461	15,461	15,461
<i>F-test</i>	84.667	78.179	135.475	125.163
<i>R-within</i>	0.122	0.122	0.263	0.263

Notes: \* p<0.10, \*\* p<0.05,\*\*\* p<0.01. Robust standard errors in parantheses.

Further, in Table 4.9 where the dependent variable is total liabilities to total assets, the findings are similar to those reported in Table 4.8. The signs of the coefficients are the same as those in Table 4.8, only the magnitudes are higher.

Estimating different models for each time period (i.e. pre-crisis, crisis and post-crisis) generates a statistically significant managerial ability rank in all the cases, as depicted in Tables 4-9 and 4-10. Its effect continues to be positive, though its magnitude is smaller during the crisis period. The results hold for both definitions of leverage. These findings contradict earlier findings regarding the significance of managerial ability during periods of

crisis. In earlier specifications, the interactions with the crisis were used to capture the significant of managerial ability impact during crisis and provided ambiguous evidence. However, splitting the sample in sub-periods, provides strong evidence about the significance of managerial ability on leverage.

Firm size, current ratio and profitability are statistically significant and negative either in the whole sample or in sub-samples, and for both leverage definitions.

*Table 4.9. Empirical results—MA\_rank sub-samples: Fixed effect (td/ta)*

	<i>Pre-crisis period (1995-2006)</i>	<i>Crisis period (2007-2009)</i>	<i>Post-crisis period (2010-2015)</i>
	<b>Specification (21)</b>	<b>Specification (22)</b>	<b>Specification (23)</b>
<b>Dependent Variable</b>	<i>Total debt /total assets (td/ta)</i>		
<i>Managerial ability _rank</i>	0.035*** (5.842)	0.014* (1.728)	0.026*** (3.659)
<i>Firm size</i>	-0.026*** (-6.534)	-0.092*** (-6.258)	-0.051*** (-6.262)
<i>Current ratio</i>	-0.017*** (-23.335)	-0.011*** (-6.464)	-0.014*** (-8.833)
<i>Profitability</i>	-0.225*** (-17.778)	-0.142*** (-4.228)	-0.226*** (-10.193)
<i>Constant</i>	0.382*** (22.285)	0.796*** (9.649)	0.636*** (12.783)
<i>Year fixed effects</i>	YES	YES	YES
<i>Firm fixed effects</i>	YES	YES	YES
<i>Observations</i>	76,809	15,951	29,461
<i>Clusters</i>	12,420	6,240	6,968
<i>F-test</i>	94.714	39.643	60.587
<i>R-within</i>	0.115	0.108	0.124

Notes: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors in parantheses.

Table 4.10. Empirical result—MA\_rank sub-samples: Fixed effect (tl/ta)

	<i>Pre-crisis period</i> (1995-2006)	<i>Crisis period</i> (2007-2009)	<i>Post-crisis period</i> (2010-2015)
	<b>Specification (24)</b>	<b>Specification (25)</b>	<b>Specification (26)</b>
<b>Dependent Variable</b>	<i>Total liabilities /total assets (tl/ta)</i>		
<i>Managerial ability</i> <i>_rank</i>	0.132*** (13.111)	0.057*** (4.232)	0.081*** (7.193)
<i>Firm size</i>	-0.124*** (-17.809)	-0.248*** (-9.835)	-0.179*** (-13.050)
<i>Current ratio</i>	-0.034*** (-28.504)	-0.031*** (-10.339)	-0.034*** (-14.310)
<i>Profitability</i>	-0.507*** (-23.342)	-0.359*** (-6.388)	-0.540*** (-13.409)
<i>Constant</i>	1.092*** (36.853)	2.023*** (14.506)	1.764*** (21.060)
<i>Year fixed effects</i>	YES	YES	YES
<i>Firm fixed effects</i>	YES	YES	YES
<i>Observations</i>	76,809	15,951	29,461
<i>Clusters</i>	12,420	6,240	6,968
<i>F-test</i>	151.0023	73.96532	95.33924
<i>R-within</i>	0.25337	0.243927	0.264307

Notes: \* p<0.10, \*\* p<0.05,\*\*\* p<0.01. Robust standard errors in parantheses.

To sum up, the evidence using the managerial ability rank supports the conclusion that managerial ability has a significant impact on corporate leverage. The results hold regardless of whether we employ the industry and year rank score (managerial ability rank) or the firm and year score (managerial ability score).

## 4.7 Conclusion

Managerial ability appears to be a critical determinant of corporate capital structure. The positive effect found in all specifications offers new insights into the capital structure literature, suggesting that good managers prefer debt usage. This contradicts prior evidence suggesting that all managers are opposed to debt financing, to ensure their tenure. Furthermore, its statistical significance over both crisis and non-crisis periods, highlights

further its importance as well as the significance of its interaction with the crisis dummy in some specifications, indicates its key influence on firm leverage, especially during financial distress periods, contributing to the crisis literature. The rest of the firm-level variables (size, liquidity and profitability) also have a robust and significant effect on corporate leverage, confirming the findings of earlier studies. To conclude, the use of managerial ability as a determinant of capital structure for the first time in the literature offers new insights and opens avenues for future research.

## Chapter 5: Management Practices and Capital Structure

### 5.1 Introduction

Chapter 5 investigates the relationship between management practices and corporate leverage in enterprises operating around the globe. Sections 5.2–5.4 present the sample, the variables, and the empirical specifications. Sections 5.5 and 5.6 present and discuss the empirical results and finally, the conclusions are outlined in Section 5.7.

### 5.2 Sample

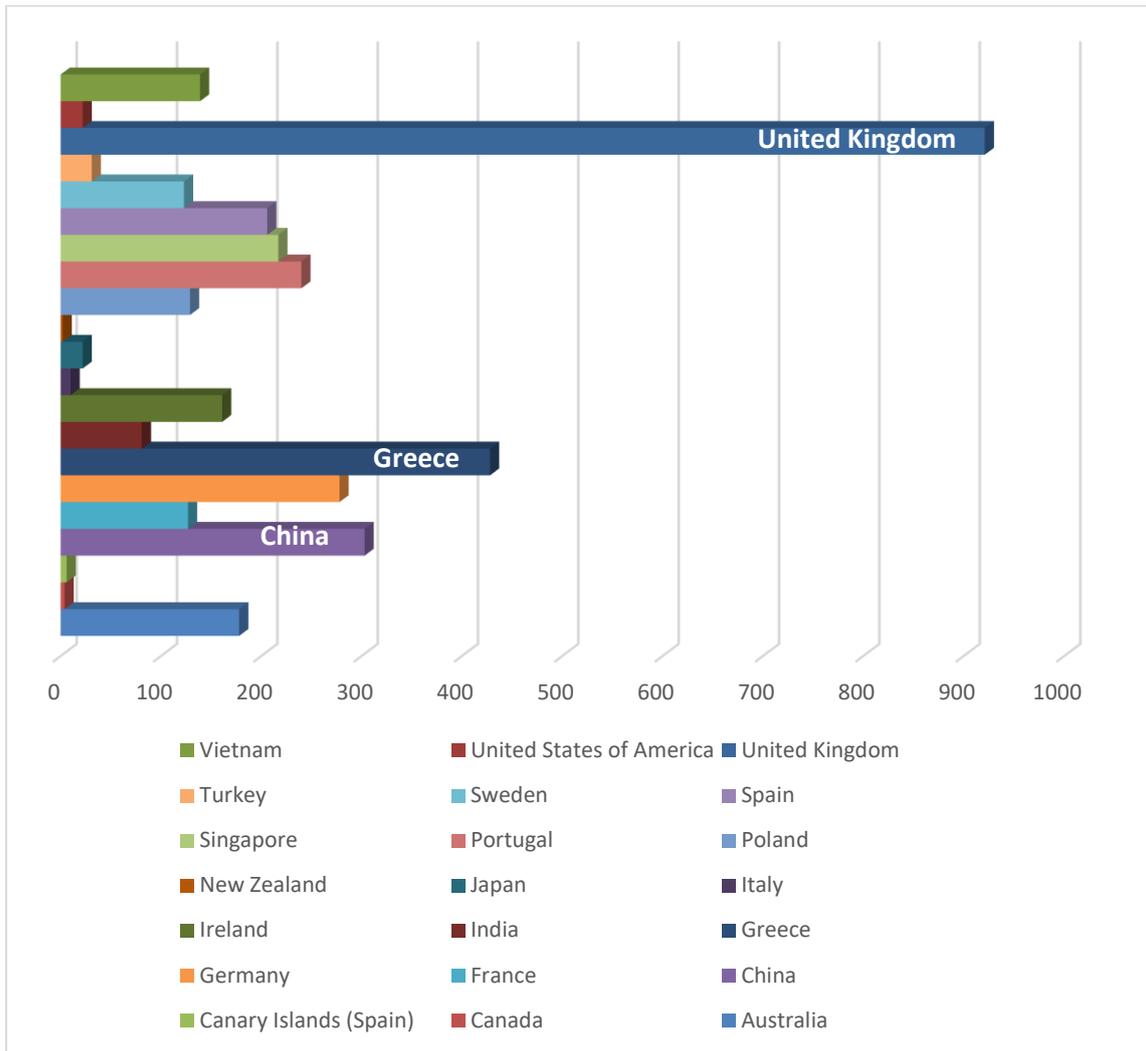
I collected the data in two stages. First, I obtained data on firm management practices from the WMS project<sup>41</sup>. This dataset includes 11,482 firm-year observations from the period 2002–2015. Next, I collected the country-level data from World Governance Indicator Database (WGI) and World Bank Doing Business database, and the financial data for the corresponding firms and years.

Due to missing observations, the final sample for which I have financial information consists of 2,680 observations from 2006–2015. Firms in the sample are from 20 different countries. As shown below, firms based in the UK make up the majority of the sample, followed by those based in Greece and China.

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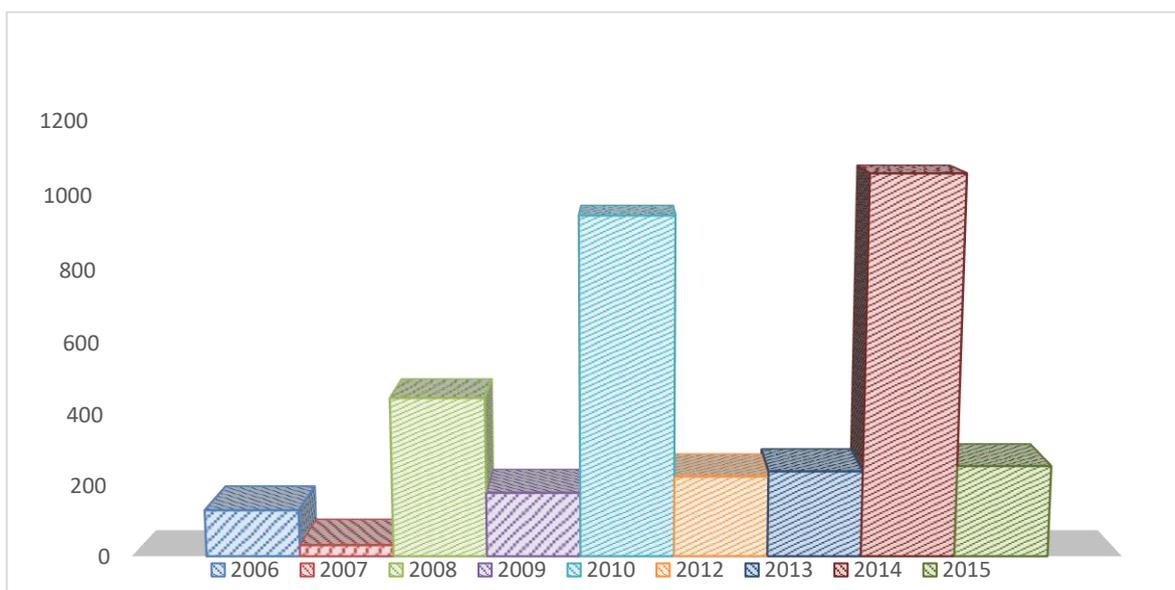
<sup>41</sup> The WMS project was initiated in 2002. The principal researchers are Nicholas Bloom, Raffaella Sadun and John Van Reenen and it has many funders, with the three long-term funders being: Advanced Institute of Management Research (UK - <http://www.aimresearch.org/>), the Anglo German Foundation (UK and Germany- <http://www.agf.org.uk/>) and the Economic and Social Research Council (UK- <http://www.esrc.ac.uk/>) (<http://worldmanagementsurvey.org/>). In the light of the search for factors driving Total Factor Productivity, continuing research is being conducted by the WMS project on the managerial practices followed by firms.

Figure 5.1. Number of firms per country



The distribution of the firms per year is presented in the bar chart (figure 5.1), illustrating that the vast majority of the data on the firms is from 2008–2015.

Figure 5.2. Firms' distribution per year



### 5.3 Variables in the model

As mentioned in previous chapters, there are several definitions of corporate leverage. In the present chapter, I use the ratio of total liabilities to total assets, due to data availability. In addition to management practices, I use both firm-level and country-level variables as regressors. The firm-level regressors are the current ratio, profitability and firm size, and the country-level regressors are the GDP per capita, the domestic credit provided by financial sector, the corruption index and the strength of investors' protection index. Their definitions are presented in Table 5.1.

Table 5.1. Variables' definitions

	<b>Variables</b>	<b>Shortcuts</b>	<b>Definition</b>
<b>1</b>	Leverage	LA	Total liabilities /Total assets
<b>2</b>	Management practices	Average	Average z-score of management practices (Bloom et al. 2014)
<b>3</b>	Firm Size	LNTA	Ln(Total assets)

4	Profitability	PROF	Operating Income(EBIT)/Total assets
5	Liquidity	CUR	Current Assets/ Current Liabilities
6	GDP per capita	GDPC	Ln(GDP per capita)
7	Domestic credit/GDP	CRFIN	Domestic credit by financial sector to GDP
8	Institutional development	INSDEV	Index ranges from -2.5(weak) +2.5(strong) governance performance, including voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption.
9	Strength of investors' protection	INPRO	Index ranges from 0 to 10(best)
<b><i>Instruments</i></b>			
	Managers with college degree		Percentage of firm's managers with college degree
	Managers in the plant		Percentage of firm's managers
	Manager's tenure		Manager's (interviewee) tenure in firm
	Manager's seniority		Dummies for capturing manager's (interviewee's) seniority in the firm
	Interview duration		The duration of the interview for management practices in minutes
	Reliability measure		It's the some of the knowledge and the reliability score assigned to the interviewee by interviewer

	Firm owned by MNE		Dummy: 1 if firm owned by a MNE and 0 otherwise
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### 5.3.1 Definitions and hypotheses development

#### 5.3.1.1 Management practices index

The management practices index is the average score derived from 18 practices examined under the WMS study. Specifically, the tool developed by the WMS project measures management practices focusing on the following four areas: operations management, performance monitoring, targeting and talent’s (or people’s) management. The operations management and performance monitoring refer to a firm’s ability to effectively survey its operations and manipulate the information gained to favour its performance. A firm’s target setting, the resulting outcomes and actions taken in case of inconsistency between the targets and the outcomes are the issues examined under the target area. Lastly, the firm’s promotion and reward scheme for its employees, its hiring process, and its ability to keep its most valuable employees are examined under the heading of talent or people management (Bloom et al., 2014).

The methodology followed in this analysis assigns a score to each management practice applied by the firm, ranging from 1–5, with 1 implying the worst management practice and 5 the best one. For example, a score of 1, in the case of examining the setting of straight targets, indicates that reaching the set goals is almost impossible or that the goals are found to be “too easy”, whereas a score of 5 indicates a firm that sets rational goals that are a necessity consideration for all departments (Bloom et al., 2014).<sup>42</sup>

Monitoring, target and people’ management are the key areas of firm’s productivity, whereas operations’ management area reveals whether or not a firm has introduced lean manufacturing in its processes. Then the average of these four subcategories constitutes the overall management firm score, which of course lies between one and five.

*Some details about the conduct of the primary research by WMS*

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<sup>42</sup> Appendix C provides details on the scoring of the answers in the questionnaire.

For the purpose of the research, a questionnaire (see in Appendix C) was developed by WMS, including questions targeting the above-mentioned areas. The initial sample included randomly chosen firms operating in manufacturing, retail, hospitals and schools. Those firms' employees varied from 50 to 5,000 (Bloom et al., 2014).

The questionnaires were filled in through interviews conducted by phone. The interviewer was an MBA student, trained for that task, whereas the interviewees were the plant managers of the examined firms. The managers chosen for the interviews were mid-level, as Bloom et al. (2014) maintain that a manager at that level is involved in daily operations, and at the same time is in charge of managing people, as a result applying certain management practices. Two other critical points are that managers had no idea about the questionnaire, since the person contacting them informed them that it would be an interview about their "day-to-day management practices" but the interviewer was filling the questionnaire while questioning the manager. Furthermore, the interviewer had no insight into the firm's performance at the time of the interview (Bloom et al., 2014; Bloom et al., 2012; Bloom & Van Reenen, 2007). Finally, all interviews took place in the language spoken in the firm's region,<sup>43</sup> their duration was on average 45 minutes, and for about 30 minutes of each interview an extra person silently listened and recorded the answers.

Therefore, the final score for a given respondent's management practices was the average score out of the 18 questions included in the questionnaire. In order to provide meaningful estimates, the z-score of each score is calculated by normalising each score to zero mean and standard deviation of one. As Bloom et al. (2014) states this modification relates each firm's managerial quality to the sample's managerial quality. They also add that using the first principal component from a factor analysis for managerial leads to very similar outcome. Therefore, following Bloom et al.'s (2011b) estimation, this indicator of management practices can be described as follows:

- Firstly, the z-score of the score of each of the 18 questions is calculated; in other words, practices are normalised to zero mean and standard deviation of 1. It is defined as follows:

$$Z_{m_i} = \frac{m_i - \bar{m}_i}{\sigma_{m_i}} \quad (25),$$

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<sup>43</sup> The interviewees are from the surveyed countries.

Where the  $z_{mi}$  is the z-score of management practice  $m_i$  in firm  $i$ ,  $\overline{m_i}$  is the unweighted average  $i$  of management practice  $i$  across all observations and  $\sigma_{m_i}$  is the standard deviation of practice  $m_i$  across all observations.

By definition, It varies between  $-3$  and  $+3$  standard deviations, and it can be depicted by a normal distribution curve (Wooldridge, 2016).

- Secondly, the average value of the 18 z-scores is calculated (i.e. the management practices average).
- Finally, the management practices index is obtained by calculating the z-score of the average value found in Step 2.

Regarding the effect of management practices at the corporate level, Bloom and Van Reenen (2007) suggest a positive and significant effect on firm productivity. According to them the management practices index offers a deeper view of the firms' ability to be more productive and profitable than the one offered by capturing only the executives' ability in management. In particular, management practices seem to be inherent in a company's organizational capital as it relates to organizational culture. Since, management practices index relates to some extent to managerial ability and following the evidence in the previous chapter (the positive effective of managerial ability on corporate leverage), I expect a positive effect of management practices index on firm leverage.

*Hypothesis:* The management practices index has a positive effect on firm leverage.

#### 5.3.1.2 Control variables

The firm- related control variables are firm size, profitability, liquidity (as defined in Chapter 3).

In order to capture the heterogeneity across countries, I also control for GDP per capita, domestic credit provided by financial sector, corruption and strength of investors' protection indices.

#### GDP per capita

Numerous studies in the capital structure literature employ the gross domestic product (GDP) to capture a country's economic development (An et al., 2016; Zheng et al., 2012; Kesternich

& Schnitzer 2010; Demirguc-Kunt et al., 2015; La Porta et al., 1999). In the study of An et al. (2016) that examines the effect of earnings management on corporate leverage, the use GDP per capita as country control variable. They find a positive effect of GDP per capita on leverage under OLS estimator, but they find a negative effect when they include instrumental variables (using either 2SLS or GMM estimators) to address endogeneity issues. In addition, Kesternich and Schnitzer (2010) study the effect of political connections on firm leverage controlling for country level factors. They suggest a positive effect of GDP per capita on corporate debt. Zheng et al. (2012) and Qi et al. (2010), on the other hand, find a negative effect of GDP per capita on corporate debt maturity and cost of debt, respectively.

Therefore, I employ the natural logarithmic form of GDP per capita to control for country differences (An et al., 2016; Kesternich & Schnitzer 2010; La Porta et al., 1999; Qi et al. 2010; Zheng et al., 2012; Acharya et al., 2011).

#### Domestic credit to GDP

Following prior research, I use the domestic credit provided by financial sector to GDP to proxy for available funds in each country's market (Joeveer 2006; Qi et al., 2010; Zheng et al., 2012; Demirguc-Kunt et al., 2015). The availability and accessibility of external financing options is an important factor in the determination of corporate debt as suggested by a large number of previous studies (Joeveer 2006; Antzoulatos et al., 2016; Sufi, 2014; Faulkender & Petersen, 2006; Zheng et al., 2012; Demirguc-Kunt et al., 2015). Demirguc-Kunt et al. (2015) find a positive and statistically significant effect of domestic credit to GDP on the leverage of SMEs worldwide. On the contrary, Kesternich and Schnitzer (2010) show a negative relationship between these two variables disrespectful of the firm size.

#### Institutional development

To study the impact of institutional environment on corporate capital structure, among countries, I use the World Governance Indicators (WGI) developed by Kaufmann et al. (2009). The WGI includes a series of indicators that capture the institutional development of each country, namely, voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law and control of corruption. All these indicators receive a value between -2.50 to +2.50. A value of -2.50 reflects weak governance performance, whilst, a +2.50 value reflects a strong one.

In detail, the voice and accountability indicator captures perceptions regarding the degree to which a country's citizens are able to participate in their government's selection, as well as the freedom of expression, freedom of association and free media. The political stability and absence of violence/terrorism indicator captures the perceptions of the likelihood of political instability and/or politically-motivated violence and terrorism. The perceptions regarding quality of public services, quality of civil services and the and the extent of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies are captured under government effectiveness indicator. The regulatory quality indicator captures the impression on government's ability to formulate and implement sound policies, and regulations that allow and promote the development of the private sector. Further, perceptions of the degree to which agents have confidence in and abide by the rules of society, and specifically, the quality of contract enforcement, property rights, the police and the courts, and also the likelihood of crime and violence are captured in rule of law indicator. The last indicator, the control of corruption, reflects perceptions of the degree to which public power is exercised for private gain, including both petty and grand sort of corruption, in addition to "capture" of the state by elites and private pursuits.

In this study, I compute the average of these six indicators, to create the overall indicator of institutional development (Doumpos et al., 2015). Prior research mainly suggests a negative effect of institutional development on corporate leverage (e.g. An et al., 2015). For instance,

#### Strength of investor protection

Another variable to control for differences in institutional environment among countries, is the strength of investor protection index provided by the World Bank Doing Business database. This index measures the strength of shareholders' protection against directors' misuse of corporate assets for personal gain and it is combination of three indices: the extent of disclosure index (transparency of related-party transactions), the extent of director liability index and the ease of the shareholder suit index (i.e. the ability of the shareholders to sue officers and directors for improper behaviour). Still, the investor protection index receives values between 0 (worst) and 10 (best).

Using data from 170 countries, Haidar (2008) finds that countries with stronger investor protection scheme experience faster GDP growth compared to countries with weak investor protection scheme. Further, La Porta et al. (1998) advocate that weak protection of investors

against expropriation of entrepreneurs, leads to high level of ownership concentration, limited availability of external equity financing, narrow equity markets and also small debt markets. Antoniou et al. (2008) conclude that the level of investor protection in the country that a firm operates strongly affects its capital structure, with anti-director rights having , a negative effect on capital structure.

### 5.3.1.3 *Instrumental variables*

To lessen endogeneity concerns, seven variables gauging management practices are employed as instruments: (i) percentage of managers with college degree, (ii) managers' seniority in the firm, (iii) manager's tenure in the firm, (iv) percentage of managers in the firm, (v) whether a multinational enterprise owns the firm, (vi) the duration of the interview, and (vii) the reliability measure. These variables are used as instruments, since they are considered as independent of the disturbance term of the basic model, but also as correlated with management practices index. According to Bloom and Van Reenen (2007), these variables are informative as regards the management practices index.

The percentage of managers with college degree considers all managers working in the firm, whereas manager's seniority in the firm refers to the managers interviewed for the needs of the WMS study. The manager's seniority is indicated by a set of dummies capturing the following: CEO or executive officer, manager of multiple establishments, manager of one establishment, non-manager or other (Bloom et al., 2013). Still, manager's tenure in the firm is calculated in years and the percentage of managers in the firm is the number of managers divided by the total number of employees. Furthermore, a dummy variable regarding whether the firm is owned by an MNE or not is included, receiving the value of 1 if the firm is owned by a MNE, and 0 otherwise. The interviews durations in minutes were used, along with a reliability measure that captures knowledge of the manager about the management practices followed by his firm and his willingness to give reliable information about them based on interviewer's opinion. Therefore, the reliability measure is subjective for each interviewer (Bloom & Van Reenen, 2007).

### 5.3.2 **Descriptive statistics**

Tables 5.2 and 5.3 present the Pearson's correlations and the descriptive statistics of the variables used in the current study. The correlation table does not present any unusual or

unexpected coefficients. The high correlation between leverage and current ratio is expected, given their definitions. Multinational enterprise' ownership and management practices also show a high level of correlation.

The descriptive statistics in Table 5.2, show that the mean value of the ratio of total liabilities to total assets is around 56.4%, with a maximum value of 155.6%. The mean of the Management practices index ( $z$ -score) is negative, around -0.013. By definition, in the total sample, the standard deviation of the management practices index is 1, with a minimum value of  $-3$  and a maximum value  $+3$ .

The current ratio, ranges between 0.23 and 1 with a mean value of 2.20 and a standard deviation of 2.42. The mean profitability of the firms is around 5%, and there are firms with negative profitability (i.e. losses), as it becomes evident by the minimum value of  $-38.93\%$ . Furthermore, firm size has a mean of 10.71, ranging from 7.22 to 14.88. The natural logarithm of GDP per capita has an average value of 10.147, whilst domestic credit provided by financial sector as percentage of GDP varies from 42.9% to 345.7% with an average value of 162%. The institutional development variable has a positive mean of 0.647 with a minimum value of -0.596 and a maximum value of +1.86. The strength of investor protection has a mean value of 6.272, with a minimum of value of 2.00 and a maximum value of 9.70.

As it concerns the instrumental variables, the interview duration averaged 58 minutes, somewhat higher than the 45 minutes recorded in the whole sample according to Bloom et al. (2014) and the 50 minutes mentioned in the earlier research of Bloom and Van Reenen (2007). On average 57% of managers in each firm's plant hold a college degree, whilst only 10% of the employees in a plant are managers. Further, half of the firms in the sample are owned by a multinational enterprise with an average tenure of managers of 10.7 years.

Table 5.2. Pearson's correlations

(\* show significance at 1%)

	Total liabilities/ Total assets	Management practices index (z-score)	Current ratio	Profitability	Firm size	GDP_per capita	Domestic credit by financial sector to GDP
Total liabilities/ Total assets	1.0000						
Management practices index	-0.0456	1.0000					
Current ratio	-0.4747*	0.0358	1.0000				
Profitability	-0.3258*	0.1003*	0.0638*	1.0000			
Firm size	-0.0002	0.3475*	-0.0244	0.1103*	1.0000		
LnGDP_per capita	-0.0847*	0.1906*	0.0875*	0.0069	0.1149*	1.0000	
Domestic credit by financial sector to GDP	-0.0634*	-0.0191	0.0619*	-0.0268	0.0042	0.3619*	1.0000
Institutional development	0.0619*	0.0325	-0.0401	-0.0447	0.0829*	0.2454*	-0.2899*
Strength of investor protection	-0.1504*	0.1368*	0.1265*	0.0351	-0.0339	0.5668*	0.1581*
Mangers with college degree(%)	0.0132	0.1905*	-0.0014	0.0117	0.1179*	-0.2241*	-0.2006*
Owned by MNE	-0.0426	0.3742*	0.0814*	0.0667*	0.3150*	0.2501*	0.0255
Manager's tenure in firm	-0.0388	0.0146	0.0461	-0.0010	0.0368	0.1226*	0.0233
Percentage of managers in the plant	-0.0116	0.0044	0.0326	-0.0497	0.0122	0.0526*	0.0124
Interview's duration	0.0183	0.1912*	-0.0310	0.0033	0.0416	-0.0685*	0.0262
Manager's seniority	0.0282	0.0096	-0.0059	0.0051	0.1804*	0.1019*	0.1461*
Reliability measure	0.0114	0.3059*	-0.0278	0.0301	0.0534*	0.0761*	-0.0299

	Institutional development	Strength of investor protection	Mangers with college degree(%)	Owned by MNE	Manager's tenure in firm	Percentage of managers in the plant	Interview's duration
Institutional development	1.0000						
Strength of investor protection	-0.0578*	1.0000					
Mangers with college degree(%)	0.1937*	-0.1763*	1.0000				
Owned by MNE	0.0631*	0.1471*	0.0497*	1.0000			
Manager's tenure in firm	0.0750*	0.0775*	-0.0614*	0.0189	1.0000		
Percentage of managers in the plant	0.0860*	-0.0110	-0.0089	0.0469*	0.0554*	1.0000	
Interview's duration	-0.0032	-0.0841*	0.0667*	0.0643*	0.0766*	0.0332	1.0000
Manager's seniority	-0.0779*	0.1071*	-0.0345	0.0910*	-0.0812*	-0.0674*	-0.0209
Reliability measure	0.0557*	0.0074	0.0602*	0.0617*	0.0662*	0.0400	0.2370*

	Manager's seniority	Reliability measure
Manager's seniority	1.0000	
Reliability measure	-0.1836*	1.0000

Table 5.3. Descriptive statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
Total liabilities /total assets	2,608	0.564	0.280	0.000	1.556
Management practices index (z-score)	3,524	0.000	1.000	-2.786	3.020
Current ratio	2,564	2.203	2.425	0.227	19.092
Profitability	2,536	0.050	0.111	-0.389	0.397
Firm size	2,610	10.729	1.510	7.222	14.888
GDP_per capita	3,657	10.147	0.940	6.659	11.123
Domestic credit by financial sector to GDP	3,663	1.620	0.469	0.429	3.457
Institutional development	3,657	0.647	0.850	-0.596	1.860
Strength of investor protection	3,675	6.272	1.678	2.000	9.700
Mangers with college	3,407	57.148	33.102	0.000	100.000
Owned by MNE	3,515	0.464	0.499	0	1
Manager's tenure in firm	3,518	13.565	9.823	0.050	56.000
Percentage of managers in the plant	3,480	10.737	8.140	1.000	100.000
Interview's duration	3,512	58.506	14.147	40.000	170.000
Manager's seniority	3,509	2.833	0.858	1.000	5.000
Reliability measure	3,517	8.136	1.630	3	10

## 5.4 Empirical identification

The initial model to be estimated is as follows:

$$Y_{i,t} = b_0 + b_1P_{i,t} + b_2X_{i,t} + \text{Country or Year dummies} + \varepsilon_{i,t}. \quad (26)$$

where,  $Y_{i,t}$  is the leverage of firm  $i$  at year  $t$ ,  $P_{i,t}$  is the managerial practice index (WMS),  $X_{i,t}$  is the vector of control variables and  $\varepsilon_{i,t}$  is the error term.

Country-fixed effects are included in our model to capture the average effect of the omitted time-invariant features of the firm related to the country, since the nature of the data does not support the inclusion of firm-fixed effects. Furthermore, year-fixed effects capture omitted time-variant industry or varied economic feature's average effect.

Further, the model that incorporates the effects of the crisis and post-crisis period that is presented at the end of this section is:

$$Y_{i,t} = \alpha + \beta_1P_{i,t} + \beta_2X_{i,t} + \mu_0Crisis_{0709,t} + \mu_1PostCrisis_{1015,t} + \gamma_0Crisis_{0709,t} * P_i + \gamma_1PostCrisis_{1015,t} * P_i + \varepsilon_{i,t}. \quad (27)$$

In (27),  $\mu_0$  and  $\mu_1$  capture the crisis and post-crisis periods' effects on corporate leverage, whilst the coefficients  $\gamma_0$  and  $\gamma_1$  capture the effect of crisis and post-crisis period for different values of management practices index on leverage. Therefore,  $\beta_1 + \gamma_0$  show the overall effect of management practices on leverage during crisis periods.

The use of instrumental variables is considered the most appropriate approach to examine the effect of management practices on corporate leverage. In the presence of a heteroscedastic error term, the simple OLS regression produces misleading results, leading to the use of other estimators, such as 2SLS. However, the small sample size in this study limits the choices for the estimator. The 2SLS is associated with a small sample bias in the presence of weak instruments. As mentioned in Section 3.5.4, the LIML estimator possesses better properties in the case of a small sample with weak instruments, since its weights depend on the data, almost completely removing the 2SLS bias.

Also, the use of an instrumental variables equation under the LIML method accounts for any endogeneity problems that might arise. Of course, this method requires the choice of valid instruments for every explanatory variable that may be connected endogenously to the dependent variable (Wooldridge, 2002).

## 5.5 Empirical results & discussion

### 5.5.1 Instrumental Variables-Limited information maximum likelihood estimations

Table 5.4, below, illustrates the results with instrumental variables and the LIML estimator. In the presence of heteroscedasticity, the LIML estimator may provide misleading results. For that reason, robust standard errors are used. In order to capture differences among countries in the initial specifications, where there are no country-related variables, I employ country dummies. Furthermore, in each case I present the corresponding tests for the validity of the models. In particular, the Kleibergen-Paap rk LM statistic for under-identification test, the Hansen  $J$  statistic for over-identification test, the Kleibergen-Paap rk Wald  $F$  statistic for weak identification test and the corresponding  $p$ -values are reported at the bottom of the Table 5.4.

The Kleibergen-Paap rk LM statistic, reveals that the initial hypothesis of under-identified instruments (i.e. the instruments are not correlated with endogenous regressors), is rejected

at the 1% level of significance, implying that the instruments are “relevant”. Furthermore, the acceptance of the null hypothesis under the Hansen  $J$  statistic implies that the instrumental variables are not correlated with the disturbance term and that the excluded ones are correctly excluded from the equation. Therefore, the instruments are valid. Finally, the rejection of the initial hypothesis of weakly identified parameters suggests that the instruments are not weak. Overall, the tests conclude whether the instruments used are relevant, valid and not weak. The tests for the validity of the specifications in Table 5.4 illustrate that the instruments are relevant, valid and not weak at all.

As it concerns the management practice index, its coefficient is positive in all the specifications, but it is statistically significant in two out of the three specifications. In the presence of country and year dummies, the management practice index is statistically significant at 10%, whereas its statistical significance increases at 5% when the specification does not include any dummies. Still, the management practice index becomes insignificant when the specification includes only year dummies. The magnitude of the effect varies from 0.02 to 0.029. This value indicates that a unit improvement in management practices index increases leverage by 0.029%.

The current ratio is negative and statistically significant at a 1% level in all specifications. Also, its magnitude remains constant at -0.055 across all specifications. Profitability follows the same pattern as the current ratio (i.e., its coefficient is negative), statistically significant at a 1% level, and with almost a constant magnitude, ranging from -0.745 to -0.748. Still, firm size carries a negative sign, but it is statistically significant at the 10% level only when no country or year dummies are present.

Table 5.4. Estimation results (firm-level control variables)

	Specification 1	Specification 2	Specification 3
	<i>Total liabilities/total assets</i>		
<i>Management practices index</i>	0.029**	0.020	0.021*
	(2.100)	(1.513)	(1.713)
<i>Current ratio</i>	-0.055***	-0.055***	-0.055***
	(-15.797)	(-15.919)	(-28.334)
<i>Firm size</i>	-0.007*	-0.002	-0.004
	(-1.685)	(-0.409)	(-0.966)
<i>Profitability</i>	-0.747***	-0.745***	-0.748***
	(-12.394)	(-12.499)	(-17.948)
<i>Constant</i>	0.807***	0.724***	0.753***
	(0.049)	(0.058)	(0.098)
<i>Observations</i>	2,418	2,418	2,418
<i>Year dummies</i>	NO	YES	YES
<i>Country dummies</i>	NO	NO	YES
<i>Arellano-Bond LM statistic</i>	319.113	347.455	472.903
<i>Arellano-Bond specification statistic p-value</i>	0.000	0.000	0.000
<i>Hansen J statistic</i>	7.391	9.835	10.349
<i>Hansen J statistic p-value</i>	0.286	0.132	0.111
<i>Arellano-Bond Wald F statistic</i>	67.595	76.097	82.663
Notes: * p<0.10, **p<0.05, ***p<0.001 . Robust standard errors in parentheses.			

As mentioned earlier, to capture differences across countries that may drive the results presented above, I control for various country-specific characteristics. Table 5-5 illustrates the findings of these specifications. Specifically, these specifications do not include country dummies, but some of them include year dummies. The inclusion of year dummies seems to alter the power of the estimations. In detail, in the presence of year dummies, the instruments may be correlated with the disturbance term and the excluded instruments may not be the correct ones, according to the Hansen J- statistic (rejection of null hypothesis- specifications 5 and 7). The Hansen J- statistic in the rest of the specifications suggests the acceptance of null hypothesis indicating the validity of the instruments.

Table 5.5. Estimation results (firm- and country-level control variables)

	Specification 4	Specification 5	Specification 6	Specification 7	Specification 8	Specification 9
	<i>Total liabilities/total assets</i>					
<i>Management practices index</i>	0.028**	0.017	0.025*	0.018	0.021	0.018
	(1.996)	(1.284)	(1.800)	(1.319)	(1.542)	(1.307)
<i>Current ratio</i>	-0.055***	-0.055***	-0.055***	-0.055***	-0.054***	-0.054***
	(-15.720)	(-15.845)	(-15.690)	(-15.764)	(-15.570)	(-15.646)
<i>Firm size</i>	-0.005	0.001	-0.005	0.001	-0.005	0.000
	(-1.258)	(0.148)	(-1.162)	(0.114)	(-1.156)	(0.029)
<i>Profitability</i>	-0.750***	-0.748***	-0.747***	-0.744***	-0.742***	-0.741***
	(-12.374)	(-12.439)	(-12.286)	(-12.338)	(-12.239)	(-12.320)
<i>GDP per capita</i>	-0.010	-0.011	-0.001	-0.013*	0.001	-0.005
	(-1.518)	(-1.445)	(-1.580)	(-1.776)	(0.091)	(-0.572)
<i>Domestic credit to GDP</i>	-0.009	-0.004	-0.007	0.005	-0.004	0.009
	(-0.730)	(-0.296)	(-0.532)	(0.315)	(-0.323)	(0.590)
<i>Institutional development</i>			0.006	0.015**	-0.005	0.005
			(0.956)	(2.170)	(-0.695)	(0.602)
<i>Strength of Investor</i>					-0.012***	-0.014
					(-2.838)	(-2.866)
<i>Constant</i>	0.900***	0.821***	0.895***	0.824***	0.859***	0.819***
	(11.382)	(9.300)	(11.187)	(9.296)	(10.664)	(9.166)
<i>Observations</i>	2,399	2,399	2,399	2,399	2,399	2,399
<i>Year dummies</i>	NO	YES	NO	YES	NO	YES
<i>Country dummies</i>	NO	NO	NO	NO	NO	NO
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	308.340	344.163	302.643	327.837	306.173	329.889
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000	0.000	0.000
<i>Hansen J statistic</i>	10.873	13.395	12.263	15.837	13.055	16.144
<i>Hansen J statistic p-value</i>	0.092	0.037	0.056	0.015	0.042	0.013
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	65.156	75.172	64.747	72.626	66.205	73.053
Notes: * p<0.10, **p<0.05, ***p<0.001 Robust standard errors in parentheses						

The management practices index is positive in all the specifications but statistically significant only in the ones without year dummies. The level of significance is either 5% or 10% and the magnitude of the coefficients is comparable to the results obtained in the table 5-5. Further, the inclusion of GDP per capita, and domestic credit to GDP have almost no effect on leverage, since they are statistically insignificant almost in all the specifications, apart from specification 7 where the instruments are indicated as invalid. However, the results of institutional development effect on leverage cause scepticism. Specifically, institutional development coefficient is positive and insignificant in all except one case; in that one case, where year dummies are included in the model, it is negative and statistically significant at 5% level with a magnitude of 0.015.

The inclusion of the country level variables does not alter the effect of the current ratio and the profitability ratio on leverage. Also, the coefficient of firm size is negative but statistically insignificant in all the specifications.

To dig deeper, I exclude successively firms based (i) in the United Kingdom and (ii) in Greece, because these two countries constitute a large portion of the total sample. Especially, observations for firms based in the United Kingdom and Greece account for 29.67% and 16,13% of the sample, respectively. Additionally, I estimate a specification where I exclude both countries simultaneously, and a specification that includes observations from these countries only. The results are presented in Table 5.6.

In specifications 10 and 11 (excluding firms operating in United Kingdom) management practice is insignificant in all the specifications, whereas the findings for the remaining firm- and country- level controls are comparable to the ones of the earlier specifications. Specifically, the coefficient of the current ratio and the profitability ratio are negative and statistically significant at 1% level of significance, whereas the impact of firm size, domestic credit, and institutional development is statistically insignificant.

Table 5.6. Estimation results (sub-samples: excluding UK and Greece)

	Specification 10	Specification 11	Specification 12	Specification 13
	Excluding UK	Excluding UK	Excluding GR	Excluding GR
	<b>Total liabilities/total assets</b>			
<i>Management practices index</i>	0.013	0.012	0.015	0.014
	(0.914)	(0.701)	(1.127)	(0.959)
<i>Current ratio</i>	-0.065***	-0.064***	-0.051***	-0.050***
	(-25.671)	(-13.026)	(-24.972)	(-24.502)
<i>Firm size</i>	-0.007	-0.001	-0.003	0.001
	(-1.394)	(-0.249)	(-0.588)	(0.276)
<i>Profitability</i>	-0.698***	-0.687***	-0.720***	-0.713***
	(-13.669)	(-9.205)	(-16.519)	(-16.188)
<i>GDP per capita</i>		-0.006		-0.003
		(-0.724)		(-0.425)
<i>Domestic credit to GDP</i>		0.014		0.008
		(0.814)		(0.547)
<i>Institutional development</i>		0.017		-0.002
		(1.635)		(-0.243)
<i>Strength of investor protection</i>		-0.018**		-0.016***
		(-2.533)		(-2.852)
<i>Constant</i>	0.786***	0.876***	0.734***	0.806***
	(7.794)	(8.050)	(7.288)	(9.241)
<i>Observations</i>	1,750	1,731	2,044	2,025
<i>Year dummies</i>	YES	YES	YES	YES
<i>Country dummies</i>	YES	NO	YES	NO
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	328.924	222.973	394.454	358.494
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000
<i>Hansen J statistic</i>	15.953	23.804	6.159	9.802
<i>Hansen J statistic p-value</i>	0.014	0.001	0.406	0.133
<i>Weak identification test</i>	56.642	47.439	68.562	61.523

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

In addition to the above specifications, Table 5.7 depicts the findings when both UK- and Greek- based firms are excluded from the sample (specifications 14 and 15) and when only UK- and Greek- based firms are included in the sample (specifications 16 and 17). The findings are remarkable when compared to the findings of Table 5.6. The impact of the management practices index is positive in all cases; however, it is statistically significant only in specifications 16 and 17. Therefore, it seems that the results are driven by firms from United Kingdom and Greece.

Table 5.7. Estimation results (sub-samples: excluding/including both UK and Greece)

	Specification 14	Specification 15	Specification 16	Specification 17
	Excluding UK&GR	Excluding UK&GR	Only UK & GR	Only UK & GR
	<b>Total liabilities/total assets</b>			
<i>Management practices index</i>	0.003	0.005	0.034**	0.033*
	(0.152)	(0.250)	(1.973)	(1.947)
<i>Current ratio</i>	-0.059***	-0.058***	-0.052***	-0.052***
	(-21.255)	(-20.444)	(-19.023)	(-19.016)
<i>Firm size</i>	-0.005	0.001	-0.001	-0.001
	(-0.850)	(0.211)	(-0.147)	(-0.153)
<i>Profitability</i>	-0.645***	-0.642***	-0.847***	-0.845***
	(-11.797)	(-11.435)	(-13.158)	(-13.114)
<i>GDP per capita</i>		-0.003		0.244
		(-0.401)		(0.984)
<i>Domestic credit to GDP</i>		0.014		0.471
		(0.856)		(1.162)
<i>Institutional development</i>		0.018		0.164
		(1.243)		(1.099)
<i>Strength of investor protection</i>		-0.030***		-0.032
		(-2.898)		(-0.569)
<i>Constant</i>	0.763***	0.890***	0.742***	2.708
	(7.298)	(8.576)	(8.172)	(0.273)
<i>Observations</i>	1,376	1,357	1,042	1,042
<i>Year dummies</i>	YES	YES	YES	YES
<i>Country dummies</i>	YES	NO	YES	NO
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	251.293	230.894	227.050	227.349
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000
<i>Hansen J statistic</i>	11.827	15.821	4.343	4.608
<i>Hansen J statistic p-value</i>	0.066	0.015	0.630	0.595
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	42.771	39.074	40.876	40.865

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

In Table 5.8, I separate the firms based on their initial management score. Following Bloom and Van Reenen (2007), firms achieving a management score higher than 2 (actually  $\geq 2.01$ )

are considered as those with better management practices, whilst a score of less than 2 indicates worse management practices. According to the results, when restricting the sample to firms implementing better management practices (management practice index  $\geq 2.01$ ), then the index of management practices has a positive and statistically significant effect on corporate leverage (specifications 20 and 21). At the same time, when restricting the sample to firms that do not implement better management practices (specifications 18 and 19), the coefficient of the management practice index is insignificant, implying no effect on corporate leverage. However, the results should be interpreted with caution, since specifications 18 and 19 include only 196 and 194 observations, respectively. The statistics indicate that the instruments in all these specifications are relevant, valid and not weak.

Table 5.8. Estimation results: Worse and Better management practices

	Specification 18	Specification 19	Specification 20	Specification 21
	Worse management practises ( $\leq 2.00$ )		Better management practices ( $\geq 2.01$ )	
<i>Management practices index</i>	0.500	0.323	0.039**	0.032*
	(0.561)	(0.568)	(2.177)	(1.703)
<i>Current ratio</i>	-0.069**	-0.067**	-0.055***	-0.053***
	(-2.397)	(-2.429)	(-16.285)	(-16.030)
<i>Firm size</i>	0.013	0.014	-0.008*	-0.006
	(0.637)	(0.714)	(-1.711)	(-1.294)
<i>Profitability</i>	-1.113***	-1.071***	-0.724***	-0.723***
	(-2.989)	(-3.440)	(-11.751)	(-11.666)
<i>GDP per capita</i>		0.008		-0.001
		(0.178)		(-0.097)
<i>Domestic credit to GDP</i>		-0.033		-0.002
		(-0.523)		(-0.138)
<i>Institutional development</i>		0.003		-0.006
		(0.078)		(-0.784)
<i>Strength of investor protection</i>		0.008		-0.014***
		(0.362)		(-3.089)
<i>Constant</i>	1.525	1.133	0.802***	0.881***
	(1.001)	(1.285)	(16.313)	(10.463)
<i>Observations</i>	196	194.000	2,222	2,205
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	8.396	7.389	243.526	228.940
<i>Underidentification statistic p-value</i>	0.299	0.390	0.000	0.000
<i>Hansen J statistic</i>	3.859	3.805	6.918	12.093
<i>Hansen J statistic p-value</i>	0.696	0.703	0.328	0.060
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	1.275	1.128	45.937	43.638

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

Overall, the findings depict a positive relationship between management practices and corporate leverage, in line with earlier studies suggesting that management practices influence firm outcomes like productivity and performance (Bloom & Van Reenen, 2007; Bloom et al., 2013), and innovation and growth employment rates (Bloom et al., 2013). However, in the context of the present study, the effect of management practices on leverage is not statistically significant in all the specifications.

Trying to dig deeper, I find that the results hold when I restrict the dataset to a sub-sample that includes only firms from Greece and the United Kingdom (the countries with the largest number firm observations in the sample). Therefore, better management practices in Greek and UK firms' increase leverage. At the same time, no relationship seems to exist between management practices and corporate leverage when both Greek and UK based firms are excluded from the initial sample. This evidence suggests that Greece and the UK drive the overall finding.

Further, distinguishing between firms that follow better management practices and those that follow worse practices, reveals that better management practices (a score above 2.01) increases firm debt usage. There might be two possible explanations for this outcome: First, firms with better management practices may appear to creditors as better firms (since firm performance increases), resulting in easy access to or better conditions for credit. Second, the board of directors and top-level management may prefer debt over equity in the presence of more favourable conditions in debt contracts and better prospects for the firms.

With respect to the firm control variables, the results are, in general, the same as the ones obtained in Chapter 3 and 4. The difference lies in the effect of firm size, which appears to be negative, albeit insignificant in most of the specifications.

Turning to the country-level control variables, the impact of domestic credit provided by financial institutions (% GDP) on leverage is statistically insignificant in all the specifications. This finding implies that the availability of domestic credit to firms does not have an effect on leverage, contradicting prior research evidence (Demirguc-Kunt et al., 2015; Kesternich & Schnitzer, 2010). Demirguc-Kunt & Maksimovic (2002), who study large manufacturing firms worldwide, do not find a per se effect of market-based or bank-based financial systems on access to financing, but they find that there is a relationship between the development of the banking sector and the available sources for short term financing.

GDP per capita has a negative impact on corporate leverage in almost all the specifications that is consistent with prior research (An et al., 2016; Arosa et al., 2014), but it is insignificant. Moreover, Serfling (2016) study's on the relationship between firing costs and capital structure for USA based firms concludes that state per capita GDP has no impact on corporate leverage. The effect of institutional development on corporate leverage is statistically insignificant in almost all the specifications. The strength of investor's protection index has a negative impact on corporate leverage, but this impact is not statistically significant in all the specifications. Thus, this provides partial support to Antoniou et al. (2008) who also find a negative effect of shareholder protection on corporate leverage using the anti-director rights index.

### **5.5.2 Further specifications**

In Table 5-8 I separated the firms based on the initial overall management score. In this section, I separate the firms based on the score on each sub-category of management practices index using as threshold, the score of 2.00. Tables 5-9 to 5-12 present the results.

The results illustrate that if firms follow worse practices in one of the four areas of management, i.e. operations, monitoring, targeting and people's management, then index of the management practices has no effect on corporate leverage. If firms follow better practices in one of those four areas, the management practices variable has a positive effect, which is statistically significant in several specifications.

Table 5-9. Estimation results: Worse and Better practices in operations

	Specification 22	Specification 23	Specification 24	Specification 25
	Worse operations practices ( $\leq 2.00$ )		Better operations practices ( $\geq 2.01$ )	
<i>Management practices index</i>	0.055	0.018	0.037*	0.026
	(0.980)	(0.397)	(1.922)	(1.271)
<i>Current ratio</i>	-0.049***	-0.047***	-0.058***	-0.056***
	(-6.348)	(-6.321)	(-14.873)	(-14.619)
<i>Firm size</i>	-0.005	0.000	-0.008	-0.006
	(-0.543)	(0.014)	(-1.598)	(-1.199)
<i>Profitability</i>	-0.822***	-0.828***	-0.735***	-0.730***
	(-5.679)	(-5.690)	(-11.004)	(-10.875)
<i>GDP per capita</i>		-0.011		0.005
		(-0.717)		(0.572)
<i>Domestic credit to GDP</i>		0.013		-0.011
		(0.433)		(-0.779)
<i>Institutional development</i>		-0.030*		0.003
		(-1.945)		(0.376)
<i>Strength of investor protection</i>		-0.014		-0.011**
		(-1.606)		(-2.156)
<i>Constant</i>	0.811***	0.918***	0.810***	0.822***
	(6.401)	(6.054)	(15.163)	(8.673)
<i>Observations</i>	510	509	1,908	1,890
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	50.182	68.834	199.682	188.125
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000
<i>Hansen J statistic</i>	9.113	9.358	4.343	8.752
<i>Hansen J statistic p-value</i>	0.167	0.154	0.630	0.188
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	10.300	14.797	37.118	35.345

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

Table 5.10. Estimation results: Worse and Better practices in monitoring

	Specification 26	Specification 27	Specification 28	Specification 29
	Worse monitor practices ( $\leq 2.00$ )		Better monitor practices ( $\geq 2.01$ )	
<i>Management practices index</i>	-0.686	-0.219	0.027	0.021
	(-0.445)	(-0.797)	(1.509)	(1.133)
<i>Current ratio</i>	-0.113***	-0.109***	-0.053***	-0.052***
	(-5.030)	(-7.896)	(-15.485)	(-15.255)
<i>Firm size</i>	0.023	0.013	-0.006	-0.005
	(0.480)	(0.791)	(-1.360)	(-1.006)
<i>Profitability</i>	-0.006	-0.662	-0.730***	-0.729***
	(-0.003)	(-1.567)	(-11.751)	(-11.668)
<i>GDP per capita</i>		0.008		-0.001
		(0.204)		(-0.124)
<i>Domestic credit to GDP</i>		-0.080		0.001
		(-1.315)		(0.074)
<i>Institutional development</i>		0.017		-0.006
		(0.429)		(-0.766)
<i>Strength of investor protection</i>		0.012		-0.014***
		(0.527)		(-3.137)
<i>Constant</i>	-0.485	0.321	0.788***	0.869***
	(-0.169)	(0.678)	(15.628)	(10.129)
<i>Observations</i>	208	204	2,210	2,195
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	14.256	14.297	244.378	233.813
<i>Underidentification statistic p-value</i>	0.047	0.046	0.000	0.000
<i>Hansen J statistic</i>	5.372	9.658	7.246	11.161
<i>Hansen J statistic p-value</i>	0.497	0.140	0.299	0.084
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	2.442	3.090	47.797	46.320

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

Table 5.11. Estimation results: Worse and Better practices in target setting

	Specification 30	Specification 31	Specification 32	Specification 33
	Worse target practices (<=2.00)		Better target practices (>=2.01)	
<i>Management practices index</i>	0.131	0.038	0.044**	0.035*
	(1.175)	(0.415)	(2.211)	(1.703)
<i>Current ratio</i>	-0.048***	-0.046***	-0.058***	-0.056***
	(-5.383)	(-5.375)	(-15.824)	(-15.598)
<i>Firm size</i>	-0.009	0.004	-0.009*	-0.007
	(-0.603)	(0.293)	(-1.803)	(-1.408)
<i>Profitability</i>	-0.914***	-0.878***	-0.721***	-0.722***
	(-4.419)	(-4.435)	(-11.370)	(-11.345)
<i>GDP per capita</i>		-0.023		0.002
		(-1.080)		(0.202)
<i>Domestic credit to GDP</i>		-0.026		0.001
		(-0.627)		(0.093)
<i>Institutional development</i>		0.001		-0.006
		(0.062)		(-0.808)
<i>Strength of investor protection</i>		0.004		-0.014***
		(0.324)		(-3.020)
<i>Constant</i>	0.979***	0.978***	0.814***	0.866***
	(3.643)	(3.725)	(15.910)	(9.661)
<i>Observations</i>	373	370	2,045	2,029
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	30.497	36.359	207.106	199.482
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000
<i>Hansen J statistic</i>	8.438	11.051	4.257	8.734
<i>Hansen J statistic p-value</i>	0.208	0.087	0.642	0.189
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	5.703	6.895	38.322	36.935

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

Table 5.12. Estimation results: Worse and Better practices in target setting

	Specification 34	Specification 35	Specification 36	Specification 37
	Worse people's management practices ( $\leq 2.00$ )		Better people's management practices ( $\geq 2.01$ )	
<i>Management practices index</i>	0.142	0.115	0.036**	0.027
	(1.625)	(1.587)	(2.007)	(1.502)
<i>Current ratio</i>	-0.055***	-0.052***	-0.055***	-0.054***
	(-5.327)	(-5.058)	(-14.977)	(-14.785)
<i>Firm size</i>	-0.018	-0.018	-0.006	-0.003
	(-1.338)	(-1.414)	(-1.214)	(-0.715)
<i>Profitability</i>	-0.988***	-0.972***	-0.702***	-0.701***
	(-5.486)	(-5.497)	(-11.111)	(-11.000)
<i>GDP per capita</i>		-0.006		0.002
		(-0.287)		(0.237)
<i>Domestic credit to GDP</i>		-0.063		0.001
		(-1.574)		(0.048)
<i>Institutional development</i>		0.011		-0.007
		(0.506)		(-0.902)
<i>Strength of investor protection</i>		-0.012		-0.012***
		(-0.900)		(-2.598)
<i>Constant</i>	1.109***	1.301***	0.777***	0.808***
	(5.279)	(5.337)	(15.127)	(9.291)
<i>Observations</i>	327	322	2,091	2,077
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	35.023	41.529	234.791	225.723
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000
<i>Hansen J statistic</i>	8.817	11.429	3.264	6.897
<i>Hansen J statistic p-value</i>	0.184	0.076	0.775	0.330
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	8.184	10.952	47.316	45.835

Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$  Robust standard errors in parentheses

In the sub-samples of better practices in each area, the management practices index receives a mean value above 3.00 in each area's sample, as Table 5.13 indicates. Specifically, when monitoring area receives a score higher than 2.01, the overall management practice index has a mean higher than 3.058, whereas for a monitoring score lower than 2.00, management

practices index has a mean value of 1.839. This fact justifies the above findings that better management practices in one area imply better management practices in the rest three areas, as the high mean values of the management practices index reveal. At the same time, poor management practices in one area imply poor management practice in the rest three areas, according to the findings that Table 5.14 illustrates.

*Table 5.13. Mean management practices index in each area with better score*

Area	Score	Management practices index					
		Mean	Std.dev.	Min	Max	P25	P50
<i>Operations</i>	>2.01	3.133	0.549	1.389	4.889	2.778	3.111
<i>Monitoring</i>	>2.01	3.058	0.558	1.500	4.889	2.667	3.056
<i>Target setting</i>	>2.01	3.112	0.531	1.444	4.889	2.722	3.111
<i>People's management</i>	>2.01	3.073	0.564	1.444	4.889	2.667	3.056

*Table 5.14. Mean management practices index in each area with worse score*

Area	Score	Management practices index					
		Mean	Std.dev.	Min	Max	P25	P50
<i>Operations</i>	<2.00	2.221	0.498	1.111	3.722	1.889	2.278
<i>Monitoring</i>	<2.00	1.839	0.367	1.111	3.000	1.611	1.833
<i>Target setting</i>	<2.00	1.991	0.396	1.111	3.167	1.722	2.000
<i>People's management</i>	<2.00	2.028	0.454	1.111	3.167	1.722	2.000

Therefore, the results presented in tables 5.9 to 5.12 confirm the earlier findings (Table 5.6), that better management practices increase corporate debt.

## 5.6 Crisis results

To examine potential differences on the impact of managerial practices on corporate leverage during different time periods, I follow two approaches. First, I split the whole sample into two sub-samples: one for the crisis period and one for the post-crisis period. A sub-sample for the pre-crisis period is not used in this analysis, since this would include only one year, 2006. Following prior research, the crisis period is defined as the period from 2007 to 2009 (Bekaert et al., 2014; Berger & Bouwman, 2013; Dungey & Gajurel, 2015), and the post-crisis period, as the period from 2010 to 2015. Second, I use the whole sample but I include crisis and post crisis dummies as well as the interactions with management practices index. Further, in 2010 Greece was still under distress conditions and hence defining the crisis as the period between 2007 and 2009 is not illustrative for the Greek case. However, I ran specifications excluding Greece from the crisis sample, but the findings did not show any

remarkable changes compared to those presented in the table below and so I decided not to present them.

As Table 5-16 demonstrates, the management practices index does not seem to have a significant effect during the crisis period. During the post-crisis period, the management practices index is initially statistically significant and positive; however, the inclusion of country control variables makes its impact insignificant.

In specifications 42-43 capturing the marginal effect of management practices index on corporate leverage during crisis period, the management practices index, as well as, the interaction terms are statistically insignificant.

Table 5-15. Estimation results: Crisis effects

	Specification 38	Specification 39	Specification 40	Specification 41	Specification 42	Specification 43
	Sub-sample crisis	Sub-sample crisis	Sub-sample post-crisis	Sub-sample post-c	Whole sample	Whole sample
<i>Management practices index</i>	-0.005	-0.005	0.029*	0.023	0.147	-0.082
	(-0.204)	(-0.192)	(1.669)	(1.294)	(0.534)	(-0.213)
<i>Firm size</i>	0.008	0.016	-0.009*	-0.008	-0.002	0.000
	(1.017)	(1.526)	(-1.668)	(-1.409)	(-0.430)	(0.122)
<i>Current ratio</i>	-0.044***	-0.044***	-0.059***	-0.058***	-0.055***	-0.054***
	(-6.358)	(-6.327)	(-14.692)	(-14.401)	(-15.540)	(-14.944)
<i>Profitability</i>	-0.507***	-0.513***	-0.853***	-0.845***	-0.733***	-0.733***
	(-3.943)	(-4.043)	(-12.342)	(-12.236)	(-12.206)	(-12.134)
<i>GDP per capita</i>		-0.013		0.013		0.002
		(-0.624)		(1.583)		(0.327)
<i>Domestic credit to GDP</i>		-0.149*		-0.005		-0.006
		(-1.846)		(-0.338)		(-0.470)
<i>Institutional development</i>		-0.004		-0.005		-0.007
		(-0.224)		(-0.565)		(-0.994)
<i>Strength of investor protection</i>		0.062**		-0.016***		-0.010**
		(2.521)		(-3.174)		(-2.056)
<i>Crisis &amp; management interaction</i>					-0.134	0.096
					(-0.484)	(0.247)
<i>Crisis dummy</i>					0.035	-0.009
					(0.519)	(-0.117)
<i>Post-crisis dummy</i>					0.061	0.004
					(0.927)	(0.057)
<i>Post-crisis and management interaction</i>					-0.146	0.085
					(-0.530)	(0.219)
<i>Constant</i>	0.577***	0.453**	0.846***	0.802***	0.687***	0.783***
	(5.890)	(1.964)	(13.751)	(8.518)	(9.683)	(8.334)
<i>Observations</i>	452	452	1,844	1,834	2,418	2,399
<i>Underidentification (Kleibergen-Paap rk LM statistic)</i>	89.473	82.388	239.730	214.071	20.637	20.730
<i>Underidentification statistic p-value</i>	0.000	0.000	0.000	0.000	0.004	0.004
<i>Hansen J statistic</i>	13.863	12.331	18.438	21.530	10.871	14.046
<i>Hansen J statistic p-value</i>	0.031	0.055	0.005	0.001	0.092	0.029
<i>Weak identification test (Kleibergen-Paap rk Wald F statistic)</i>	22.258	20.810	48.555	43.835	2.959	2.949
Notes: * $p < 0.10$ , ** $p < 0.05$ , *** $p < 0.001$ Robust standard errors in parentheses						

## 5.7 Conclusion

The current chapter suggests that firms following good management practices, as captured by WMS, may experience higher debt levels. The findings suggest that improved management practices (score above 2.00) are related to higher debt levels (according to results in sub-samples).

The results show that management practices do not have a significant impact on corporate leverage during the period of the crisis. In addition, firm profitability and liquidity are significant and negative in all the periods and in all the samples. Country-specific factors, namely, GDP per capita, domestic credit to GDP, institutional development and strength of investor protection do not appear to have a strong relationship with corporate leverage.

Overall, good management practices seem to be related to leverage choices during regular periods, but their significance during periods of financial distress is doubtful. Consequently, this could be an avenue for future research.

## Chapter 6: Conclusions

### 6.1 Introduction

This chapter summarizes the overall findings of the current thesis and analyses the implications for institutions and their management. Finally, it discusses some limitations of the current study and potential fields for future research.

### 6.2 Discussion of research findings

Board heterogeneity is a feature of the boards of directors that is being considered as a key determinant of firm performance. Its role on corporate leverage has been partially examined, with the majority of research focusing on gender diversity. The heterogeneity of the board in terms of the genetic diversity in the country of origin of the directors has received minimal attention in the finance literature, and there is no study examining its effect on leverage. Using data for 1,878 firm listings in London and North American Stock Exchanges from 1999–2012 (around 6,000 firm-year observations), I examined the effect of board heterogeneity in terms of genetic diversity, as captured by Delis et al. (2016), on corporate leverage with both static and dynamic models.

The results show that board heterogeneity has a negative influence on corporate leverage. Thus as the number of members coming from heterogeneous regions in terms of genetic diversity increases, the amount of debt financing decreases. This finding contradicts prior research suggesting that board heterogeneity increases efficient firm monitoring, reducing the cost for banking financing and increasing debt financing (Berger et al., 1997).

In the light of arguments that the management teams are the ones responsible for the financial crisis this Thesis also examined the direct effect of managerial ability on firm leverage. Thus, it built on prior research investigating the impact of managerial ability indexes on corporate decisions and outcomes, such as tax avoidance, credit risk assessment, loan contracts and earnings quality (Demerjian et al., 2013; Francis et al., 2016; Bonsall et al., 2016; Koester et al., 2016).

I used fixed effects models and more than 122,000 US firm-year observations from the period 1995 to 2015 to examine the effect of the managerial ability indicator developed by Demerjian et al. (2012) on corporate leverage. The significant impact of the managerial ability score on leverage accords with prior research arguing that managers' features

determine financing decisions, while it contradicts prior evidence of the relationship between managers and leverage decisions (Berger et al., 1997; Bertrand & Schoar, 2003; Faccio et al., 2016; Francis et al., 2016b; Demerjian et al., 2013; Berger et al., 1997; Novae, 2003; Jensen, 1986). Its positive impact indicates the increase of debt usage as a result of the improvement in management skills in generating revenues (by construction of managerial ability index) of top-level executives.

Regarding its impact during the crisis, the significance of the interaction between managerial ability score and the crisis dummy strongly supports the key role of managers' ability to corporate financing decisions. The positive result of the interaction term (managerial ability and crisis dummy) also indicates that increasing managerial ability results in even higher debt levels during periods of financial distress. The overall findings yield the conclusion that the ability of managers is a critical attribute in decisions related to the increase or decrease of corporate leverage.

As regards management practices, the importance of examining their effect on corporate leverage follows the same principle as managerial ability. Specifically, the management team applies certain tools and practices to achieve its goals. Therefore, examining their effectiveness in corporate financing decisions becomes important. In this study, I employed the management practices scores by WMS, and I combined them with financial and country-related data. This produced a sample of 2,680 firm-year observations from 2006–2015, from 21 countries around the world.

Good management practices have a positive impact on firm's leverage, implying that the application of better management practices raises corporate debt. This finding could be possibly explained by earlier evidence documenting increased innovation and employment rates in the presence of better management practices (Bloom et al., 2013). Furthermore, splitting the dataset into sub-samples of firms with better and worse management practices reveals that management practices affect firm leverage only in the case of firms with better management practices. To sum up, the evidence for the relationship between management practices and corporate leverage is ambiguous and it does not lead to a general accepted conclusion.

As it concerns the capital structure theories, it seems that the empirical results mainly support the pecking-order theory, while there is also some evidence in favour of the trade-off theory. Regarding the effects of profitability and current ratio, there is no doubt that they are in accordance with the pecking-order theory, whereas in the case of firm size the picture is

mixed. While management and corporate governance attributes do not directly concern the aforementioned theories, the positive effect of managerial ability and good management practices on leverage seem to contradict the pecking-order theory, since they suggest that managers prefer external to internal financing.

Taking into account all the results of this Thesis (i.e., board diversity, managerial ability and managerial), one concludes that the manipulation of these attributes results in different leverage outcomes. For example, manipulating board diversity would imply choosing directors that come from certain countries; managerial ability could be associated with hiring talented, top-level executives; and managerial practices would be associated with the adoption of good management practices.

It should be mentioned here that both the managerial ability and the managerial practices can be related to some extent to corporate governance. At the same time, as it has been highlighted on several occasions capital structure choice lies in the “hands” of the board of directors. However, the critical point is not its direct determination. Rather the key is in its indirect manipulation, through the strategies followed in selecting and overseeing directors, managers and managerial practices.

One really interesting policy implication is addressed to boards of directors. Hiring more able managers alleviates conflicts between managers and shareholders. Hence, improving the selection process of managers, apart from improving firm’s efficiency (shown by Demerjian et al., 2012), increases debt levels.

At the same time, the findings of the current thesis lead to the conclusion that it is not only the managers (the human beings) that matter for firm’s financing choices but also the employed practices. Therefore, implementation of better practices can be a signal for existing shareholders, or new ones, that a firm is not reluctant about debt financing, and hence there are higher chances that shareholder wealth will increase (compared to firms opposed to debt financing). According to Ganguing and Bilardello (2005) management’s significance is undoubtable, since its contribution to making firms successful is undeniable, as well as its contribution to making them unsuccessful.

### **6.3 Contribution of the thesis**

Focusing on non-traditional firm-level determinates, the current thesis provides new insights into the capital structure literature. First, it contributes to the corporate governance literature, offering insights into the effects of the characteristics of the board-of-directors on corporate

leverage. The results of the Thesis strongly suggest that genetic diversity in the boardroom indeed reduces debt.

Second, the current research contributes to the management field. Researchers have so far claimed that managers are always opposed to debt usage to extend their tenures, and they choose conservative policies that do not increase shareholders' wealth, which causes a conflict of interest between them and shareholders. The evidence in this thesis highlights that more able managers choose debt over equity. Therefore, these managers seem not to be concerned with strategies for their tenure maximization, since they may be more self-confident.

Third, no prior study has related management practices (in innovation, performance and people's management) to corporate capital structure. The sample employed in this part of the analysis is smaller than the one used in earlier chapters (around 2,600 observations), albeit higher in terms of country coverage. The results reveal a relationship between better management practices and leverage, highlighting another important aspect of management.

Fourth, this thesis contributes to the recent and growing literature on the financial crisis, since it examines the effects of the aforementioned variables before, during and after the years of the crisis. The statistically significant interaction term of managerial ability with the crisis dummy, emphasizes the critical role of the managers during periods of economic distress.

#### **6.4 Limitations of the study and future research**

The relationship between genetic diversity in the country of origin of the board of directors and leverage was based on data from the US and the UK. This possibly raises some concerns as for the generalization of the results into an international context. Therefore, future research could extend the sample to include firms from additional countries, and possibly include firms from both developing and developed economies or countries with very diverse characteristics in terms of investor protection, culture, financial markets and institutions.

In order to examine further the role of managerial ability during the crisis, additional specifications could be estimated. This could range from robustness tests like different definitions of leverage, to an attempt to reveal the channels through which managerial ability influences leverage. In addition, the results that relate to management practices are derived using a somewhat small sample in terms of international coverage. The addition of more

firms could result in a better coverage from each country and the examination of additional firm and country differences. Finally, the inclusion of the combined effect of the managerial ability score and the index of management practices on corporate leverage in a single model could provide deeper insights and possibly offer more conclusive arguments. At present this was not possible as the combination of the two datasets would result in an extremely small sample, since managerial ability index is available only for US firms and the management practices index in the current study includes only 200 observations from US firms, from which only a small proportion can be matched with managerial ability data.

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## Appendices

### Appendix A

#### Chapter: Board Diversity

*Table A.1 - Regarding Table 1-whole sample (pg56)*

Variables	N	Mean	SD	Min	Max
Leverage	10,047	0.53	0.25	0.01	1.36
Diversity Deviation	11,085	0.01	0.02	0.00	0.08
Firm Size	10,047	13.25	2.25	7.95	19.40
Profitability	10,012	0.05	0.13	-0.73	0.35
Size of Board of Directors	10,947	2.00	0.35	1.10	2.77
Liquidity	8,233	2.98	13.79	0.28	843.64
Market to Book ratio	9,901	2.62	2.80	-8.43	22.66
Ultraviolet Exposure	11,110	4.52	0.40	3.77	5.60
Migratory Distance	11,100	2.45	0.52	1.05	3.13
Deviation of Masculinity	11,083	1.64	4.41	0.00	33.41
Deviation of Uncertainty Avoidance	11,083	2.30	5.07	0.00	40.63
Deviation of Individualism	11,083	2.09	4.88	0.00	39.84
Deviation of Power Distance	11,083	1.46	3.62	0.00	30.73

*Table A.2- Bootstrapping: 1000 replacements (specification 5-OLS)*

	Total assets/total liabilities
Diversity deviation	-0.693***
	(-3.594)
Firm size	0.041***
	(-20.693)
Prof/bility	-0.171***
	(-8.282)
Market-book ratio	0.008***
	(-7.132)
Current ratio	-0.029***
	(-12.610)
No of directors in board	0.022**
	-2.143
Gender	-0.001***
	(-2.876)
Ind. directors	0.000
	(-0.295)
CEO's dual role	0.008
	(-1.549)
Board's age	0.003***
	-4.677
Ind. in audit committee	0.000
	(-0.907)
Director's network	-0.000***
	(-13.177)
Director's tenure	-0.004***
	(-5.583)
Past roles' ind.	0.000**
	(-2.083)
Legal diversity	0.006
	(-0.388)
Political diversity	-0.003
	(-0.867)
Cultural diversity	-0.019***
	(-9.912)
Development diversity	0.005
	(-0.282)
Trust level diversity	0.001**
	(-2.551)
Constant	-0.073
	(-1.610)
Observations	7235
Adj.R-square	0.351
* p<0.10, **p<0.05, *** p<0.01	

## Appendix B

### Chapter: Managerial Ability

*Table B.1- Hausman Test-Specification (1)* (dependent variable: total debt/total assets- pg.125)

----	Coefficients	----		
	(b)	(B)	(b-B) Difference	$\sqrt{\text{diag}(V_b - V_B)}$ S.E.
	(9) Fixed effects	(9) Random effects		
Managerial ability score	0.117119	0.10715	0.009973	0.00221
Firm size	-0.02692	-0.0122	-0.01472	0.000774
Current ratio	-0.01915	-0.0226	0.003404	0.000122
Profitability	-0.24437	-0.2606	0.016197	0.001197
_Iyear_1996	0.00455	0.00126	0.003288	0.000458
_Iyear_1997	0.015719	0.0099	0.00582	0.00058
_Iyear_1998	0.037065	0.02831	0.00876	0.000657
_Iyear_1999	0.047486	0.03454	0.012951	0.000752
_Iyear_2000	0.043977	0.02967	0.014308	0.000854
_Iyear_2001	0.047574	0.0339	0.013672	0.000861
_Iyear_2002	0.053051	0.03996	0.01309	0.000842
_Iyear_2003	0.048066	0.03412	0.013942	0.000877
_Iyear_2004	0.042956	0.02689	0.016071	0.000941
_Iyear_2005	0.037269	0.01976	0.017508	0.001019
_Iyear_2006	0.044977	0.02505	0.019928	0.001093
_Iyear_2007	0.054838	0.03305	0.02179	0.001196
_Iyear_2008	0.072046	0.04937	0.022677	0.001196
_Iyear_2009	0.065023	0.04231	0.022711	0.001206
_Iyear_2010	0.058484	0.0345	0.023983	0.001267
_Iyear_2011	0.065878	0.04029	0.025585	0.001331
_Iyear_2012	0.074851	0.0481	0.026748	0.001377
_Iyear_2013	0.086761	0.05901	0.027752	0.001475
_Iyear_2014	0.094715	0.06616	0.02856	0.001575
_Iyear_2015	0.114171	0.0822	0.031966	0.001649
b = consistent under Ho and Ha; obtained from xtreg				
ent under Ha, efficient under Ho; obtaine				
Test: Ho:				difference in coefficients not systematic
				$\chi^2(24) = (b-B)'[(V_b - V_B)^{-1}](b-B)$
				= 1354.74
				Prob>chi2 = 0.0000
				(V_b-V_B is not positive definite)

*Table B.2- Hausman test- Specification (3)* (dependent variable: total liabilities/total assets-  
pg.125)

----	Coefficients	----		
	(b)	(B)	(b-B) Difference	sqrt(diag(V_b V_B)) S.E.
	(13) Fixed effects	(13) Random effects		
Managerial ability score	0.3863934	0.42557	-0.03918	0.0031778
Firm size	-0.1196375	-0.0717	-0.0479	0.0011857
Current ratio	-0.0400724	-0.047	0.00695	0.0001797
Profitability	-0.5542262	-0.606	0.051754	0.001791
_Iyear_1996	0.0168797	0.00793	0.00895	0.0000621
_Iyear_1997	0.0330354	0.01582	0.01722	0.0005513
_Iyear_1998	0.0599383	0.03492	0.025018	0.0007179
_Iyear_1999	0.0802643	0.04586	0.034407	0.0009133
_Iyear_2000	0.0936331	0.05164	0.041993	0.0010998
_Iyear_2001	0.1038004	0.06221	0.041586	0.0011057
_Iyear_2002	0.1288609	0.08986	0.038998	0.0010652
_Iyear_2003	0.1533307	0.11225	0.041082	0.0011252
_Iyear_2004	0.1634418	0.11656	0.046885	0.0012395
_Iyear_2005	0.1743517	0.12184	0.052511	0.0013735
_Iyear_2006	0.1902926	0.13069	0.059608	0.0014994
_Iyear_2007	0.2116248	0.14471	0.066915	0.0016701
_Iyear_2008	0.2347272	0.1668	0.067926	0.001666
_Iyear_2009	0.2321444	0.16407	0.068071	0.00168
_Iyear_2010	0.2426345	0.17125	0.071383	0.0017812
_Iyear_2011	0.2626728	0.18594	0.076736	0.0018847
_Iyear_2012	0.274682	0.19482	0.079863	0.0019582
_Iyear_2013	0.2887436	0.20425	0.08449	0.0021214
_Iyear_2014	0.2983207	0.20973	0.088593	0.0022838
_Iyear_2015	0.3205587	0.22793	0.092627	0.0024003
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho:	difference in coefficients not systematic			
	$\chi^2(24) = (b-B)'[(V_b - V_B)^{-1}](b-B)$			
	=3030.33			
	Prob>chi2 = 0.0000			
	(V_b - V_B is not positive definite)			

*Table B.3- Bootstrapping: 1000 replacements (Specifications (1)- (4)) pg. 125)*

	Total debt/total assets		Total liabilities/total assets	
<i>Managerial ability</i> <i>_score</i>	0.117***	0.102***	0.386***	0.376***
	(-11.629)	(-9.347)	(-24.279)	-19.923
<i>Firm size</i>	-0.027***	-0.027***	-0.120***	-0.120***
	(-14.740)	(-13.670)	(-35.411)	(-39.307)
<i>Current ratio</i>	-0.019***	-0.019***	-0.040***	-0.040***
	(-39.317)	(-38.509)	(-51.200)	(-52.669)
<i>Profitability</i>	-0.244***	-0.244***	-0.554***	-0.554***
	(-26.547)	(-26.784)	(-33.447)	(-33.757)
<i>Crisis period</i>		0.065***		0.232***
		(-12.543)		-27.793
<i>Crisis &amp; MA _rank</i> <i>interaction</i>		0.055***		0.045
		(-2.947)		-1.405
<i>Post-crisis period</i>		0.114***		0.320***
		-18.197		-32.927
<i>Post-crisis &amp; MA _rank</i> <i>interaction</i>		0.02		0.01
		-1.132		-0.372
<i>Constant</i>	0.410***	0.411***	1.159***	1.160***
	(-45.36)	(-42.122)	(-72.032)	(-79.398)
<i>Year fixed effects</i>	YES	YES	YES	YES
<i>Firm fixed effects</i>	YES	YES	YES	YES
<i>Observations</i>	122,221	122,221	122,000	122,000
<i>Clusters</i>	15,461	15,461	15,461	15,461
<i>R-within</i>	0.122	0.122	0.247	0.264

Notes: \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

## Appendix C

### Chapter: Managerial Practices

Figure C.1 WMS-Questionnaire: indicative of the all questionnaires used from WMS to collect the management data.

2010 Manufacturing Survey Instrument			
Interview Details		Company and Manager's Information	
Company ID: _____		a) Position: _____	
Company Name: _____		b) Tenure in post ( <i>number of years</i> ): _____	
Interviewer Name: _____		c) Tenure in company ( <i>number of years</i> ): _____	
Date (DD/MM/YY): _____		d) When was your factory built ( <i>number of years</i> )? _____	
Time (24 hour clock): _____		e) Country: _____	
Running interview <input type="checkbox"/> Listening to interview <input type="checkbox"/>		f) Region: _____	
		g) Number of competitors: _____ <i>(i.e. major domestic and international competitors)</i>	
Management Questions			
<u>1) Introducing Lean (Modern) Techniques</u>  <i>Tests how well lean (modern) manufacturing management techniques have been introduced</i>		a) Can you describe the production process for me? b) What kinds of lean (modern) manufacturing processes have you introduced? How long has this practice been in place? Can you give me specific examples? c) How do you manage inventory levels? What is done to balance the line? What is the takt time of your manufacturing processes?	
Score: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/>		Score 1: Other than JIT delivery from suppliers few modern manufacturing techniques have been introduced (or have been introduced in an ad-hoc manner)	Score 3: Some aspects of modern (lean) manufacturing techniques have been introduced, through informal/isolated change programmes
		Score 5: All major aspects of modern/lean manufacturing have been introduced (Just-in-time, automation, flexible manpower, support systems, attitudes and behaviour) in a formal way	
<u>2) Rationale for Introducing Lean (Modern) Techniques</u>  <i>Tests the motivation and impetus behind changes to operations and what change story was communicated</i>		a) Can you take me through the rationale to introduce these processes? b) What factors led to the adoption of these lean (modern) management practices?	
Score: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/>		Score 1: Modern (lean) manufacturing techniques were introduced because others were using them	Score 3: Modern (lean) manufacturing techniques were introduced to reduce costs
		Score 5: Modern (lean) manufacturing techniques were introduced to enable us to meet our business objectives (including costs)	

2010 Manufacturing Survey Instrument

<p><b>3) Process Documentation and Continuous Improvement</b></p> <p><i>Tests processes for and attitudes to continuous improvement and whether learnings are captured/ documented</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) How do problems typically get exposed and fixed?                      b) Talk me through the process for a recent problem.                      c) How can the staff suggest process improvements?</p>		
	<p>Score 1: No process improvements are made when problems occur</p>	<p>Score 3: Improvements are made in 1 week workshops involving all staff (to improve performance in their area of the plant)</p>	<p>Score 5: Exposing problems in a structured way is integral to individuals' responsibilities and resolution occurs as a part of normal business processes rather than by extraordinary effort/teams</p>
<p><b>4) Performance Tracking</b></p> <p><i>Tests whether performance is tracked using meaningful metrics and with appropriate regularity</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) What kind of KPIs would you use for performance tracking?                      b) How frequently are these measured? Who gets to see this KPI data?                      c) If I were to walk through your factory could I tell how you were doing against your KPIs?</p>		
	<p>Score 1: Measures tracked do not indicate directly if overall business objectives are being met. Tracking is an ad-hoc process (certain processes aren't tracked at all)</p>	<p>Score 3: Most key performance indicators are tracked formally; tracking is overseen by senior management</p>	<p>Score 5: Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools</p>
<p><b>5) Performance Review</b></p> <p><i>Tests whether performance is reviewed with appropriate frequency and communicated to staff</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) How do you review your KPIs?                      b) Tell me about a recent meeting.                      c) Who is involved in these meetings? Who gets to see the results of this review?                      d) What is the follow up plan?</p>		
	<p>Score 1: Performance is reviewed infrequently or in an un-meaningful way (e.g. only success or failure is noted)</p>	<p>Score 3: Performance is reviewed periodically with both successes and failures identified; Results are communicated to senior management; No clear follow-up plan is adopted</p>	<p>Score 5: Performance is continually reviewed, based on indicators tracked; All aspects are followed up to ensure continuous improvement; Results are communicated to all staff</p>
<p><b>6) Performance Dialogue</b></p> <p><i>Tests the quality of review conversations</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) How are these meetings structured? Tell me about your most recent meeting.                      b) How would the agenda for the meeting be determined?                      c) What type of feedback occurs in these meetings?                      d) For a given problem, how would you identify the root cause?</p>		
	<p>Score 1: The right data or information for a constructive discussion is often not present or conversations overly focus on data that is not meaningful; Clear agenda is not known and purpose is not stated explicitly</p>	<p>Score 3: Review conversations are held with the appropriate data and information present; Objectives of meetings are clear to all participating and a clear agenda is present. Conversations do not, as a matter of course, drive to the root causes of the problems</p>	<p>Score 5: Regular review/performance conversations focus on problem solving and addressing root causes; Purpose, agenda and follow-up steps are clear to all. Meetings are an opportunity for constructive feedback and coaching</p>

**2010 Manufacturing Survey Instrument**

<p align="center"><b>7) Consequence Management</b></p> <p><i>Tests whether differing levels of performance (not personal but plan/ process based) lead to different consequences</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) Let's say you've agreed to a follow up plan at one of your meetings, what would happen if the plan weren't enacted?</p> <p>b) How long is it between when a problem is identified to when it is solved? Can you give me a recent example?</p> <p>c) How do you deal with repeated failures in a specific business segment?</p>	<p>Score 1: Failure to achieve agreed objectives does not carry any consequences</p>	<p>Score 3: Failure to achieve agreed results is tolerated for a period before action is taken</p>	<p>Score 5: A failure to achieve agreed targets drives retraining in identified areas of weakness or moving individuals to where their skills are appropriate</p>
<p align="center"><b>8) Types and Balance of Targets</b></p> <p><i>Tests whether targets cover a sufficiently broad set of metrics and whether financial and non-financial targets are balanced</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) What types of targets are set for the company? What are the goals for your plant?</p> <p>b) Tell me about the non-financial goals?</p>	<p>Score 1: Goals are exclusively financial or operational</p>	<p>Score 3: Goals include non-financial targets, which form part of the performance appraisal of top management only (they are not reinforced throughout the rest of organisation)</p>	<p>Score 5: Goals are a balance of financial and non-financial targets; Senior managers believe the non-financial targets are often more inspiring and challenging than financials alone (e.g. 60% market share by 2003)</p>
<p align="center"><b>9) Interconnection of Targets</b></p> <p><i>Tests whether targets are tied the organization's objectives and how well they cascade down the organisation</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) What is the motivation behind your goals?</p> <p>b) How are these goals cascaded down to the individual workers?</p> <p>c) How are your targets linked to company performance and their goals?</p>	<p>Score 1: Goals are based purely on accounting figures (with no clear connection to shareholder value)</p>	<p>Score 3: Corporate goals are based on shareholder value but are not clearly cascaded down to individuals</p>	<p>Score 5: Corporate goals focus on shareholder value. They increase in specificity as they cascade through business units ultimately defining individual performance expectations</p>
<p align="center"><b>10) Time Horizon of Targets</b></p> <p><i>Tests whether firm has a '3 horizons' approach to planning and targets</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) What kind of time scale are you looking at with your targets?</p> <p>b) Which goals receive the most emphasis?</p> <p>c) Are long term and short term goals set independently?</p> <p>d) Could you meet all your short-run goals but miss your long-run goals?</p>	<p>Score 1: Top management's main focus is on short term targets</p>	<p>Score 3: There are short and long term goals for all levels of the organisation. As they are set independently, they are not necessarily linked to each other</p>	<p>Score 5: Long term goals are translated into specific short term targets so that short term targets become a "staircase" to reach long term goals</p>

2010 Manufacturing Survey Instrument

<p align="center"><u>11) Target Stretch</u></p> <p align="center"><i>Tests whether targets are based on a solid rationale and are appropriately difficult to achieve</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) How tough are your targets? Do you feel pushed by them?</p> <p>b) On average, how often would you say that you meet your targets?</p> <p>c) Do you feel that all groups receive the same degree of difficulty, in terms of targets? Do some groups get easy targets?</p> <p>d) What is the rationale behind the targets?</p>			
	<table border="1"> <tr> <td>Score 1: Goals are either too easy or impossible to achieve; managers low-ball estimates to ensure easy goals</td> <td>Score 3: In most areas, top management pushes for aggressive goals based on solid economic rationale. There are a few "sacred cows" that are not held to the same rigorous standard</td> <td>Score 5: Goals are genuinely demanding for all divisions. They are grounded in solid, solid economic rationale</td> </tr> </table>	Score 1: Goals are either too easy or impossible to achieve; managers low-ball estimates to ensure easy goals	Score 3: In most areas, top management pushes for aggressive goals based on solid economic rationale. There are a few "sacred cows" that are not held to the same rigorous standard	Score 5: Goals are genuinely demanding for all divisions. They are grounded in solid, solid economic rationale
Score 1: Goals are either too easy or impossible to achieve; managers low-ball estimates to ensure easy goals	Score 3: In most areas, top management pushes for aggressive goals based on solid economic rationale. There are a few "sacred cows" that are not held to the same rigorous standard	Score 5: Goals are genuinely demanding for all divisions. They are grounded in solid, solid economic rationale		
<p align="center"><u>12) Clarity and Comparability of Goals</u></p> <p align="center"><i>Tests how easily understandable performance measures are and whether performance is openly communicated to staff</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) If I asked your staff directly about individual targets what would they tell me?</p> <p>b) Does anyone complain that the targets are too complex?</p> <p>c) How do people know about their own performance compared to other people's performance?</p>			
	<table border="1"> <tr> <td>Score 1: Performance measures are complex and not clearly understood. Individual performance is not made public</td> <td>Score 3: Performance measures are well defined and communicated; performance is public in all levels but comparisons are discouraged</td> <td>Score 5: Performance measures are well defined, strongly communicated and reinforced at all reviews; performance and rankings are made public to induce competition</td> </tr> </table>	Score 1: Performance measures are complex and not clearly understood. Individual performance is not made public	Score 3: Performance measures are well defined and communicated; performance is public in all levels but comparisons are discouraged	Score 5: Performance measures are well defined, strongly communicated and reinforced at all reviews; performance and rankings are made public to induce competition
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<p align="center"><u>13) Instilling a talent mindset/ Managing Talent</u></p> <p align="center"><i>Tests what emphasis is out on overall talent management within the organization</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) How do senior managers show that attracting and developing talent is a top priority?</p> <p>b) Do senior managers get any rewards for bringing in and keeping talented people in the company?</p>			
	<table border="1"> <tr> <td>Score 1: Senior management <b>do not</b> communicate that attracting, retaining and developing talent throughout the organisation is a top priority</td> <td>Score 3: Senior management believe and communicate that having top talent throughout the organisation is a key way to win</td> <td>Score 5: Senior managers are evaluated and held accountable on the strength of the talent pool they actively build</td> </tr> </table>	Score 1: Senior management <b>do not</b> communicate that attracting, retaining and developing talent throughout the organisation is a top priority	Score 3: Senior management believe and communicate that having top talent throughout the organisation is a key way to win	Score 5: Senior managers are evaluated and held accountable on the strength of the talent pool they actively build
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<p align="center"><u>14) Building a High-Performance Culture through Incentives and Appraisals</u></p> <p align="center"><i>Tests whether there is a systematic approach to identifying good and bad performers and rewarding them proportionately</i></p> <p>Score:</p> <p>1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/></p>	<p>a) How does your appraisal system work? Tell me about the most recent round?</p> <p>b) How does the bonus system work?</p> <p>c) Are there any non-financial rewards for top performers?</p> <p>d) How does your reward system compare to your competitors?</p>			
	<table border="1"> <tr> <td>Score 1: People within our firm are rewarded equally irrespective of performance level</td> <td>Score 3: Our company has an evaluation system for the awarding of performance related rewards</td> <td>Score 5: We strive to outperform the competitors by providing ambitious stretch targets with clear performance related accountability and rewards</td> </tr> </table>	Score 1: People within our firm are rewarded equally irrespective of performance level	Score 3: Our company has an evaluation system for the awarding of performance related rewards	Score 5: We strive to outperform the competitors by providing ambitious stretch targets with clear performance related accountability and rewards
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**2010 Manufacturing Survey Instrument**

<b>Manager's Bonus:</b> What is your bonus as a percentage of salary? _____ What is your percentage increase of salary, when you receive a promotion? _____		% of the bonus based on individual performance _____ % of the bonus based on team/plant performance _____ % of the bonus based on company performance _____	Refused to answer Yes <input type="checkbox"/> No <input type="checkbox"/> Bonus on individual, team, and company performance MUST add up to 100
<u>15) Removing Poor Performers/ Making Room for Talent</u>  <i>Tests how well the organization is able to deal with underperformers</i>  Score: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/>		a) If you had a worker who could not do his job what would you do? Could you give me a recent example? b) How long would underperformance be tolerated? c) Do you find any workers who lead a sort of charmed life? Do some individuals always just manage to avoid being fixed/fired?	
		Score 1: Poor performers are rarely removed from their positions	Score 3: Suspected poor performers stay in a position for a few years before action is taken
		Score 5: We move poor performers out of the company or to less critical roles as soon as a weakness is identified	
<u>16) Developing Talent and Promoting High-Performers</u>  <i>Tests whether promotion is performance based and whether talent is developed within the organization</i>  Score: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/>		a) Tell me about your promotion system. b) What about poor performers? What happens with them? Are there any examples you can think of? c) How would you identify and develop your star performers? d) If two people both joined the company 5 years ago and one was much better than the other what job opportunities would he/she have in the company?	
		Score 1: People are promoted primarily upon the basis of tenure	Score 3: People are promoted upon the basis of performance
		Score 5: We actively identify, develop and promote our top performers	
<u>17) Distinctive Employee Value Proposition</u>  <i>Tests the strength of the employee value proposition</i>  Score: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/>		a) What makes it distinctive to work at your company as opposed to your competitors? b) If you were trying to sell your firm to me how would you do this (get them to try to do this)? c) What don't people like about working in your firm?	
		Score 1: Our competitors offer stronger reasons for talented people to join their companies	Score 3: Our value proposition to those joining our company is comparable to those offered by others in the sector
		Score 5: We provide a unique value proposition above our competitors to encourage talented people to join our company	
<u>18) Retaining Talent</u>  <i>Tests whether the organization will go out of its way to keep its top talent</i>  Score: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> -99 <input type="checkbox"/>		a) If you had a star performer who wanted to leave what would the company do? b) Could you give me an example of a star performers being persuaded to stay after wanting to leave? c) Could you give me an example of a star performer who left the company without anyone trying to keep them?	
		Score 1: We do little to try and keep our top talent	Score 3: We usually work hard to keep our top talent
		Score 5: We do whatever it takes to retain our talent	

2010 Manufacturing Survey Instrument

Organization Questions

a) How many people are in the firm? \_\_\_\_\_

Please say "Now I want to talk about the firm hierachy". Then iteratively ask "Who does a shop floor worker report to?", "Who would [their boss] report to"....., Keep asking until you reach the CEO

b) Number of levels in the firm BETWEEN the shopfloor and the CEO: \_\_\_\_\_

c) Have the levels changed in the last 3 years? Yes  No  -99

d) If Yes, number of levels added (negative for subtracted): \_\_\_\_\_

Please confirm back to them the reporting levels between Plant management and shopfloor

e) Number of levels BETWEEN the shopfloor and the Plantmanager: \_\_\_\_\_

f) How many people are in the plant? \_\_\_\_\_

g) How many people directly report to the PLANT MANAGER (i.e. the number of people the PLANTMANAGER manages directly in the hierachical layer below him)? \_\_\_\_\_

h) How much do managers decide how tasks are allocated across workers in their teams?

- Managers make all the decisions
- Managers make most of the decisions
- Decision making is about equal
- Workers make most of the decisions
- Workers make all the decisions

i) Who decides the pace of work on the shopfloor?

- Managers make all the decisions
- Managers make most of the decisions
- Decision making is about equal
- Workers make most of the decisions
- Workers make all the decisions
- Customer demand determines pace

j) To hire a FULL-TIME PERMANENT SHOPFLOOR worker what agreement would your plant need from CHQ?

Score:

1  2  3  4  5  -99

Score 1: No authority – even for replacement hires

Score 3: Requires sign-off from CHQ based on the business case, but is typically agreed (i.e. 80-90% of the time)

Score 5: The plant has complete authority

k) What is the largest CAPITAL INVESTMENT your plant could make without PRIOR authorization from CHQ? (ignore form filling) [PLEASE CROSS CHECK ANY ZERO RESPONSE BY ASKING "what about buying a new computer - would that be possible?", and then probe... \_\_\_\_\_

l) Where are decisions taken on new product introductions - at the plant, at the CHQ or at both?

Score:

1  2  3  4  5  -99

Score 1: All new product introduction decisions taken at CHQ.

Score 3: New product introductions are jointly determined by the plant and CHQ.

Score 5: All new product introduction decisions take place at the plant level.

**2010 Manufacturing Survey Instrument**

m) How much of sales and marketing is carried out at the plant level (rather than at CHQ)?

Score:

1  2  3  4  5  -99

Score 1: None- sales and marketing is all at CHQ.

Score 3: Sales and marketing decisions are split between plant and CHQ.

Score 5: The plant runs all sales and marketing.

n) Is CHQ on the site being interviewed? \_\_\_\_\_

o) How many production sites in the firm? \_\_\_\_\_

p) How many production sites are abroad? \_\_\_\_\_

q) What percent of production is outsourced? \_\_\_\_\_

r) What percent of production is exported? \_\_\_\_\_

s) How has the credit crunch impacted the way you manage your firm, if at all?

Cost Cutting \_\_\_\_\_

Changed Product Mix \_\_\_\_\_

Reduced Employment Levels \_\_\_\_\_

Reduced Investment \_\_\_\_\_

Cut Prices \_\_\_\_\_

Any Other? \_\_\_\_\_

**Ownership**

a) Who ultimately owns the firm (the single largest shareholding block)? If multinational who owns the parent firm in the home country?  
*If no entity owns more than 25% of the shares, tick the "Dispersed Shareholder" box*

Founder     Family (+2<sup>nd</sup> gen)     Private Individuals     Managers

Dispersed Shareholders     Private Equity or Venture Capital

Joint Venture     Government     Other \_\_\_\_\_

b) Has ownership changed in the last 3 years?    Yes  No  -99   
If changed, who owned the firm 3 years ago?

Founder     Family (+2<sup>nd</sup> gen)     Private Individuals     Managers

Dispersed Shareholders     Private Equity or Venture Capital

Joint Venture     Government     Other \_\_\_\_\_

c) Is the firm owned by a foreign Multinational?    Yes  No  -99

If yes, which country is the Multinational from? \_\_\_\_\_

*Ask only if family/founder owns (or owned the firm 3 years ago)*

d) Is a family member CEO?    Yes  No  -99

e) Which generation? \_\_\_\_\_

f) How many family members are working in management in the firm? \_\_\_\_\_

g) When CEO control was passed down through the family was it given to the oldest son?    Yes  No  -99

2010 Manufacturing Survey Instrument

Human Resources/ Constraints on Management

Managers are individuals with line control of others - i.e. they direct their work and help set their pay

Managers Non-Managers

- a) Percent of employees who are \_\_\_\_\_
- b) Percent with a college degree \_\_\_\_\_
- c) Average actual hours worked per week \_\_\_\_\_
- d) Percent of managers who have left in the last 12 months (in plant) \_\_\_\_\_
- e) Percent employees who are union members \_\_\_\_\_

f) Roughly how many times bigger is the CEO salary than a standard shopfloor salary. That is, does the CEO earn twice as much, ten times as much, or 100 times as much?

\_\_\_\_\_ Refused to answer: Yes  No

g) Ignoring yourself, how well managed do you think the rest of the company is on scale: 1 to 10, where 1 is worst practice, 10 is best practice and 5 is average

Overall \_\_\_\_\_  
 Operations (production processes) \_\_\_\_\_  
 Talent (people, promotions, incentives, etc.) \_\_\_\_\_

Would you like me to send you a copy of this report when it is written? Yes  No

Constraints on Management:

h) We have been discussing different aspects of management within your firm, looking back what do you think might constrain improving any of your management practices? For example, I will go through a few options, and could you tell me if these are a major, a minor obstacle or not an obstacle at all?

Hiring managers with the right skills:

Not an obstacle  Major Obstacle  Minor Obstacle

Hiring non-managers with the right skills:

Not an obstacle  Major Obstacle  Minor Obstacle

Employment laws and regulations:

Not an obstacle  Major Obstacle  Minor Obstacle

Trade unions:

Not an obstacle  Major Obstacle  Minor Obstacle

Obtaining cost-effective management consultancy:

Not an obstacle  Major Obstacle  Minor Obstacle

Knowing what new management practices to introduce:

Not an obstacle  Major Obstacle  Minor Obstacle

Any Other? \_\_\_\_\_

Not an obstacle  Major Obstacle  Minor Obstacle

**2010 Manufacturing Survey Instrument**

**Post - Interview**

a) Interview duration (minutes) \_\_\_\_\_

b) Interviewee knowledge of management practices

Score:

1  2  3  4  5

Score 1: Some knowledge his site, and no knowledge about the rest of the firm

Score 3: Expert knowledge his site, and some knowledge about the rest of the firm

Score 5: Expert knowledge about his site and the rest of the firm

c) Interviewee willingness to reveal information

Score:

1  2  3  4  5

Score 1: Very reluctant to provide more than basic information

Score 3: Provides all basic information and some more confidential information

Score 5: Totally willing to provide any information about the firm!

d) Interviewee patience

Score:

1  2  3  4  5

Score 1: Little patience - wants to run the interview as quickly as possible. I felt heavy time pressure.

Score 3: Some patience - willing to provide richness to answers but also time constrained. I felt moderate time pressure

Score 5: Lot of patience - willing to talk for as long as required. I felt no time pressure.

e) Number of times mentioned the environment \_\_\_\_\_

Attitude on the environment (if mentioned)

Score:

1  2  3  4  5

Score 1: Environmental Regulations seen entirely as a hindrance - bad for the firm

Score 3: Good environment important but also a constraint - mixed for the firm

Score 5: Good environment very important and takes priority over other objectives - good for the firm

f) Number of times rescheduled (0=never rescheduled) \_\_\_\_\_

j) Did the interviewee have a degree - guess if not told \_\_\_\_\_

g) Seniority of interviewee

Director                       VP/General Manager     Plant or Factory Manager

Manufacturing/Production Manager     Technician

k) Manager studied abroad                      Yes  No

h) Age of interviewee (don't ask) - guess if not told \_\_\_\_\_

l) Interview language

i) Gender of interviewee                                      Male  Female

*Table C.1 - WMS- Scoring Table (Bloom and Van Reenen 2007)*

**Any score from 1 to 5 can be given, but the scoring guide and examples are only provided for scores of 1, 3 and 5. Multiple questions are used for each dimension to improve scoring accuracy.**

<b>(1) Modern manufacturing, introduction</b>			
	a) Can you describe the production process for me? b) What kinds of lean (modern) manufacturing processes have you introduced? Can you give me specific examples? c) How do you manage inventory levels? What is done to balance the line? <small>Angular Strip</small>		
	<b>Score 1</b>	<b>Score 3</b>	<b>Score 5</b>
<b>Scoring grid:</b>	Other than Just-In-Time (JIT) delivery from suppliers few modern manufacturing techniques have been introduced, (or have been introduced in an ad-hoc manner)	Some aspects of modern manufacturing techniques have been introduced, through informal/isolated change programs	All major aspects of modern manufacturing have been introduced (Just-In-Time, automation, flexible manpower, support systems, attitudes and behaviour) in a formal way
<b>Examples:</b>	A UK firm orders in bulk and stores the material on average 6 months before use. The business focuses on quality and not reduction of lead-time or costs. Absolutely no modern manufacturing techniques had been introduced.	A supplier to the army is undergoing a full lean transformation. For 20 years, the company was a specialty supplier to the army, but now they have had to identify other competencies forcing them to compete with lean manufacturers. They have begun adopting specific lean techniques and plan to use full lean by the end of next year.	A US firm has formally introduced all major elements of modern production. It reconfigured the factory floor based on value stream mapping and 5-S principles, broke production into cells, eliminated stockrooms, implemented Kanban, and adopted Takt time analyses to organize workflow [these are all forms of lean/modern manufacturing techniques].
<b>(2) Modern manufacturing, rationale</b>			
	a) Can you take through the rationale to introduce these processes? b) What factors led to the adoption of these lean (modern) management practices?		
	<b>Score 1</b>	<b>Score 3</b>	<b>Score 5</b>
<b>Scoring grid:</b>	Modern manufacturing techniques were introduced because others were using them.	Modern manufacturing techniques were introduced to reduce costs	Modern manufacturing techniques were introduced to enable us to meet our business objectives (including costs)
<b>Examples:</b>	A German firm introduced modern techniques because all its competitors were using these techniques. The business decision had been taken to imitate the competition.	A French firm introduced modern manufacturing methods primarily to reduce costs.	A US firm implemented lean techniques because the COO had worked with them before and knew that they would enable the business to reduce costs, competing with cheaper imports through improved quality, flexible production, greater innovation and JIT delivery.

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**(3) Process problem documentation**

- a) How would you go about improving the manufacturing process itself?
- b) How do problems typically get exposed and fixed?
- c) Talk me through the process for a recent problem.
- d) Do the staff ever suggest process improvements?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	No, process improvements are made when problems occur.	Improvements are made in one week workshops involving all staff, to improve performance in their area of the plant	Exposing problems in a structured way is integral to individuals' responsibilities and resolution occurs as a part of normal business processes rather than by extraordinary effort/teams
<b>Examples:</b>	A US firm has no formal or informal mechanism in place for either process documentation or improvement. The manager admitted that production takes place in an environment where nothing has been done to encourage or support process innovation.	A US firm takes suggestions via an anonymous box, they then review these each week in their section meeting and decide any that they would like to proceed with.	The employees of a German firm constantly analyse the production process as part of their normal duty. They film critical production steps to analyse areas more thoroughly. Every problem is registered in a special database that monitors critical processes and each issue must be reviewed and signed off by a manager.

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**(4) Performance tracking**

- a) Tell me how you track production performance?
- b) What kind of Key Performance Indicators (KPIs) would you use for performance tracking? How frequently are these measured? Who gets to see this KPI data?
- c) If I were to walk through your factory could I tell how you were doing against your KPI's?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Measures tracked do not indicate directly if overall business objectives are being met. Tracking is an ad-hoc process (certain processes aren't tracked at all)	Most key performance indicators are tracked formally. Tracking is overseen by senior management.	Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools.
<b>Examples:</b>	A manager of a US firm tracks a range of measures when he does not think that output is sufficient. He last requested these reports about 8 months ago and had them printed for a week until output increased again.	At a US firm every product is bar-coded and performance indicators are tracked throughout the production process; however, this information is not communicated to workers	A US firm has screens in view of every line. These screens are used to display progress to daily target and other performance indicators. The manager meets with the shop floor every morning to discuss the day past and the one ahead and uses monthly company meetings to present a larger view of the goals to date and strategic direction of the business to employees. He even stamps napkins with key performance achievements to ensure everyone is aware of a target that has been hit.

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(5) Performance review

- a) How do you review your Key Performance Indicators (KPIs)?
- b) Tell me about a recent meeting
- c) Who is involved in these meetings? Who gets to see the results of this review?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Performance is reviewed infrequently or in an un-meaningful way, e.g. only success or failure is noted.	Performance is reviewed periodically with successes and failures identified. Results are communicated to senior management. No clear follow-up plan is adopted.	Performance is continually reviewed, based on indicators tracked. All aspects are followed up ensure continuous improvement. Results are communicated to all staff
<b>Examples:</b>	A manager of a US firm relies heavily on his gut feel of the business. He will review costs when he thinks there is too much or too little in the stores. He admits he is busy so reviews are infrequent. He also mentioned staffs feel like he is going on a hunt to find a problem, so he has now made a point of highlighting anything good.	A UK firm uses daily production meetings to compare performance to plan. However, clear action plans are infrequently developed based on these production results.	A French firm tracks all performance numbers real time (amount, quality etc). These numbers are continuously matched to the plan on a shift-by-shift basis. Every employee can access these figures on workstations on the shop floor. If scheduled numbers are not met, action for improvement is taken immediately.

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(6) Performance dialogue

- a) How are these meetings structured? Tell me about your most recent meeting.
- b) During these meeting, how much useful data do you have?
- c) How useful do you find problem solving meetings?
- d) What type of feedback occurs in these meetings?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	The right data or information for a constructive discussion is often not present or conversations overly focus on data that is not meaningful. Clear agenda is not known and purpose is not stated explicitly	Review conversations are held with the appropriate data and information present. Objectives of meetings are clear to all participating and a clear agenda is present. Conversations do not, as a matter of course, drive to the root causes of the problems.	Regular review/performance conversations focus on problem solving and addressing root causes. Purpose, agenda and follow-up steps are clear to all. Meetings are an opportunity for constructive feedback and coaching.
<b>Examples:</b>	A US firm does not conduct staff reviews. It was just "not the philosophy of the company" to do that. The company was very successful during the last decade and therefore did not feel the need to review their performance.	A UK firm focuses on key areas to discuss each week. This ensures they receive consistent management attention and everyone comes prepared. However, meetings are more of an opportunity for everyone to stay abreast of current issues rather than problem solve.	A German firm meets weekly to discuss performance with workers and management. Participants come from all departments (shop floor, sales, R&D, procurement etc.) to discuss the previous week performance and to identify areas to improve. They focus on the cause of problems and agree topics to be followed up the next week, allocating all tasks to individual participants.

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**(7) Consequence management**

- a) What happens if there is a part of the business (or a manager) who isn't achieving agreed upon results? Can you give me a recent example?
- b) What kind of consequences would follow such an action?
- c) Are there any parts of the business (or managers) that seem to repeatedly fail to carry out agreed actions?

	<b>Score 1</b>	<b>Score 3</b>	<b>Score 5</b>
<b>Scoring grid:</b>	Failure to achieve agreed objectives does not carry any consequences	Failure to achieve agreed results is tolerated for a period before action is taken.	A failure to achieve agreed targets drives retraining in identified areas of weakness or moving individuals to where their skills are appropriate
<b>Examples:</b>	At a French firm, no action is taken when objectives are not achieved. The President personally intervenes to warn employees but no stricter action is taken. Cutting payroll or making people redundant because of a lack of performance is very rarely done.	Management of a US firm reviews performance quarterly. That is the earliest they can react to any underperformance. They increase pressure on the employees if targets are not met.	A German firm takes action as soon as a weakness is identified. They have even employed a psychologist to improve behavior within a difficult group. People receive ongoing training to improve performance. If this doesn't help they move them in other departments or even fire individuals if they repeatedly fail to meet agreed targets

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**(8) Target balance**

- a) What types of targets are set for the company? What are the goals for your plant?
- b) Tell me about the financial and non-financial goals?
- c) What does Company Head Quarters (CHQ) or their appropriate manager emphasize to you?

	<b>Score 1</b>	<b>Score 3</b>	<b>Score 5</b>
<b>Scoring grid:</b>	Goals are exclusively financial or operational	Goals include non-financial targets, which form part of the performance appraisal of top management only (they are not reinforced throughout the rest of organization)	Goals are a balance of financial and non-financial targets. Senior managers believe the non-financial targets are often more inspiring and challenging than financials alone.
<b>Examples:</b>	At a UK, firm performance targets are exclusively operational. Specifically volume is the only meaningful objective for managers, with no targeting of quality, flexibility or waste.	For French firm strategic goals are very important. They focus on market share and try to hold their position in technology leadership. However, workers on the shop floor are not aware of those targets.	A US firm gives everyone a mix of operational and financial targets. They communicate financial targets to the shop floor in a way they found effective – for example telling workers they pack boxes to pay the overheads until lunchtime and after lunch it is all profit for the business. If they are having a good day the boards immediately adjust and play the “profit jingle” to let the shop floor know that they are now working for profit. Everyone cheers when the jingle is played.

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**(9) Target interconnection**

- a) What is the motivation behind your goals?
- b) How are these goals cascaded down to the individual workers?
- c) What are the goals of the top management team (do they even know what they are!)?
- d) How are your targets linked to company performance and their goals?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Goals are based purely on accounting figures (with no clear connection to shareholder value)	Corporate goals are based on shareholder value but are not clearly communicated down to individuals	Corporate goals focus on shareholder value. They increase in specificity as they cascade through business units ultimately defining individual performance expectations.
<b>Examples:</b>	A family owned firm in France is only concerned about the net income for the year. They try to maximize income every year without focusing on any long term consequences.	A US firm bases its strategic corporate goals on enhancing shareholder value, but does not clearly communicate this to workers. Departments and individuals have little understanding of their connection to profitability or value with many areas labeled as "cost-centers" with an objective to cost-cut despite potentially disproportionately large negative impact on the other departments they serve.	For a US firm strategic planning begins with a bottom up approach that is then compared with the top down aims. Multifunctional teams meet every 6 months to track and plan deliverables for each area. This is then presented to the area head that then agrees or refines it and then communicates it down to his lowest level. Everyone has to know exactly how he or she contributes to the overall goals or else they will not understand how important the 10 hours they spend at work every day is to the business.

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**(10) Target time horizon**

- a) What kind of time scale are you looking at with your targets?
- b) Which goals receive the most emphasis?
- c) How are long term goals linked to short term goals?
- d) Could you meet all your short-run goals but miss your long-run goals?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Top management's main focus is on short term targets	There are short and long-term goals for all levels of the organization. As they are set independently, they are not necessarily linked to each other	Long term goals are translated into specific short term targets so that short term targets become a "staircase" to reach long term goals
<b>Examples:</b>	A UK firm has had several years of ongoing senior management changes – therefore senior managers are only focusing on how the company is doing this month versus the next, believing that long-term targets will take care of themselves.	A US firm has both long and short-term goals. The senior managers know the long-term goals and the short-term goals are the remit of the operational managers. Operations managers only occasionally see the longer-term goals so are often unsure how they link with the short term goals.	A UK firm translates all their goals – even their 5-year strategic goals - into short-term goals so they can track their performance to them. They believe that it is only when you make someone accountable for delivery within a sensible timeframe that a long-term objective will be met. They think it is more interesting for employees to have a mix of immediate and longer-term goals.

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**(11) Targets are stretching**

- a) How tough are your targets? Do you feel pushed by them?
- b) On average, how often would you say that you meet your targets?
- c) Are there any targets which are obviously too easy (will always be met) or too hard (will never be met)?
- d) Do you feel that on targets that all groups receive the same degree of difficulty? Do some groups get easy targets?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Goals are either too easy or impossible to achieve; managers provide low estimates to ensure easy goals	In most areas, top management pushes for aggressive goals based on solid economic rationale. There are a few "sacred cows" that are not held to the same rigorous standard	Goals are genuinely demanding for all divisions. They are grounded in solid, solid economic rationale
<b>Examples:</b>	A French firm uses easy targets to improve staff morale and encourage people. They find it difficult to set harder goals because people just give up and managers refuse to work people harder.	A chemicals firm has 2 divisions, producing special chemicals for very different markets (military, civil). Easier levels of targets are requested from the founding and more prestigious military division.	A manager of a UK firm insisted that he has to set aggressive and demanding goals for everyone – even security. If they hit all their targets he worries he has not stretched them enough. Each KPI is linked to the overall business plan.

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**(12) Performance clarity**

- a) What are your targets (i.e. do they know them exactly)? Tell me about them in full.
- b) Does everyone know their targets? Does anyone complain that the targets are too complex?
- c) How do people know about their own performance compared to other people's performance?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Performance measures are complex and not clearly understood. Individual performance is not made public	Performance measures are well defined and communicated; performance is public in all levels but comparisons are discouraged	Performance measures are well defined, strongly communicated and reinforced at all reviews; performance and rankings are made public to induce competition
<b>Examples:</b>	A German firm measures performance per employee based on differential weighting across 12 factors, each with its own measurement formulas (e.g. Individual versus average of the team, increase on prior performance, thresholds etc.). Employees complain the formula is too complex to understand, and even the plant manager could not remember all the details.	A French firm does not encourage simple individual performance measures as unions pressure them to avoid this. However, charts display the actual overall production process against the plan for teams on regular basis.	At a US firm self-directed teams set and monitor their own goals. These goals and their subsequent outcomes are posted throughout the company, encouraging competition in both target setting and achievement. Individual members know where they are ranked which is communicated personally to them bi-annually. Quarterly company meetings seek to review performance and align targets.

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**(13) Managing human capital**

- a) Do senior managers discuss attracting and developing talented people?
- b) Do senior managers get any rewards for bringing in and keeping talented people in the company?
- c) Can you tell me about the talented people you have developed within your team? Did you get any rewards for this?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Senior management do <b>not</b> communicate that attracting, retaining and developing talent throughout the organization is a top priority	Senior management believe and communicate that having top talent throughout the organization is a key way to win	Senior managers are evaluated and held accountable on the strength of the talent pool they actively build
<b>Examples:</b>	A US firm does not actively train or develop its employees, and does not conduct performance appraisals or employee reviews. People are seen as a secondary input to the production.	A US firm strives to attract and retain talent throughout the organization, but does not hold managers individually accountable for the talent pool they build. The company actively cross-trains employees for development and challenges them through exposure to a variety of technologies.	A UK firm benchmarks human resources practices at leading firms. A cross-functional HR excellence committee develops policies and strategies to achieve company goals. Bi-monthly directors' meetings seek to identify training and development opportunities for talented performers.

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**(14) Rewarding high-performance**

- a) How does your appraisal system work? Tell me about the most recent round?
- b) How does the bonus system work?
- c) Are there any non-financial rewards for top-performers?
- d) How does your reward system compare to your competitors?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	People within our firm are rewarded equally irrespective of performance level	Our company has an evaluation system for the awarding of performance related rewards	We strive to outperform the competitors by providing ambitious stretch targets with clear performance related accountability and rewards
<b>Examples:</b>	An East Germany firm pays its people equally and regardless of performance. The management said to us "there are no incentives to perform well in our company". Even the management is paid an hourly wage, with no bonus pay.	A German firm has an awards system based on three components: the individual's performance, shift performance, and overall company performance.	A US firm sets ambitious targets, rewarded through a combination of bonuses linked to performance, team lunches cooked by management, family picnics, movie passes and dinner vouchers at nice local restaurants. They also motivate staff to try by giving awards for perfect attendance, best suggestion etc.

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**(15) Removing poor performers**

- a) If you had a worker who could not do his job what would you do? Could you give me a recent example?
- b) How long would underperformance be tolerated?
- c) Do you find any workers who lead a sort of charmed life? Do some individuals always just manage to avoid being fixed/fired?

	<b>Score 1</b>	<b>Score 3</b>	<b>Score 5</b>
<b>Scoring grid:</b>	Poor performers are rarely removed from their positions	Suspected poor performers stay in a position for a few years before action is taken	We move poor performers out of the company or to less critical roles as soon as a weakness is identified
<b>Examples:</b>	A French firm had a supervisor who was regularly drinking alcohol at work but no action was taken to help him or move him. In fact, no employee had ever been laid off in the factory. According to the plant manager HR "kicked up a real fuss" whenever management wanted to get rid of employees, and told managers their job was production not personnel.	For a German firm it is very hard to remove poor performers. The management has to prove at least three times that an individual underperformed before they can take serious action.	At a US firm, the manager fired four people during last couple of months due to underperformance. They continually investigate why and who are underperforming.

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**(16) Promoting high performers**

- a) Can you rise up the company rapidly if you are really good? Are there any examples you can think of?
- b) What about poor performers – do they get promoted more slowly? Are there any examples you can think of?
- c) How would you identify and develop (i.e. train) your star performers?
- d) If two people both joined the company 5 years ago and one was much better than the other would he/she be promoted faster?

	<b>Score 1</b>	<b>Score 3</b>	<b>Score 5</b>
<b>Scoring grid:</b>	People are promoted primarily upon the basis of tenure	People are promoted upon the basis of performance	We actively identify, develop and promote our top performers
<b>Examples:</b>	A UK firm promotes based on an individual's commitment to the company measured by experience. Hence, almost all employees move up the firm in lock step. Management was afraid to change this process because it would create bad feeling among the older employees who were resistant to change.	A US firm has no formal training program. People learn on the job and are promoted based on their performance on the job.	At a UK firm each employee is given a red light (not performing), amber light (doing well and meeting targets) a green light (consistently meeting targets very high performer) and a blue light (high performer capable of promotion of up to two levels). Each manager is assessed every quarter based on his succession plans and development plans for individuals.

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**(17) Attracting human capital**

- a) What makes it distinctive to work at your company as opposed to your competitors?
- b) If you were trying to sell your firm to me how would you do this (get them to try to do this)?
- c) What don't people like about working in your firm?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	Our competitors offer stronger reasons for talented people to join their companies	Our value proposition to those joining our company is comparable to those offered by others in the sector	We provide a unique value proposition to encourage talented people join our company above our competitors
<b>Examples:</b>	A manager of a firm in Germany could not give an example of a distinctive employee proposition and (when pushed) thinks the offer is worse than most of its competitors. He thought that people working at the firm "have drawn the short straw".	A US firm seeks to create a value proposition comparable to its competitors and other local companies by offering competitive pay, a family atmosphere, and a positive presence in the community.	A German firm offers a unique value proposition through development and training programs, family culture in the company and very flexible working hours. It also strives to reduce bureaucracy and seeks to push decision making down to the lowest levels possible to make workers feel empowered and valued.

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**(18) Retaining human capital**

- a) If you had a star performer who wanted to leave what would the company do?
- b) Could you give me an example of a star performers being persuaded to stay after wanting to leave?
- c) Could you give me an example of a star performer who left the company without anyone trying to keep them?

	Score 1	Score 3	Score 5
<b>Scoring grid:</b>	We do little to try to keep our top talent.	We usually work hard to keep our top talent.	We do whatever it takes to retain our top talent.
<b>Examples:</b>	A German firm lets people leave the company if they want. They do nothing to keep those people since they think that it would make no sense to try to keep them. Management does not think they can keep people if they want to work somewhere else. The company also will not start salary negotiations to retain top talent.	If management of a French firm feels that people want to leave the company, they talk to them about their reasons for leaving and what the company could change to keep them. This could be more responsibilities or a better outlook for the future. Managers are supposed to "take-the-pulse" of employees to check satisfaction levels.	A US firm knows who its top performers are. If any of them signal an interest to leave the firm pulls in senior managers and even corporate Head Quarters to talk to them and try and persuade them to stay. Occasionally they will increase salary rates if necessary and if they feel the individual is being underpaid relative to the market. Managers have a responsibility to try to keep all desirable staff.

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**Table C.2 – LIML estimator (1<sup>st</sup> and 2<sup>nd</sup> stages) - Specification 1 (pg. 154)**

First-stage regressions

First-stage regression of zsaverage:

Statistics consistent for homoskedasticity only

Number of obs = 2431

zsaverage	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
degree_m	.0019583	.0005094	3.84	0.000	.0009594	.0029573
mne_yn	.523285	.0349362	14.98	0.000	.4547771	.5917928
duration	.0066135	.0011665	5.67	0.000	.004326	.008901
i_seniority	.0156028	.0203939	0.77	0.444	-.0243886	.0555941
reliability	.1167874	.0106409	10.98	0.000	.0959212	.1376536
cr1	.0068393	.0070015	0.98	0.329	-.0068902	.0205689
size1	.1473419	.0119342	12.35	0.000	.1239396	.1707443
prof1	.3814608	.1505422	2.53	0.011	.086256	.6766656
_cons	-3.355696	.1620896	-20.70	0.000	-3.673545	-3.037847

F test of excluded instruments:

F( 5, 2422) = 88.88

Prob > F = 0.0000

Sanderson-Windmeijer multivariate F test of excluded instruments:

F( 5, 2422) = 88.88

Prob > F = 0.0000

Summary results for first-stage regressions

Variable	F( 5, 2422)	P-val	(Underid) SW Chi-sq( 5)	P-val	(Weak id) SW F( 5, 2422)
zsaverage	88.88	0.0000	446.07	0.0000	88.88

Stock-Yogo weak ID F test critical values for single endogenous regressor:

10% maximal LIML size	4.84
15% maximal LIML size	3.56
20% maximal LIML size	3.05
25% maximal LIML size	2.77

Source: Stock-Yogo (2005). Reproduced by permission.

NB: Critical values are for i.i.d. errors only.

Underidentification test

Ho: matrix of reduced form coefficients has rank=K1-1 (underidentified)

Ha: matrix has rank=K1 (identified)

Anderson canon. corr. LM statistic Chi-sq(5)=376.91 P-val=0.0000

Weak identification test

Ho: equation is weakly identified

Cragg-Donald Wald F statistic 88.88

Stock-Yogo weak ID test critical values for K1=1 and L1=5:

10% maximal LIML size	4.84
15% maximal LIML size	3.56
20% maximal LIML size	3.05
25% maximal LIML size	2.77

Source: Stock-Yogo (2005). Reproduced by permission.

