DEPARTMENT OF BUSINESS AND MANAGEMENT

MASTER IN MANAGEMENT

Chair of Financial Reporting and Performance Management

Financial expert CEOs' backgrounds, experiences and characteristics: an analysis of the EURO600

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Academic Year 2019 / 2020

Thesis title: Financial expert CEOs' backgrounds, experiences and characteristics: an analysis of the EURO600

SUMMARY

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1. Introduction

This research work has gone through a mapping of the Chief Executive Officers that have been guiding the companies listed in Stoxx 600 over the span of time that goes from 2014 to 2018. With a fixed number of 600 components, the STOXX Europe 600 Index represents large, middle and small capitalization companies across 17 countries of the European region (STOXX® Europe 600, s.d.). The dataset includes the most successful firms in Europe, that are characterised for having the highest market capitalisation among all the listed companies. The main focus of analysis was the board of directors of non-financial companies that includes, among its members, the chief executive officer.

The study concentrates upon CEOs that boast some kind of financial expertise that can be related to their professional or educational background. The final purpose of this thesis is to delve deeply into the analysis of what defines and characterises the financial expertise of a CEO, who represents an important figure guiding the company and contributing to its performance. In a second phase, the study switched its focus on finding a relationship between the successions of CEOs that entails a change in expertise in the companies analysed and the firm performance.

The research process went through the investigation and examination of several variables that are deemed to indicate the presence of a financial knowledge and experience for the CEOs analysed, to detect existing trends in terms of common orientations in the choice of the CEOs for the most important companies in Europe, to give some insights about the most significant results obtained and to observe possible associations among the variables analysed.

In order to delineate the characteristics of CEOs, their work and study experiences were analysed.

It is understandable that in every study centred upon managerial characteristics, there might be some omitted variables in the analysis, such as a specific talent or personal traits and attitudes that cannot be taken into consideration in the analyses but may be still relevant to have a comprehensive view of the profile of a leader.

2. Fortune 500 list in 1990 vs. 2019: a comparison of CEOs

With the idea to detect the evolution of CEOs' characteristics over time, a comparison between the chief executives of companies in Fortune 500 was made. Fortune 500 provides an annual list of the five hundred largest US industrial corporations, as measured by gross income. For the purpose of the analysis, ten CEOs were selected among the twenty companies placed on the top of two lists that were compared, an old one that was published in 1990 and the more recent list of 2019.

1990 Fortune 500	2019 Fortune 500
General Motors	Walmart
Ford Motor	Exxon Mobil
Exxon Mobil	Apple
Intl Business Machines	Berkshire Hathaway
General Electric	Amazon.com
Chrysler	UnitedHealth Group
Dupont	McKesson
Boeing	CVS Health
Occidental Petroleum	AT&T
Eastman Kodak	Amerisource Bergen

Table 1 – List of Top 10 Companies in 1990 and 2019

The information gathered to confront the CEOs were: date of birth, age of the CEO at the moment they were in charge, gender, the possession of a degree, the presence of a further specialisation in the form of a postgraduate degree; moreover, it was important to see whether the type of degree was from a financial or economic field and to search for the presence of a work experience in finance. The years of experience as CEO (the tenure) were also taken into account together with the university where the CEOs had conducted their studies.

Some interesting insights came out of this comparison. It was found out that the average age of CEOs did not experience a strong variation in the almost thirty years that passed from 1990 to 2019, that were also years of big transformations with a new era of globalization and digitalization. CEOs in 1990 were on average 58,1 years old while in 2019 they were only slightly older, with an average age of 59,4, a bit more than one-year difference.

It was surprising to note that gender has remained overwhelmingly male throughout the years: there is not a female chief executive in the top U.S. firms and this tendency has not changed from 1990 to 2019. This result gives an indication of the very weak presence of women in the management boards, where the general lack of gender balance persists also in advanced economies like the US or Europe. All the top executives at the head of Fortune 500 list of companies have an academic degree, while postgraduate specialisations such as Masters and PhDs have slightly increased in presence during the years: in 1990, 6 out of 10 chief executives had a postgraduate degree (60%), while in 2019, those with a postgraduate specialization were 7 out of 10 (70%). This sample denotes a growing specialisation level for top executives.

The numbers that most changed in two decades are related to the presence of an educational background in economics or finance: in 1990, only one out of ten CEOs had a finance-related degree (10%); in 2019, this numbers increased to eight out of ten CEOs (80%). It is important to highlight that, both in 1990 and in 2019, the most common alternative to studying economics and finance is getting a degree in engineering (that can be industrial, mechanical, electronical, chemical). This trend was stronger in 1990, in which the 60% of CEOs in the list of firms analysed had a degree in the field of engineering. In 2019, the graduates in economics, management or finance represent the majority, but there are still 3 out of 10 CEOs with a degree in engineering. Therefore, most top executives in 1990's were engineers, but this is also due to the nature of the companies at the top of the list and the sector in which they operated (automotive, household appliances etc.), that may have required CEOs with a technical know-how.

The trend of degrees that are mostly divided between economics and engineering field is consistent also in Italy, nowadays, were in 2016, 1 out of 3 students got a degree in economics or engineering (Finizio, 2017).

For what concerns the experiences made in the financial sector or in a financial role, in 1990 only 1 out of the 10 CEOs had accumulated an experience in finance. In 2019, the professional background of 3 CEOs out of 10 included a work experience in finance, with one of them with a more specific experience as Chief Financial Officer, denoting an increasing importance of financial backgrounds for managers. In terms of tenure, the data showed a little variation during the years, with an average of 9,9 years of tenure in 1990 and 10 years in 2019.

The universities where these top executives studied to obtain their academic titles were half public and half private in 1990, while in 2019 the number of private universities was a bit higher, with 6 out of 10 private universities.

While this analysis focuses on demographic, educational and professional attributes, there are a number of other features, skills and qualities of CEOs that cannot be included but are equally important to have a comprehensive view of the profile of a leader. Moreover, the results of this comparison have to be interpreted in light of the geographical context in which they have been found, which (differently from our sample of companies analysed) is the US and not Europe.

According to (Coon, 2017), any individual who has reached a position in the C-suite[1] is bound to already possess a wide range of business skills and corporate know-how. However, even for those who hold the title of CEO, there is always

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[1] The C-suite is a widely-used vernacular describing a cluster of a corporation's most important senior executives: the chief executive officer (CEO), the chief financial officer (CFO) and the chief operating officer (COO).

room for improvement. The variety of competencies required for the role of CEO have not only increased but noticeably shifted over the last decade. In fact, experienced executive recruiters have noted a significant change in the landscape of C-level jobs in recent years, resulting in a new variety of chief executives. From enhanced projection skills to being completely comfortable with new technology, there are top five skills that all modern CEOs should have.

A high tolerance for ambiguity is required as today's modern business terrain is evolving drastically and more rapidly than ever before. Doing so, requires the capacity to adapt to situations as they change. The capacity to understand and embrace new technology is also important, as modern businesses become increasingly reliant on up-to-the-minute technology to enhance their competitive edge, CEOs must be able to have at least a working knowledge of the technology on which their companies heavily rely. The power to inspire is another capability that CEOs should have, as they represent the public face of the company and promote the "personality" and vision of the organization. Agile decision-making skills are also needed, CEO should be able to react quickly as the situations evolve. Last but not least, the ability to assemble a great team: even the best leaders are only as capable as the people with whom they choose to surround themselves. One of the most important traits of a good leader is the ability to recognize valuable skills and positive qualities in others, and thus placing these key individuals in roles that are best suited to them (Coon, 2017).

3.   Why is it important to study CEOs characteristics?

Starting from the industrial revolution, there was the rise of official companies. In that period, enterprises were owned by their founders, who had both ownership and control over the company. However, the companies' size increased to a point where it was no longer possible for the owner/founder to lead the company on his or her own: this is the start of separation between ownership and control. New managers were appointed to lead the companies (Diks, 2016), that opened their doors to outsiders who could invest in order to increase the firm's growth. The investors then became shareholders of the firms and gained profits when the firms increased in value. Firstly, it was possible for the shareholders to oversee the day-to-day tasks in the company, but once the firm reached a big dimension, it was no longer possible for a single or a few individuals to have the full oversight of a massive entity. The shareholders had to rely on competent managers that acted on their behalf for tasks of administration and control. Furthermore, the number of shareholders increased, which made it harder for a single individual to influence the company's strategies and directions. There were simply too many shareholders to give each of them power over the firm. Therefore, the board of directors was created. Every shareholder could influence the company and have a voice in the matter through the shareholders' meeting. The components of the board of directors were present at these meetings and had to listen to the ideas and proposals of the shareholders. The board of directors became an important part of the organization because they had the task to appoint the new managers for the firm, who, in turn, should listen to the board (Diks, 2016).

(Mace, 1971) adds on the relevance of CEO: "the powers of control usually rest with the president, not with the board. It is the president who, like the family owner-managers in the small corporation, determines in large part what the board of directors does or does not do". He claims that the board of directors is a creature of the CEO and has to agree to his or her decisions (Diks, 2016).

According to agency theories from (Jensen & Meckling, 1976), CEOs are risk averse, act in their own interests and possess goals that are not in line with those of the shareholders. Therefore, the CEO will engage in projects and actions that are beneficial for themselves without giving much consideration to the results and consequences that their decisions may have for shareholders. The board of directors is created to prevent this phenomenon. Their duty is to monitor the CEO in such a manner that he or she will act on behalf of the company. This would suggest that firms with greater dominance by independent directors should have higher firm performance (Diks, 2016).

The analysis of CEOs personal and professional traits and characteristics has been the focus of a few academic works that draw conclusions about the possible correlations that can exist between the profile of a company's top executives and the company performance.

The upper echelons theory set forth by (Hambrick & Mason, 1984), states that top executives view their situations through their own highly personalized lenses. These individualized constructs of strategic situations arise because of the differences that characterize executives in their experiences, values, personalities and other human factors. Using the upper echelons perspective, researchers have examined the effects of top management team (TMT) composition and processes on organizational outcomes, as well as the influences of CEOs' characteristics on company strategy and performance. Dozens of studies have confirmed the basic logic of upper echelons theory.

In a study about CEO-specific heterogeneity, (Custódio & Metzger, 2013) demonstrate that previous financial expertise of CEOs is correlated with a firm's financial policies, to show that financial expertise is an important factor in defining the choices, decision-making and direction taken by the company. Starting from the statistical results that an important fraction of CEOs has some type of financial background, they find that nonfinancial firms headed by financial expert CEOs tend to hold less cash on average, to rely more on financial leverage and to have a higher propensity than other firms to pay out money to shareholders. The study provides evidence that the decision-making process and the actions of CEOs that possess a financial expertise are more "financially sophisticated". As a consequence, firms lead by managers with a financial mind-set and background are better equipped to respond to exogenous changes that can occur in the business conditions (Custódio & Metzger, 2013).

They show that firms that include bankers on their board of directors tend to lean more on external financing and to have lower investment-cash flow sensitivity. Moreover, they affirm that financial experts are able to provide better access to capital markets due to deeper knowledge and understanding of the field and also because they can rely on a stronger network: financial expert CEOs might directly benefit from their personal links to the financial sector (Custódio & Metzger, 2013).

(Custódio & Metzger, 2013) also examine the possible match between companies and their CEOs and they evaluate different views. They find that financial expert CEOs are, on average, employed at companies that are bigger, older, make lower total investments, have lower asset volatility and experience less asset growth. Also, they notice that firms headed by financial experts tend to invest fewer resources in research and development for the firm, thus generating less innovation (Custódio & Metzger, 2013).

The main difference between financial expert CEOs and nonfinancial experts concerns their education background and their accumulated work experience. Financial expert CEOs tend to have a more diverse work experience than nonfinancial experts and they have more general managerial skills (Custódio & Metzger, 2013). This may be interpreted as meaning that people who choose a financial academic path or career try out different job options before reaching top positions, and for this reason they acquire stronger managerial abilities along their path. Their findings appear to be consistent with two non-mutually exclusive views.

Under the "financial skills view", financial expertise is relevant to implement a specific financial policy and firms purposely hire financial experts at the life cycle stage when financial policies are more strategically important than other firm policies. At the same time, the results are also consistent with a view under which the professional skills of CEOs do not matter ("no financial skills view"). For instance, financial expert CEOs could have an idiosyncratic preference for specific financial policies, and firms hire CEOs with the preferences to match their life cycle stage or their business model. The observed assortative matching is based on the supposition that financial expert CEOs have a preference for low cash holdings, high leverage, and high pay-outs and would match themselves to firms accordingly. In this case, appointing a financial expert CEO is the cheapest way for the firm to implement a certain strategy. There can also exist other reasons,

that are not directly associated with financial expertise, for the existence of a matching between financial expert CEOs and mature firms. For instance, these CEOs might have some specific primary skill set that tends to be correlated with financial expertise. In this way, observing financial expertise is a side-effect of these primary skills and unrelated to preferences (Custódio & Metzger, 2013).

In any case, the analysis of the role of financial expert CEOs in nonfinancial firms indicates that companies headed by CEOs with this kind of accounting competencies, tend to hold less cash, incur in higher debt, pay more dividends and engage more in share repurchases. The study of actions and behaviours of financial expert CEOs at a micro-level yields evidence consistent with a conclusion that financial expert CEOs are more financially sophisticated and are more likely to comply with academic theory when making strategic decisions (Custódio & Metzger, 2013).

The choice of a CEO is endogenous to the company; however, firms are not likely to frequently change their CEOs to systematically respond to changes in the business environment. Anyway, changes of CEO will be the topic of further analysis in this thesis. The study carried out by (Custódio & Metzger, 2013) exploits exogenous shocks to overall credit and market conditions in order to test whether financial expert CEOs respond to changes in a different way with respect to non-financial experts. They find consistent evidence that the two types of CEOs react differently to these changes and financial expert CEOs respond to external dynamics in a way that is consistent with the use of their financial skills and knowledge, thus they have a stronger ability to access credit markets in hard times (Custódio & Metzger, 2013).

Financial experts tend to manage their cash and the financial leverage in a more dynamic way. They are able to increase both cash and debt levels in periods when it is difficult to do so, when credit conditions are tight. This may imply that financial expert executives are better-suited to face exogenous changes that have an impact on the firm's functioning.

(Custódio & Metzger, 2013) find this practice to be advantageous for shareholders: firms run by financial expert CEOs are less exposed to the riskiness of internal cash flows when they need to invest.

In order to implement important changes in the company, financial expert CEOs may also replace incumbent chief financial officers (CFOs) more often. This result may be consistent with the idea that changing management helps to overcome inertia, which makes the implementation of new strategies either feasible or easier.

The data provided by (Custódio & Metzger, 2013) have several implications. Firstly, they show that previous work experience of the CEOs, namely, their financial expertise, affects firms' financial policies. Researchers to date have focused mostly on (partly unobservable) top manager characteristics or on age and education. They also discuss the endogenous matching between CEOs and firms and the direction of the relationship of causality. They analyse the matching process itself, showing some evidence of endogenous CEO-firm matching based on the financial expertise of the CEO and the life cycle of the firm. Results in a set of additional tests provide evidence that is mostly consistent with a "financial skills view" interpretation of the effects of financial expertise on the firm performance (Custódio & Metzger, 2013). Moreover, (Hambrick & Mason, 1984) also demonstrate that organizational outcomes-strategic choices and performance levels-are partially predicted by managerial background characteristics.

3.1. How the executive can influence the firm

The CEO is part of the board of a company that is appointed by the shareholders and has to act on their behalf to run the day-to-day tasks of the business. The job description of a CEO is complex and includes everything that cannot be delegated to co-workers. The most important task that this position requires is to set a strategy for the firm, which is strongly related to the vision and mission of the company. Besides, he or she has to model and set the company's culture, build and lead the senior executive team, and allocate capital to the company's priorities (Diks, 2016).

The board of directors is accountable for all the actions taken by the firm, it periodically provides a report on the performance of the company and what its future plans and strategies are (Diks, 2016).

Several researchers tried to find possible correlations between characteristics of the board and firm performance. (Campbell & Mínguez-Vera, 2008) found empirical evidence for a correlation of female participation in the board and firm performance. Diversity in boards leads to competitive advantages in comparison to firms who only have males in the board of directors (Diks, 2016). Nowadays, as competition increases, there is more need of understanding the complex demands of customers. Furthermore, shareholders and investors request for higher profit margins (Hong and Shum, 2002), so the importance of having a well-structured board increases (Diks, 2016).

(Linck, Netter, & Yang, 2008) suggest that the CEO position and the chairman of the Board (COB) position are combined in large firms when the CEO is older and has a longer tenure. The CEO has a significant impact on the decisions and policies of the firm. Moreover, (Papadakis & Barwise, 2002) argue that the CEO influences the strategic decision-making process related the broader context (external environment, firm, size, decision characteristics etc) that surrounds the firm. Therefore, selecting the CEO is a key organizational decision, which has important implications for the firm's effectiveness (Kesner & Sebora, 1994). The most challenging part is to find a good 'fit' between the characteristics of the company and the individual who will fulfil the top executive position. (Salancik & Pfeffer, 1978) stated in their study that most firms in different context recruit and hire CEOs with backgrounds and skills fitting the company's characteristics (Diks, 2016).

It is interesting to see whether the characteristics of a CEOs really have impact on different choices and outcomes for the company (Adams, Almeida, & Ferreira, 2005). A lot of research has been done about why and how CEO characteristics matter for a company. (Datta & Guthrie, 1994) found that there is a strong connection between poor performance of a firm and selection of the CEO outside of the firm. They conclude that firms should search internally for a successor before selecting external executives. (Norburn, 1989) already provided information regarding the different CEO characteristics and showed that they matter.

(Diks, 2016) in his research takes CEO characteristics such as age, compensation, gender and tenure as independent variables, with the purpose to analyse if these variables have a significant impact on the firm value and what the sign of the impact is. Furthermore, five different control variables are added, namely capital expenditures, total liability, total assets, sales growth, and a dummy variable for the crisis. This helps to construct a more complete view on what the effects on firm value are. However, their thesis does not test for reverse causality, that may give further explanations (Diks, 2016).

Furthermore, (Adams, Almeida, & Ferreira, 2005) tested the impact of CEO power on the variance of firm performance. Results showed that the variance of firm performance is higher when CEO has higher power. Thus, CEO who experience higher influence in the company are able to affect the decision-making process and strategic decisions (Diks, 2016). However, CEOs have to deal with regulations set by governments nowadays, which slightly reduce their possibility for manoeuvre (Finkelstein & Boyd, 1998).

(Diks, 2016) assumes that the differences that characterise each CEO matter and that the CEO is able to influence the decisions and the direction of the firm. This can have further impact on the value of the firm, which is described in the paper by the Tobin's Q of the company. This measure is defined as the ratio of market value of the firm to the replacement cost of the assets of the same firm and it plays an important role in many other financial interactions (Chung & Pruitt, 1994). Tobin's Q indicates how much more is a company worth on the stock market than the costs it will bear if it chooses to replace all of its assets. If the number is between 0 and 1 it means that the costs to replace all assets is higher than the market value, therefore the stock is undervalued. If it is greater than 1, it suggests that the stock is overvalued. However, it is hard to be precise in the replacement costs of the intangible assets, thus it does not mean the stock is overvalued per se. For example, technological companies would have relatively lower replacement costs for their assets to their market value than company that are more dependent of industrial machines (Diks, 2016).

One of the ways in which CEOs can have an impact on the firm value is that executives with a higher education and a technical functional background are more likely to engage in intensive research and development programs. Firms with high R&D expenditures are more likely to select new CEOs that have technical and specialised experience as they would be more familiar and understanding towards the background of the company. Furthermore, individuals with advanced training and education are related with higher research and development expenditures (Datta & Guthrie, 1994). (Thong & Yap, 1995) agree with this view and found that small businesses are more likely to adopt new information technology when the CEO has an innovative character, is positive towards adoption of IT, and possesses greater IT knowledge. Younger CEOs tend to spend more on research and development when they have more wealth invested in firm stock and have significant career experience in marketing and engineering (Diks, 2016).

Besides the adoption of information technology and the intensity of research and development, the characteristics of a CEO also have influence on the choice of foreign market entry mode.

(Herrmann & Datta, 2002) found which characteristics affect entry mode. In general, entry modes can be divided in four categories: export, contractual agreement, joint venture, and wholly owned subsidiary. The first two (non-equity-based entry) are less risky, because there is less equity involved than the last two options (equity-based entry). (Herrmann & Datta, 2002) also found which characteristics favour full-control entry strategies. Firstly, the longer the position tenure of CEOs, the higher the probability for a full-control entry (equity-based entry). Furthermore, legitimacy in their position along with higher levels of confidence and experience result in full-control entry. CEOs with throughput backgrounds normally have desire for greater control and efficiency, thus also prefer full-control entry. Lastly, international experience among successor are important factors for full-control entry (Diks, 2016).

Confidence of a CEO can also be seen as a characteristic that affects firm performance. (Heaton, 2002) found that optimistic CEOs overvalue their own corporate projects and therefore invest in negative net present value projects even though their aim is to make profit. Moreover, they believe that capital markets undervalue their firm's risky securities. (Malmendier & Tate, 2008) agree on this view and concluded from their study that CEOs that are too confident overpay in mergers and acquisitions, especially if they have the access to internal financing. A reason for this is that they overestimate their ability to generate returns during mergers and acquisitions. Therefore, they make more mergers and acquisitions than they should (Diks, 2016).

3.2. The impact of financial expertise on firms' financial policies and responsiveness to change

It is clear that there are several ways in which the personal characteristics of the CEO at the guide of a company can be determinant for the way the firm is managed. The purpose of this thesis is to develop an understanding of a particular phenomenon that occurs when the CEO is a financial expert: firms managed by this kind of executives show some distinctive characteristics with respect to others.

Companies that have a possibly easier access to capital funds, such as large firms with more stable cash flows, tend to hold less cash. According to the data, a financial expert CEO holds up to 12% less cash than a nonfinancial expert CEO. The trend in corporate cash holdings over the last decades is mainly driven by the precautionary motive for keeping cash. In general, results are consistent with firms holding cash for precautionary motives: CEOs with better access to financing seem to have fewer needs to hold large cash stocks (Custódio & Metzger, 2013). Therefore, firms led by financial expert CEOs tend to have a higher portion of debt in their capital structure. Financial expert CEOs are more likely to repurchase shares than non-expert CEOs. Controlling for the typical determinants of pay-out policy, financial expert CEOs have a two to four percentage points higher propensity to engage in share repurchases than non-expert CEOs, which corresponds to a 7% higher likelihood, on average, in relative terms (Custódio & Metzger, 2013).

Overall, the results are consistent with the idea that financial expert CEOs follow different financial policies. The fact that financial expert CEOs hold less cash and more debt and are more likely to buy back shares, is also consistent with the idea that they have easier access to external capital markets (Custódio & Metzger, 2013).

One potential mechanism through which CEOs can get better access to credit markets is a better communication between the firm management and outside investors, who are mainly financial experts themselves (e.g., loan officers or financial analysts). Having a similar professional background might mean that CEOs have more in common, speak the same language and can communicate more effectively when funding is needed (Custódio & Metzger, 2013). There is evidence that investors are more likely to hold stocks they are familiar with in terms of their professional background or that are closer in terms of language and culture (Massa & Simonov, 2006). For example, (Grinblatt & Keloharju, 2001) find that investors in Finland prefer to hold and trade firms whose CEO is of similar cultural origin. These findings could be consistent with behavioural biases or with better or deeper information, but also with greater ability to evaluate and interpret information by referring to the same technical language and to the same underlying theories. There is also evidence of the importance of soft information in financial intermediation.

To explore the channel of improved communication, (Custódio & Metzger, 2013) analyse firms' communication with financial analysts. They obtained data on earnings forecasts by financial analysts. They defined the dispersion of the analyst forecasts as the standard deviation across different analysts of yearly earnings forecasts standardized by the assets of the firm. This measure should capture the level of disagreement among different analysts on the earnings perspective of a company, thus showing how effective the communication of the management is. Results highlight that the average dispersion of analyst earnings forecasts is 0.012 if the CEO is not a financial expert, which is more than double the forecast dispersion of firms with financial expert CEOs (0.005). The difference is also statistically significant: they interpret this result as a first evidence that financial expert CEOs are better communicators of information that is relevant for financial markets. They conclude that financial expert CEOs are better at communicating firm prospects with other entities in financial markets, as reflected by lower dispersion in analysts' forecasts for their firms (Custódio & Metzger, 2013).

Moreover, (Custódio & Metzger, 2013) test if firms with financial expert CEOs benefit from lower sensitivity of investment to cash flows, which would be a consequence of better access to financing by this type of CEO. The main coefficient of interest is the interaction term between the financial expertise of the CEO and cash flow. They find this coefficient to be negative and significant across all specifications. This result indicates that investments of firms with financial expert CEOs are less sensitive to internally generated cash flows. This conclusion is also consistent with (Malmendier & Tate, 2005) who show that CEOs with technical education have more investment-cash flow sensitivity than CEOs with general education while CEOs with financial education have less. (Guner, Malmendier, & Tate, 2008), however, also find that the firms benefiting from this effect are mainly firms with poor investment opportunities, which leads to inefficient overinvestment. Their reasoning is that bankers on the boards of these firms have an incentive to benefit their own financial institutions, and thus generate business by providing funds to the firms. Such a conflict should not be the case for a CEO who is a financial expert and should have no apparent reason to favour any financial institution. Nonfinancial firms with financial expert independent board members need to rely less on internally generated funds to invest. Firms can benefit from appointing a financial expert CEO because they are better able to raise external finance. They find not only that this expertise can make investment less sensitive to internal resources of the firm, but also that it is not associated with inefficient investment (Custódio & Metzger, 2013).

In order to analyse financial policies from a dynamic perspective, (Custódio & Metzger, 2013) test whether financial expert CEOs react differently to exogenous changes in the market environment and whether they manage financial policies more actively. They exploit exogenous variation in general credit conditions for firms, measured by the default spread. The main independent variable of interest is the interaction term of the spread and the financial expert CEO

dummy. The coefficient of this interaction is positive and statistically significant, indicating that financial expert CEOs are able to increase cash holdings when external markets discourage the raising of cash. Because they find very weak results with respect to CEO education, this suggests that the operant mechanism is related to CEO professional experience. The fact that financial expert CEOs hold more cash and are not so constrained in accessing debt markets in periods of high default spreads, suggests benefits associated with financial expertise. It might be that financial expert CEOs have better access to a financial network and to financing providers. Or, it could be that through their career path, financial expert CEOs have acquired the necessary skills to facilitate access to capital markets, perhaps through better ability to communicate with the markets by reducing the information asymmetries (Custódio & Metzger, 2013).

Overall, the results suggest that financial expert CEOs follow more compelling financial policies and have a better ability to raise financing in times of worse credit conditions. This type of CEOs is more dynamic in reacting to changes in the business environment in a way that suggests them being more financially sophisticated (Custódio & Metzger, 2013).

3.3. The fit between the company, the CEO and the CFO

(Custódio & Metzger, 2013) provide direct evidence about the matching between companies and their CEOs based on both observable CEOs' and firms' characteristics. They evaluate two possible interpretations: one is that CEOs impose their idiosyncratic management styles on the companies they lead, so the CEO's characteristics would be the independent variable and the company's performance is the response one; the other view argues that it is the board which chooses a specific CEO because of his or her attributes, as the optimal strategies for the firm evolve over time.

If one assumes that the matching between CEOs and firms is based on time-invariant unobservable characteristics, the estimates of financial expertise can be interpreted as causal effects and the CEOs impose their particular management style on a company. If the optimal strategies of firms change over time, however, CEOs might not impose their styles but rather be chosen by firms because of their attributes (Custódio & Metzger, 2013), as he or she may be the most suitable figure to lead the company in a specific moment under certain circumstances.

Their study shows that financial expert CEOs tend to be appointed by mature firms, while non-financial experts tend to be preferred by firms that are in the growth stage of their life cycle. The priorities and objectives of companies can change according to the lifecycle stage that the firm is going through. Using the balance sheet as a metaphor, firms in a young stage of their life cycle are relatively more focused on the asset side, evaluating different growth opportunities and profitable projects, investing more and working to grow their assets. When they are in a more mature stage, companies turn their attention to the financing side of the balance sheet, minimizing the cost of capital and paying out dividends to shareholders while making sure they have enough financial resources to run their operations. Due to the variety of approaches that are needed, a different type of CEO profile might be suitable for firms at different stages of their life cycle. It is supposed that a financial expert CEO could be optimal for firms in a mature stage, while a more entrepreneurial CEO could be better for young firms that are in a growth stage. By the way, this does not imply that financial expert CEOs are not valuable for growing firms as well, it only means that other skills might be relatively more important (Custódio & Metzger, 2013).

To summarize, (Custódio & Metzger, 2013) assert that the demand for financial expertise in a CEO could be linked to a firm's life cycle, as firms run by financial experts tend to be older and larger, to have lower asset growth, lower cash flow volatility, fewer investment opportunities, less volatile assets and more retained earnings. All these characteristics are associated with firms that are at a mature stage in their life cycle (Custódio & Metzger, 2013).

A substantial percentage of CEO turnovers occur in the first few years of the CEO's tenure (Sebora, 1996) (Allgood & Farrell, 2000). (Sebora, 1996) finds that 34% of all CEO tenures in his sample ended by the fourth year. Job match theory can provide an explanation of why many CEOs leave their positions within a few years. According to "match theory",

workers who otherwise appear equivalent, differ in their productivity because of heterogeneity across firms in the quality of job matches. The implication is that good matches are more productive than bad matches. Of course, labour economists are not the only ones who recognize the importance of matching the "right" worker to the "right" job. Management consultants, for example, emphasize that matching senior people to a job is difficult (Gerstein & Reisman, 1983). The finance literature on CEO turnover instead focuses primarily on monitoring mechanisms of the CEO, including the role of the board of directors and block holders in dismissing poorly performing CEOs and on the quality of the CEO (Weisbach, 1988) (Yermack, 1996) (Perry, 2000). Match theory begins with the notion that there are no good workers or good employers; there are only good matches (Jovanovic, 1979). Instead of viewing firm performance as a measure of whether or not the CEO is doing a good job, match theory moves the focus directly on the match rather than the CEO characteristics, suggesting that good matches are characterized by better firm performance than are bad matches. If turnovers occur because of poor match quality, then good matches should be characterized by firm performance that is higher under the new CEO than under the previous CEO. In fact, they find that a good match is more likely if firm performance is higher under the new CEO than it was under the previous CEO (Allgood & Farrell, 2003).

Financial expertise might come at the expense of having less expertise or skills in other dimensions. Indeed, the findings on valuation and compensation do not indicate that financial expert CEOs are generally superior. The results are consistent with the idea that there exist complementarities between different skills of the CEO and firm characteristics: e.g., financial expert CEOs seem to have skills that are valuable in mature companies that are at a later stage in their life cycle. If, on the other hand, financial CEOs lack skills that are likely to be important at other stages of the lifetime of a corporation, they are likely to underperform in these companies – for instance young firms. Financial CEOs generally underperform nonfinancial experts in young firms or high-growth firms (proxies for an early stage in the life cycle), while they outperform nonfinancial expert CEOs in more mature companies (Custódio & Metzger, 2013).

Concerning the relationship between a financial expert CEO and the CFO in the same company, there is evidence that capital structure decisions are made mainly by CEOs, with execution delegated to CFOs. As CFOs are still likely to play some part in setting and managing financial policies, (Custódio & Metzger, 2013) investigate whether financial expert CEOs manage CFOs and their replacement differently. CEOs with a financial expertise might, by their nature, be more interested in getting involved in financial policies, and potentially in revolutionising them. The strategic management literature describes the replacement of top executives as a mechanism for an organization to overcome inertia (Tushman & Romanelli, 1985) or loyalty to a former CEO and to adapt strategically to changing contexts (Helmich, 1977) (Pfeffer & Salancik, 1978) (Vancil, 1987). Because executives are constrained by their experiences (Hambrick & Mason, 1984) and backgrounds, new CEOs may want to replace executives whose knowledge and skills have become obsolete to facilitate desired strategic changes (Custódio & Metzger, 2013).

(Custódio & Metzger, 2013) further restrict the analysis to the replacement of CFOs after CEO turnovers. In a multivariate analysis, they examine whether it is more likely the CFO will be replaced if the incoming CEO has financial expertise. Interestingly enough, they find a strong positive effect of the financial expertise of the CEO on CFO turnover. The likelihood of replacing the CFO is about 7% higher if the incoming CEO is a financial expert. Overall, findings are consistent with the idea that financial expert CEOs become more involved than others in the financial policies of a firm. As it becomes easier to implement changes in a firm by changing management, financial expert CEOs are more likely to replace the CFOs, who mostly execute tasks delegated by CEOs. The identity or specific characteristics of the CFOs do not seem to matter much (Custódio & Metzger, 2013).

3.4. Financial experts and their approach to innovation

It has been shown that executives with a technical background tend to be open to innovation and to invest in projects that may generate value (Diks, 2016). This may not be always the case for CEOs who have a background in finance, who are the cornerstone of our analysis. Indeed, (Custódio & Metzger, 2013) analyse whether financial expert CEOs are open and predisposed towards innovation for their company. The first measure of innovation they use is the amount of expenses in research and development, they look at the ratio of R&D expenditures to the book value of assets. The second measure of innovation is the number of patent applications filed by a firm in a given year. The third measure is the total number of citations received by the set of patents that a firm applied for in a given year.

The R&D results using ordinary least squares (OLS) estimates suggest that firms with financial experts at the top management tend to spend less in R&D and to devote fewer resources to innovative projects. The estimate is economically significant: compared to the mean, financial expert CEOs spend 25% less in R&D. This issue is examined in depth by looking at the output generated by the investments, with the number of filed patents and the number of citations. They find that financial expert CEOs file up to 13% fewer patents than non-experts, and generate up to 19% fewer citations (Custódio & Metzger, 2013).

They also look at the sensitivity of innovation output measures to R&D spending, that indicates how effective has been the expense in R&D. The coefficient of interest in the regressions is the interaction term between R&D spending and financial expertise. They find this coefficient to be positive and statistically significant across the different measures. This suggests that firms with financial experts produce more efficient innovation: financial expert CEOs generate more patents and citations per dollar spent in R&D. This shows a more effective approach taken by financial expert CEOs towards the cost items of financial statements. The reason why financial experts tend to spend less in R&D might be that they only invest in more successful or profitable projects, rejecting the low profitability ones. Other alternative interpretations for these results are that financial experts might do less in-house innovation and acquire already patented innovation; or that they only invest in innovation that generates hard evidence of success, i.e., that is more likely to be patented and generate citations (Custódio & Metzger, 2013).

The study also looks at the average firm characteristics for firms with and without a financial expert CEO. Firms with financial expert CEOs are about 5.5 years older, on average, and they are almost double the size of firms without a financial expert CEO. Therefore, they conclude that the financial expertise of the CEO is linked to larger and older firms, with less R&D, low-tech firms (30% fewer financial expert CEOs in high-tech firms), and more retained earnings (45% vs. 30%). Financial expert CEOs tend to run more diversified firms (25% more financial expert CEOs are in diversified firms). This shows the impact that a CEO with a specific profile may have on the way firms are managed.

3.5. CEO-specific attributes and impact on firm performance

As already mentioned, (Diks, 2016) conducts a study to test several different hypotheses about the relationship between the characteristics of CEOs and the performance of the firm which they manage: the main purpose is to answer the question about the existence of a correlation between these variables and to investigate whether the characteristics of the CEO have a significant impact on the value of a firm. The dataset consists of firms taken from S&P 500 list and the methods used to make these statistical tests is linear regression and a fixed effects model, with the aim to give statistical conformation (Diks, 2016). The beta is used for the analysis: this value indicates in which proportion each CEO characteristic can influence the firm value. Furthermore, the reliability of these numbers is tested to check whether the results are statistically significant. The level of significance is divided in four groups. The first group denotes a 10-percent level. The second group is significant on a 5-percent level (95% confidence interval) and the third group means on a 1-

percent level. The last group has no sign which means that the result is insignificant. Results are also tested for endogeneity and reverse causality.

(Diks, 2016) examines whether a set of four CEO characteristics (compensation, age, tenure, and gender) have a significant impact on firm value. Evidence shows that, except gender, all the CEO characteristics have significant impact on Tobin's Q (measure of firm value) based on a 95% confidence interval. Total compensation, age, and tenure all have a beta that significantly differs from 0, which means that they either have a positive or a negative relationship with the firm's value. This is in line with (Norburn, 1989) findings that CEO characteristics matter. It is important to find a good 'fit' between the characteristics of the company and individual who will fulfil the CEO position, because this will have beneficial effects on firm performance.

A first hypothesis that (Diks, 2016) moves forward is that the executive's compensation is positively correlated with firm value: the beta of total compensation is 0.038, which means that total compensation is positively correlated with firm performance. Higher compensation for the CEO, on average, leads to higher firm performance and value. This number is in line with (Mehran, 1995), who argues that equity-based compensation increases the incentives for higher performance. Therefore, the executive is more likely be willing to improve firm performance if their compensation is equity-based.

(Diks, 2016) also suggests that executive's age is negatively correlated with firm value: results show that CEO's age is significantly and negatively correlated with Tobin's Q, with a beta of -0.082. The negative relationship between executive age and firm performance has been suggested also by previous literature. Young CEOs normally have a better performance, while older CEOs are less likely to bring up new ideas due to their more conservative attitude (Hambrick & Mason, 1984), lower focus on creativity and a stronger confidence in their way of doing.

Another claim is that executive's tenure is positively correlated with firm value: despite the fact that tenure is correlated to age, its relationship with firm value is the other way around. Tenure has a positive effect on corporate performance with a beta of 0.089. CEOs that stay longer in the same firm improve the performance significantly (Diks, 2016). This may be due to a consolidated experience and knowledge of the firm's dynamics that allow them to take the right decisions in a short time. According to (Adams, Almeida, & Ferreira, 2005), longer-tenured CEOs have more decisional power within their firm. Having more influence results in higher stock performance. Furthermore, they have more experience in leadership and know the culture of the company better. Eventually, the firm performance will increase by keeping the same CEO over time (Diks, 2016).

Lastly, (Diks, 2016) assumes a negative relationship between executive's gender and firm value: in the sample, gender is negatively correlated with firm value with a beta of -0.022. This correlation implies that having a female CEO can in fact improve firm value. The fixed effects model shows consistency with the linear regression. However, in both regressions this number is not statically significant, therefore the gender of the CEO should not be taken into account too heavily (Diks, 2016).

In any case, results show that if the CEO is female, the Tobin's Q will be 0.022 higher on average. Diversity in the board has a positive impact on firm performance according to (Carter, Simkins, & Simpson, 2003). A more diverse management team promotes a better understanding of the marketplace, increases creativity and innovation, produces more effective problem-solving and enhances the effectiveness of corporate leadership. Furthermore, most CEOs are male. So, it could be logical that a diverse company with a female leading the firm has higher performance (Diks, 2016).

Overall, results show that CEO characteristics have significant impact on the Tobin's Q of firms: CEO's compensation and tenure are positively correlated with firm value, while CEO's age and gender are negatively related. This can have a few implications for companies concerning their recruiting process for CEOs. When striving for higher firm value, companies should consider the age and gender at their human resource management. Older CEOs tend to be the cause of lower firm value. Furthermore, female CEOs should be more frequently nominated, as they can have a positive effect on

firm performance. Further research can be done on others CEO characteristics to get a more complete view on what characteristics should be used in the recruitment process for a CEO to 'fit' in the company (Diks, 2016).

4. Defining Financial expertise

This thesis has a particular focus on the elements that characterise the financial expertise of chief executives who carry out top management roles in the companies analysed. Much of the recent corporate-governance debate revolves around the composition of corporate boards, with the central question about which types of directors can be expected to actively pursue the interests of shareholders. Regulators in various occasions have stressed the need for more financial experts on the boards. The implicit assumption is that "an understanding of generally accepted accounting principles and financial statements" will lead to better board oversight and serve the interest of shareholders (Guner, Tate, & Malmendier, 2006). The Security and Exchange Commission (SEC) passed rules to form a definition of who qualifies as a financial expert under Section 407 of the Sarbanes-Oxley Act[2]. The final rules provide for a broader definition of an audit committee financial expert, who should have the following qualifications: the expert must have an understanding of GAAP and financial statements; the ability to assess the general application of principles in connection with the accounting for estimates, accruals and reserves; experience in preparing, auditing, analysing or evaluating financial statements that present the scope and complexity of accounting issues that are generally comparable to the complexity of issues that the registrant's financial statements may raise or experience; experience in actively supervising other people engaged in those activities; ability to understand the internal controls and procedures for financial reporting and to understand audit committee functions (Price, 2019).

To qualify, the audit committee financial expert would have acquired the attributes listed above through experience or education in the following positions: education and experience as a principal financial officer, principal accounting officer, controller, public accountant or auditor or experience in one or more positions that involve the performance of similar functions; experience in actively supervising a principal financial officer, principal accounting officer, controller, public accountant, auditor or person performing similar functions; experience in overseeing or assessing the performance of companies or public accountants with respect to the preparation, auditing or evaluation of financial statements (Jenner & Block, 2003). In addition, the regulation proposes a list of factors to be considered in making the evaluation, including the level of the person's accounting or financial education (i.e. whether the person has earned an advanced degree in finance or accounting); whether the person is a certified public accountant; whether the person is certified or otherwise identified as having accounting or financial experience by a recognized private body that establishes and administers standards in respect of such expertise; the person's level of familiarity and experience with all applicable laws and regulations regarding the preparation, use and analysis of financial statements.

4.1. The role of the chief executive officer

Among the different professional figures that are present in the organizational chart of a company, the chief executive officer assumes, in most cases, a very important role in the execution and implementation of the company's activities. Peter Drucker, a famous theorist in the field of organizational management, in 2004 affirmed that "the CEO represents the link between the internal sphere, which is the organization, and the external world, represented by society, economy, technology, market and consumers" (Lafley, 2009). The CEO is the subject that in the company has got the essential task to take final decisions and to establish the path that the company will undertake, acting also as a mediator between the opinions of the administrators and top executives (Calori, Johnson, & Sarnin, 1994). It is the highest-ranking individual

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[2] Securities and Exchange Commission: Disclosure Required by Sections 406 and 407 of the Sarbanes-Oxley Act of 2002: https://www.sec.gov/rules/final/33-8177.htm

in a company or organization. The person in charge for this role is responsible for the overall success of a business entity or other organization and for making top-level managerial decisions. Although CEOs may ask for input on major decisions, they are the ultimate authority in making final decisions (Corporate Finance Institute, 2015).

Ducker distinguishes the main activities of CEOs in four typologies:

1. Definition of the significant elements of the inter-organizational context: this means essentially to set objectives and guidelines;

2. Decision of the business in which the firm operates: this is the definition of the core business, analysing the competitive position in the market, defining the operational boundaries;

3. Balancing present and future: this requires making sure that the short-term objectives of stakeholders do not overlap with the long-term vision of the company and also the ability to balance the short-term investments with the investment in resources that will be useful in the future;

4. Setting the values, mission and identity that characterise the firm: this entails the creation of standardised models that guide behaviour towards the right direction and are fundamental to verify the achievement of pre-fixed objectives (Lafley, 2009).

4.2. Analysing the variety of executive backgrounds

There is no commonly used criterion and no established trend for companies to select a CEO and managers may have a variety of educational and professional backgrounds in their CVs, which may be equally valuable depending on the type of profile the company is looking for.

(Whitler, 2019) explored the early functional choices made by the CEOs in Fortune 100 list, focusing on the first functional areas that the F100 CEOs pursued after they finished school.

Surprisingly, the field of operations was the starting point for most of the F100 CEOs, with 25% beginning their careers in an operational role. Finance was the second most popular choice (22% of F100 CEOs began their career in finance), engineering the third (17%), and sales/marketing the fourth (13%). Accounting represented the fifth most frequent choice (11%) and law was sixth (7%) in the list. Interestingly, management and consulting were last, with just 3% of F100 CEOs beginning their careers in each of these two areas. It is important to highlight that, in many cases, the early-career function chosen by the F100 CEOs is also the dominant function of the firm that they helm, meaning that companies tend to choose CEOs with a work experience in the same sector in which they operate. For example, the CEOs of Goldman Sachs, Liberty Mutual Insurance Groups, and AIG all started their careers in finance-related functions. All the three firms operate within the financial service space.
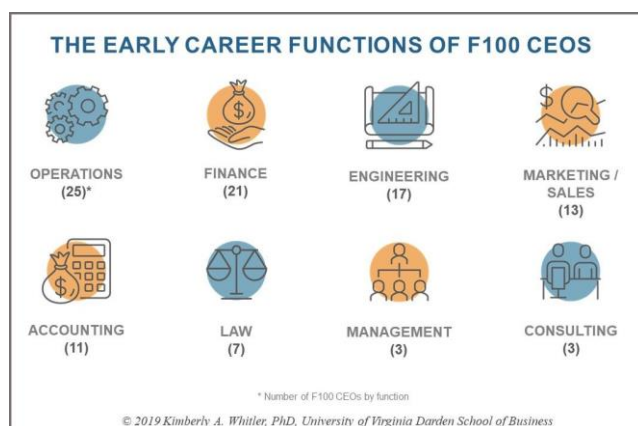
Figure 1 – Early career functions of F100 CEOs

(Whitler, 2019) also looked at the undergraduate degrees of study chosen by the F100 CEOs.

The Bachelor of Arts and Bachelor of Business Administration were the most popular among F100 CEOs, with 53% of those identified having obtained one of these two degrees. A Bachelor of Science degree is held by 47% of the CEOs who received an undergraduate degree. Not all F100 CEOs obtaining a Bachelor of Science necessarily graduated with a science, engineering, or math degree, with 45% getting their Bachelor in a business field (e.g., accounting, finance, television and radio, etc.).

Interestingly, nearly all F100 CEOs in tech-related fields have undergraduate degrees directly related to engineering. For example, Apple's CEO Tim Cook has a degree in industrial engineering, Alphabet's Larry Page has a degree in computer engineering, IBM's Virginia Rometty's focus was on computer science/electrical engineering, and Amazon's Bezos focused on electrical engineering/computer science. Also, Facebook's Mark Zuckerberg and Dell's Michael Dell did not graduate.

In contrast, some F100 CEOs don't hold degrees in areas that are directly applicable to the industry in which their company operates. For example, Goldman Sachs' CEO Lloyd Blankfein has a degree in history. So does Bank of America's Brian Moynihan. Anthem's CEO, Gail Boudreaux, studied psychology/sociology and Lowe's Marvin Ellison got a degree in marketing. Both Nike's Mark Parker and Target's Brian Cornell received degrees in political science.

In sum, while some industries appear to require a specific undergraduate education path to the CEO position (e.g., tech industry), other fields do not necessarily hire CEOs with a required background in the same field (e.g., financial services), with CEOs holding varied degrees or ones that are not an obvious link to the industry (e.g., degree in history to work in banking sector). In terms of the kind of university path to be undertaken, it is not clear (other than industry-based norms such as in tech) whether it truly matters.

4.3. Overall CEO's characteristics: variables and hypotheses

Several factors were examined in this thesis as indicators of CEO's personal and professional profile. Based on the set of variables analysed and on the insights that emerged during the research phase about CEOs characteristics, some hypotheses were formulated regarding the recurrence of some events, possible correlations between different variables, trends and evolution of some variables over the years of analysis. These hypotheses were the result of the expectations that came out while examining the characteristics of these top executives.

Different elements were analysed about each CEO in our sample, with the aim to scrutinize the determinants of different profiles and to detect what characterises a "financial expert" chief executive officer.

4.3.1. CEO age

CEO's age was the first variable to be included in the analysis, for clear reasons. It represents the most basic and important biographical information about an individual. Moreover, studying a sample of CEOs with different backgrounds, working in several publicly listed companies, showed that the trend of CEO's age was quite uniform over time: there is not high variability in the age of CEOs in the years analysed. This may mean that there is a generational factor that is valid for career paths, and that approximately, the time of maturity for reaching a certain position is the same for the majority of managers, corresponding to a short age range. This is the same insight that came out from the comparison of CEOs made in section 2 above.

According to the existing literature, CEOs are relatively older than the regular workforce that characterise the majority of workers employed in the companies. However, within the CEO segment, a lot of variation was found. Several papers investigated the impact of age on the financial implications for a firm. (Hambrick & Mason, 1984) argued that older CEOs are less likely to come up with new ideas, because they have a more conservative mind-set and thus are less innovative. More experienced senior CEOs may feel confident about the way they lead the company (Diks, 2016).

The reasons for a low inclination that older CEOs have towards innovation can be: a drop in the physical and mental strength (Child, 1974), weaker ability to grasp new opportunities and to adopt new ways of doing (Chown, 1960), inability to take into consideration a big quantity of information in the decision-making process, and also in higher self-confidence due to age (Taylor, 1975); it can also be due to a preference towards maintaining the current "status quo", without altering the organization of the firm; another reason for lack of propensity to change in older CEOs may be related to the fact they

have reached a point of financial and professional stability in their lives, so they prefer to avoid moves that may be strategically risky (Carlsson & Karlsson, 1970).

(Chown, 1960) reinforced the perception that the lack of change in the companies is due to the fact that older CEOs have a lower ability or propensity to come up with innovative ideas. According to (Child, 1974), executive youth is associated with economic growth, an assertion that establishes a correlation between young age of top executives and progress of the firm they lead. He noted that the company's growth and the variability of sales and profits are associated to young leaders, because they are attracted by innovation and by the unknown, which means also risk. Another characteristic that is associated to younger CEOs is a more detailed research and evaluation of the information available, leading to strategic decisions that are more accurate and thoughtful. However, it is also true that older executives have deeper and longer experience in seeking and evaluating provided information, that may give them more confidence in dealing with the different situations and events occurring at the firm level. More mature CEOs take more time to make decisions with their obtained knowledge. (Maccrimmon & Wehrung, 1988) argued that risk aversion increases with executives' age. The young optimism that characterise people at a certain stage of their career path will fade away with time and, as people grow up, they prefer secured profits over risky projects, even if they may be more profitable. The lack of revolutionary changes coming from older CEOs can be the factor which leads to competitive disadvantages compared to competitor firms. Therefore, it is more likely that there is a negative relationship between CEOs age and firm performance (Diks, 2016). This would entail that, as CEO's age increases, the value created by the firm declines due to less innovation and lower propensity of top executives to change.

Generally, it can be affirmed that companies that are led by younger CEOs with respect to companies that have older CEOs, will be more prone to set risky strategic objectives which are more oriented to innovation and diversification, will have more variability in their profits and growth with respect to the stability that can represent firms with older CEOs, and finally these firms will be more incline to accept change and support creativity (Diks, 2016).

Our hypothesis concerning CEOs' age is:

H1. The average age of top executives, although slightly, will keep decreasing in the years of analysis from 2014 to 2018, showing that there are increasing probabilities for young people to get an important promotion earlier in their career path. This is due to a growing number of start-ups in many sectors, the valorisation of young talents and to the general focus on innovation that firms have shown in the recent years.

4.3.2. CEO gender

Data regarding the gender of top executives of the firms analysed was also collected and examined, as it represents an important factor to be taken into consideration when studying CEOs profiles; moreover, the issues related to gender diversity and gender balance in top executive positions have become a growing concern globally.

There is not a lot of discussion on the implication of gender as a characteristic of the CEO with respect to the performance of the firm. In a study of 2013 conducted by (Jalbert, Furumo, & Jalbert, 2013), on a large sample of 6305 observations, only 1,22% of CEOs were women. They did not find significant differences in firm performance in the case where the firm was managed by a female CEO. However, the most relevant element of difference in the management of women or men was found in the corporate social responsibility of the companies. Women are more prone to consider the community and the environment that surrounds the company. They show greater attention and sensibility for the environment by promoting initiatives and spreading awareness to the people working in the organization. The presence of a woman in the top management board of a firm allows for a more socially responsible vision of the activities, as they give more attention to the work conditions of people who are socially weaker, such as minorities. A good evaluation of the social responsibility of the firm can improve the company's reputation to the external world. It is also important to note that women, compared

to men, have a larger set of extra-company experiences, that allows them to have a more inclusive vision of problems and to assume varying perspectives based on the different situations (Hillman, Cannella Jr., & Harris, 2002). Women normally adopt a leadership style that tends to be more participatory and democratic, that improves internal communication in the firm and also allows to take more effective strategic decisions.

Recently, gender diversity has been at the centre of many debates and it has been more discussed in literature and in political systems. In Europe, a quota has been set which requires a certain percentage of women in the board of directors. The argument behind this approach is that females need to get equal chances as men and should be offered the same possibilities to fulfil managerial roles within the company and the board. The United States lags behind Europe in this topic and presents lower gender diversity in boards. (Carter, D'Souza, Simkins, & Simpson, 2010) argue that skilled and qualified women and ethnic minorities should have the opportunity to participate into the board of directors at top management levels. They possess external networks, information and other characteristics that can be useful for the companies they manage. The problem that arises is that firms do not want to recruit females just in virtue of them being female, thus for mere reasons of gender. Companies, before including women into their management board, need to be sure that it will be beneficial for the company and it will have positive consequences on the firm performance. The image of the standard board in the United States, consisting of white, old, and bald directors is still recurrent and will need to be changed. This entails a cultural revolution towards a different consideration of females, destroying the unmotivated belief that a diverse board does *per se* mean worse performance (Diks, 2016).

(Smith, Smith, & Verner, 2006) and (Carter, Simkins, & Simpson, 2003) in their studies found a positive relationship between gender diversity and firm performance. Women tend to increase the oversight functions of the board. Moreover, women tend to distinguish themselves when making investment decisions. (Barber & Odean, 2001) showed that men have different investing habits compared to women, and they trade more excessively than women. They are more confident that their investment will result in profit, regardless the level of knowledge and expertise they have on their investment opportunity. Moreover, men are more likely to pay out dividend compared women. Their attitude to risk is also different: women are more risk averse than men (Weber, Blais, & Betz, 2002).

The compensation structure for women and men is not the same. According to (Kulich, Trojanowski, Ryan, & Alexander Haslam, 2011), men are more likely to be paid based on performance. Apparently, men have less incentive to perform well than women and therefore need performance-related payments. Overall, men are paid more than women, which denotes further gender disparity in workplaces. Therefore, not only there are fewer women than men in top executive positions, but they are also paid less than men.

(Diks, 2016) asserts that gender diversity within a board improves firm performance. Therefore, it could be reasonable that a female CEO would lead to higher firm value.

Our hypotheses concerning the gender of CEOs are:

H2. The vast majority of CEOs in the firms analysed are men.

H3. In the years analysed, the percentage between men and women will slightly change and there will be a growing portion of women nominated as top executive by the companies.

4.3.3. CEO tenure

The tenure measures the duration of the term of office for the CEO. However, the seniority of the experience as top executives is also related to the age of the CEO.

The impact of executive's tenure on firm performance is more uncertain than other characteristics. CEOs with higher tenure normally gain higher power within the firm. More power, on the one hand, leads to better stock performance, but

on the other hand causes higher volatility. This is the normal risk-return payoff, which means that CEOs with a higher tenure prefer higher returns instead of more secured projects with lower returns.

(Alutto, 1975) derives a positive relationship between longer-tenured CEOs and commitment towards their results: higher commitment led to higher incentives to perform well (Diks, 2016).

Contradicting is the paper of Miller (1991), which argues that CEO's strategy is less likely to change when tenure increases. Long-tenured CEOs prefer stability and efficiency over inconsistency. This can either be the result of CEOs' safeness and conviction about their own strategy or it may be due the fact that interests in firm environment is lost and they stop reinventing (Diks, 2016).

(Diks, 2016) thesis confirms the positive link between tenure and commitment towards the company, which can eventually lead to higher performance and firm value. Therefore, they test the hypothesis that executive's tenure is positively correlated with firm value.

According to (Rakhmayil & Yuce, 2013), tenure specifies the number of years in the current position, therefore a greater number of years will mean that the individual has more experience on the job and this should translate into higher managerial qualifications. Their study's results suggest that CEOs whose tenure in a company is relatively short tend to use debt more aggressively compared their peers with longer tenure, after controlling for firm age and industry effects.

In their study about the match between CEO and the firm, (Allgood & Farrell, 2003) mention human capital theory as another explanation for why CEO's turnover decreases with tenure. If some component of the human capital developed on a job is specific to the firm, the worker's productivity and wage increase with tenure at the current firm. Because the accumulated human capital is firm-specific, the worker's productivity is likely to be higher at the current firm than at the next best alternative, and CEOs are less likely to quit as tenure increases (Allgood & Farrell, 2003).

In his paper, (Lubojacky, 2017) talks about the effects of CEO tenure on entrepreneurial orientation and firm performance. He defines entrepreneurial orientation (EO) as indicating "how entrepreneurial a firm acts", and includes three dimensions in the definition: innovation (which is mainly investing in R&D), risk taking (that is about making bold moves or decisions with regards to risking capital in the face of uncertainty) and pro-activeness (ability for the firm to take initiative). (Lubojacky, 2017) argues that the key to understanding how firm-level entrepreneurship affects firm performance is tied to CEO tenure. CEO's propensity for learning and experimentation and the direction he/she chooses for the firm are going to drive the firm's entrepreneurial orientation. If the CEO's vision encourages and inspires employees, then the employees are more likely to exchange knowledge with each other and cultivate new ideas (Carmeli, Arazy, & Caridi-Zahavi, 2016). In contrast, a CEO can be detrimental to a firm's orientation and strategic decisions if the he/she choses to bypass learning and experimentation because he/she is supremely confident in his or her ideas for how the firm should be run and choses to pursue that direction indefinitely (Hambrick & Fukutomi, 1991). Entrepreneurial orientation is linked to CEO tenure by a framework of the executive lifecycle that characterizes the learning and performance over the course of a CEO's tenure and is made up of three stages: learning, harvesting, and declining (Miller & Shamsie, 2001).

The learning stage, characterized by knowledge assimilation and experimentation (Miller & Shamsie, 2001), begins upon taking the role of CEO and generally lasts the first few years. Initially, the CEO is focused on building legitimacy and he/she focuses to some degree on the functional areas that best align with the competencies that were instrumental in obtaining the job (Hambrick & Fukutomi, 1991). Also, newly appointed executives are likely to seek various information from internal and external sources (McClelland, Barker, & Oh, 2012). After gaining a political foothold, the CEO begins experimenting (Hambrick & Fukutomi, 1991) and using the learning gained about market opportunities and organizational strengths (Miller & Shamsie, 2001) to undertake various actions, including considering a new direction for the firm (Hambrick & Fukutomi, 1991).

After the learning stage, CEOs capitalize on their past learning and experience in the harvest stage. During the harvest stage, executives begin to gain confidence in their way of doing and thinking (Miller & Shamsie, 2001). Consolidation and convergence characterize this stage in which the CEO begins to reinforce his or her mode of operating through incremental actions related to structure, staffing, and processes (Hambrick & Fukutomi, 1991). This stage produces the best financial performance as the executive has learned to concentrate on what is most important (Miller & Shamsie, 2001) and they are able to set priorities. During the harvest stage, the level of entrepreneurial orientation is in a stationary status as the CEO settles on an acceptable mode of operating and the firm starts exploiting its earlier explorations (Lubojacky, 2017).

The final stage is one of decline and dysfunction. This stage is characterized by loss of interest, fatigue, and habituation on part of the CEO. The CEO will engage in fewer extraordinary initiatives and utilize lethargic decision-making based on less diverse information (Hambrick & Fukutomi, 1991) and lower proactivity. Executives are less willing to learn and search for market opportunities, and tend to remain faithful to obsolete schema used for running the firm (Miller & Shamsie, 2001). At the firm-level, this leads to atrophy of a firm's adaptive properties (Hambrick & Fukutomi, 1991) and declining financial performance (Miller & Shamsie, 2001). This is due to obsolescence (Miller & Shamsie, 2001) and the tendency for CEOs to become more resistant to firm reorientation as tenure increases (Miller, 1991).

These three stages of CEO's tenure have some implications for the entrepreneurial orientation (EO). During the learning stage, the level of EO is low but increasing due to the freshness of the CEO who is open to new ideas and is actively searching for information and opportunities (i.e., EO is increasing as the CEO begins to manage the organization). A new CEO who is active in learning and experimenting is more likely to encourage innovation and proactively take risks in terms of firm strategy and product offerings (Lubojacky, 2017). However, CEOs are likely to moderate their behaviour over time as their tenure increases. Entrepreneurial orientation increases as the CEO keeps on experimenting but the rate of change will be decreasing because the scope of the CEO's search for information decreases as tenure increases (Weng & Lin, 2014) and CEOs tend to become more conservative in their attitudes toward change as their term of office goes on (Musteen, Barker, & Baeten, 2006).

During the harvest stage, due to the focus on exploitation instead of exploration, the EO rate of change will stabilize. At this point, CEOs have acquired a solid knowledge of their business and are more confident, which leads to less experimentation in products and strategies (Miller & Shamsie, 2001).

In contrast, later on in the CEO's tenure during the decline stage, the CEO tends to have a flatter approach and to rely on a narrower flow of information (Hambrick & Fukutomi, 1991): this leads to a decline in entrepreneurial orientation. Long tenured CEOs are more interested in maintaining the status quo (McClelland, Barker, & Oh, 2012) (Weng & Lin, 2014) and may experience a loss of interest in actualizing organizational changes (Barker & Mueller , 2002) (Hambrick & Fukutomi, 1991). To summarize, CEOS' ability and desire to promote an entrepreneurial orientation within their firms will be likely to change during the CEOs' tenure (Lubojacky, 2017).

(Lubojacky, 2017) assumes that the relationship between CEO tenure (independent variable) and firm performance (dependent variable) is mediated by entrepreneurial orientation. His hypothesis is that the relationship between CEO tenure and EO is curvilinear with the highest level of EO occurring at an intermediate stage of CEO tenure (during the harvest stage).

(Lubojacky, 2017) developed and tested a model of how the CEO lifecycle as measured by tenure predicts entrepreneurial orientation, which then impacts firm performance. However, he found no support for his hypotheses related to CEO tenure nor for the positive relationship between EO and firm performance.

Our thesis assumes that:

H4. CEOs with a long tenure (more than twenty years' time) are also founders or owners of the company they manage and are predominantly men, meaning that tenure is not only related to age but also to gender.

H5. We also expect female CEO to have a shorter tenure on average with respect to their male peers, as they have reached top executive positions only in the last few years.

The relationship between CEO tenure and the sector of the firm is also scrutinized to see whether there is a correlation between the tenure of the CEO and the sector in which the firm operates.

4.3.4. CEO education

CEOs' educational basis was analysed as a first basic indicator of propensity towards a specific field or role. British economic literature identifies education as generally the cognitive and experiential basis of an individual; (Bantel, 1993) adds that education reflects the capability of an individual to process information. The different educational backgrounds that indicate the specialization of the CEO in a given field (economics, engineering, human sciences etc.) allow us to make quite valid inferences about the values and preferences of the individuals (Hambrick & Mason, 1984). The disciplinary field that the CEO chose for his or her formation, is strongly related to his or her professional knowledge.

One of the primary roles and objectives of a corporate board is to hire a chief executive officer with a high ability and with a certain level of qualifications. CEO ability is the composition of observable and quantifiable characteristics such as education and work experience, as well as unobservable and potentially non-quantifiable characteristics such as leadership and team-building skills. The identification and measurement of CEO abilities is a difficult, imprecise and expensive process as evidenced by the growing "executive search" industry, and the considerable resources that are expended in the CEO search process (Bhagat, Bolton, & Subramanian, 2010).

Given the difficulty of evaluating CEO ability, objective and easily measurable characteristics such as the educational background and the qualifications obtained would be expected to play an important role in the CEO hiring process. Indeed, the large literature on "human capital" as a driver of production and economic growth highlights the importance of education as a determinant of human capital. CEO education potentially impacts the executive ability in three mutually non-exclusive ways. First, education could potentially contribute to the CEO's knowledge, perspective and ability to understand technical and abstract concepts. Second, higher education could be a signal of the CEO's intellectual capacity and ability to persevere on challenging intellectual activities. Finally, the social networks acquired in college and graduate school can be quite helpful professionally in the future (Bhagat, Bolton, & Subramanian, 2010) and gives an idea of the cultural background that characterises the person.

In a study that included Fortune 500 listed firms in the year 2008, (Martelli & Abels, 2010) analysed the education level of the CEOs that managed these firms, and they also presented a comparison with thirty years before. In fact, in 1976 (Burck, 1976) examined the Fortune 500 list and it came out that 85,9% of CEOs had completed at least an undergraduate degree, while the rest of CEOs had a high school diploma. This same information was further analysed by (Chandy, 1991) that added a specification: almost half of these CEOs (the 51%) had a degree in management, with specialisations in finance, marketing and accounting; 19% of CEOs had an engineering background and the rest of them came from the field of liberal arts (especially in law). After thirty-two years, the percentage of CEOs with an undergraduate degree had increased from 86% to 93%; moreover, while in 1976 the CEOs that had a master degree were only the 24%, in 2008 they represented the 55% of the total. After so many years, most part of the CEOs with an undergraduate degree (53%) did not come from the field of economics and management, but they had studied engineering, technologies, law and sciences. This indicates that the study of subjects related to firm management has decreased over the years. Although having a competence in economics and management will be important for future CEOs, (White, 2005) affirms that in a complex era of global competition, liberal arts will gain more importance: this will give CEOs a wider and more

diversified preparation, that will allow them to face and solve problems by gleaning knowledge from sectors that are not necessarily and only related to economics and management.

There exist two competing theories about the relationship between education and future earnings of CEOs. One is the human capital theory, affirming that the credential of having a degree is not what is important in determining future successes. Rather, the skills learned allow individual to achieve higher employment status. The other one is the screening theory which argues that credentials afford the individual something above and beyond the skills attained. That is, individuals can only realize the value of the skills they have learned when accompanied by the acquisition of a recognized credential. Employers, lacking complete information about an individual, rely on certifications and credentials as a screening device. Students select an educational level that signals their abilities to employers (Jalbert, Ramesh, & Jalbert, 2002).

Our hypotheses concerning CEO education are as follows:

H6. The CEOs who do not have a degree, may be founders or owners of the companies that they manage or they may be successors of the original founders.

H7. CEOs without a degree are generally older and/or have a longer tenure as CEOs in that firm, meaning that they were nominated for that position for reasons of ownership or some participation bond within the company.

H8. The vast majority of young CEOs, in the age group between 20 and 35 years old, have acquired a degree and possess some academic background that can be related or not to the role that they perform.

4.3.5. CEO job experience

Together with the educational background, the work experience gathered before becoming CEO defines the person and his/her possible attitudes towards some specific subject matter. The impact that CEOs with a career background in finance can have on the functioning of the company, its financial policies and decision-making has been discussed previously in this work.

(Hamori & Koyuncu, 2014) analysed a sample of CEOs from Standard & Poor 500 corporations in the list of 2005 in order to look at the relationship between having an experience as CEO in a different firm and the post-succession financial performance of the firm that they currently lead as CEOs. It was found that experience in the CEO position is negatively related to the performance of the current firm. CEOs who directly move to their current CEO position from the previous one and those with job-specific experience in the same or related industry or at the helm of a previous company

Figure 2 – Pyramid of financial expertise levels

similar in size to the current one, are associated with significantly lower post-succession performance than those without prior CEO experience.

In general, when there is a specific focus on CEOs with a financial background, it is useful to imagine a scale of different levels of financial specialisation, where the most generic bottom line characteristic would be to possess an academic title (i.e. a degree), the next more specific level would be to have a degree in finance or economics, a job experience in finance would be on the next step, then there would be a job experience in the fields of consulting and/or accounting, which is more specific than a general financial work experience; lastly, on the top of the pyramid there would be a previous experience as Chief financial officer that in our dataset represents the highest and most complete achievement in a

financial career. As one moves from the bottom to the top of the pyramid, the level of financial specialisation increases and the number of CEOs included in each category level gets smaller.

The hypothesis made on the variable concerning CEO previous work experience was:

H9. Most CEOs only have a job experience in finance or a related field and only a small part of them have a previous experience in consulting or accounting, that is more specific and denotes further specialisation.

4.3.6. Other variables

Among all the specific CEO's characteristics, another dummy variable examined was whether the firms examined changed their CEO during the period of analysis. The characteristics and backgrounds of new CEOs were also scrutinized and compared with those of the previous CEOs. The aim was to detect possible similarities or continuity in terms of educational and career backgrounds, between top executives that succeeded in the same company. For every company analysed, the information about the sectors in which they operate was also taken into consideration, in order to look for possible correlations between the sector and other CEO variables that were considered in the study and also to check whether there is some homogeneity and similarity in the choice of a particular CEO profile in the same sector.

5. Research design: data gathering

This thesis has a particular focus on the elements that characterise the financial expertise of chief executives who carry out top management roles in the companies analysed. Starting from the firms listed in Stoxx 600, data was collected from 2014 to 2018; financial firms were excluded from the sample and the research concentrated on individual CEOs and their backgrounds. The data collection phase focused on the search for CEOs' demographical information (gender, age, date of birth), tenure as CEO, education history with degrees and post-graduate specialisations, the field of studies, the work experiences made in the financial sector, in consulting or accounting firms, possible experiences as CFO and tenure as CFO.

CEOs were analysed individually and a personal identification code was assigned to each of them, on the basis of a number of variables that have been considered as indicators of different kinds of financial knowledge and expertise.

Demographical attributes of the CEOs were first identified, such as the age while they were in charge as CEOs in the years of analysis, date of birth and a dummy for gender. Tenure as CEOs was also analysed, in order to see for how many years they had been occupying this position in the governance board of that company.

Another variable concerned the analysis of the education level, where the main point was to indicate, through a dummy variable, whether the CEO had or did not have a university degree. In a more detailed way, the next variable detected whether the degree had a financial or, more generally, an economic related nature (i.e. degree in Economics, Finance, Management, Marketing). After assessing the presence of a degree, it was important to differentiate between those possessing an academic knowledge in economics or a related field, and those who had pursued a different orientation in their studies (i.e. engineering, pharmaceutical, chemical etc.).

The next step was to further delineate those who were in possess of a specialisation, adding the dummy variable for an advanced, postgraduate degree (i.e. Master of Arts, Graduate Diploma in Law, Master of Business Administration, Masters in Management or Economics, Master of Engineering, certificate of Chartered Accountant).

In addition to the academic background, the previous job experiences of CEOs were also analysed in order to understand whether these people may have gathered a professional experience in the financial sector (in companies or any entities that perform financial activities related to banking and investment, private equity, credit institutions, financial market transactions, investment and financial services, asset management etc.). Job experiences in the financial consulting or accounting fields were treated as a separate variable with respect to the broader financial sector. The criterion used to discern among these experiences in the field of finance is related to the definition of a financial expert provided above in this thesis (section 4).

An important point that emerged from the research was that the educational and professional background are not necessarily related: the presence of an economic or finance-related degree does not necessarily entail the development of some work experience in the same field of finance, consulting or accounting. In the same way, not all the managers who have a work experience in the financial sector have an economic or financial educational background. A more specific filter was added to the first variables to distinguish, among the CEOs that would possess some financial expertise, those that had been occupying the position of chief financial officer, in the same firm or in another company. Consequently, filtering for those that had been CFOs before (dummy "1"), the tenure as CFOs was also indicated, to have an idea of their accumulated experience in this role.

Following the collection of data and information useful for the analysis, we set up a list of the companies that were available online in the Stoxx600 index website, in the 5-years span of time from 2014 to 2018, and we excluded those that were not useful for the analysis. Subsequently, all the data about the CEOs who were in their positions during the years analysed were gathered, paying attention to the companies that in the years analysed had changed their CEOs or had more than one CEO (co-CEOs). With a complete list of companies and their executives, the data collection focused on recovering the information about firms' characteristics and CEO's characteristics.

As already anticipated, during the research phase, all insurance, financial or banking companies were excluded. Only the CEOs at the head of non-financial firms were considered in the panel, and in the case of financial expert CEOs, the aim was to make a detailed analysis of their financial background in a descriptive yet experimental manner. The sector in which each firm operates was also taken into consideration, as it represents an important distinctive characteristic for the company that may be an explanatory variable for the choice of a specific type of CEO with a particular functional orientation.

Most of the data were analysed year by year, with the aim to detect possible changes in trends and statistics during a time period of five years, especially with respect to CEOs profiles and characteristics. Particular attention was dedicated to the cases in which the companies switched from a CEO to a new one during the period analysed, to highlight the differences between the CEOs who had covered this role in the same firm: a radical change in the governance members' characteristics may also entail a mutation of vision, culture and direction for the company.

In general, detailed biographical information on the CEOs was gathered, including their educational background and employment history. Taken together, this set of variables can be considered a general index that denotes the generic skills of the CEO, giving also some proxies for the talent of the CEO. The arising concern may be that financial expertise might be correlated with CEO characteristics that are unobservable or not present in our analysis.

CEO-related variables analysed include age, sex, tenure as CEO, education, job experience, tenure as CFO, although talent and general managerial ability cannot be directly measured. Firm-level variables include ROA, ROE and Cash Flow to Sales ratio, controlled for leverage, size (measured as logarithm of total revenues), year of analysis and sector.

The main focus of our study was to analyse CEOs' backgrounds with special attention to their financial expertise and this will provide the answers to the hypotheses that have been stated before about CEOs' characteristics. The next step of the study was to conduct different linear regression models in order to find possible relationships between the change of CEOs who succeed in the companies with a consequent change of expertise and the firm performance measured by profitability indicators.

The sample of our study was composed by the CEOs from the 600 biggest companies listed in the Stoxx600. The index includes the biggest six hundred companies in terms of market capitalization, across 17 countries of the European region: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and the United Kingdom. The initial panel included data about 814 firms and 3229 firm-year observations, in the time period from 2014 to 2018. The companies analysed were further divided according to the sector in which they operate and the Global Industry Classification Standard (GICS) was used in order to identify the industry. The GICS divides companies into 11 sectors and 24 industry groups: all those belonging to the sector of "Financials" were removed from our research sample, because the purpose of this study is to analyse the effect of a CEO with a financial background on the firm performance. As it would be reasonable to assume that the CEOs of most financial

companies or institutions would have some type of financial expertise, they would not represent a reliable sample. The sector of "Financials" included three industry groups: banks (composed by banks and thrifts and mortgage finance), diversified financials (including diversified financial services, consumer finance, capital markets and mortgage real estate investment trusts – REITS) and insurance. As a consequence, the initial sample was reduced and the final one includes 620 companies analysed, 808 CEOs and 2477 firm-year observations.

The sample for the linear regression included 1844 firm-year observations which were those valid for measuring the occurrence of a CEO change, because the term of comparison with the previous year was available. 633 observations were considered not valid and were excluded from the sample because they belonged to the first year available for analysis of the firm and could not be compared against the previous year.

Furthermore, for the linear regression models, the dataset had to be further restricted because the main variable to be detected was the change of CEO. The measurement of a change, in general, requires a phenomenon in a given year to be compared against a benchmark, which in this case was the existence of the same company in the previous year (meaning that the firm had to be present in the Stoxx600 list also in the previous year), in order to see whether the CEO was the same or not. As the starting year of analysis was 2014 in our study, we do not have information about the year before, so the change of CEO in a given firm could only be measured starting from 2015. More in general, for each firm, the change could only be detected starting from the second year of their presence in the listed firms.

Orbis database was used to retrieve information about firms' characteristics. In particular, data about companies' profitability ratios, balance sheet and income statement items were collected from this source. Data for six years were downloaded about return on equity, return on asset, cash flow ratios, total revenues, asset turnover, profit margin, leverage, total assets and operating revenues of the companies in our sample. The data about the characteristics of the CEOs who guided these companies were collected one by one and manually from the information published online about their CVs or from the companies' financial statements, official reports, releases, websites and from Bloomberg. The information that was not available on the companies' direct sources were taken from the CEO's official LinkedIn profiles, that were useful for backtracking their past work experiences, university careers (degrees and field of specialisation), and to have a more precise knowledge of the time periods (as a double check of the period in which they had been CEOs or CFOs in a specific company).

In addition, pivot tables on Microsoft Excel were an extremely useful instrument to arrange the big amount of data and variables analysed. This allowed us to define the main descriptive statistics, percentages and relations.

6. Investigation on descriptive variables

The central focus of this study was to analyse all the aspects that characterise the phenomenon of CEOs' financial expertise. To this purpose, we conducted a deep analysis of the data available about CEOs' characteristics in order to investigate, one by one, all the variables that could give some insights about the variety of CEOs profiles and what characterises such variety. In a following phase, we included firm's characteristics into the study and analysed them in relation to CEO expertise.

Our research focused deeply on understanding the relationships between all the variables analysed to see whether there can be some links between the various phenomena that characterise CEOs' profiles. This is why, we related each of the variables analysed with the others and some compelling insights came out.

6.1. Academic specialisation

During the research phase, a successive step to checking whether the CEO had a degree, was to see whether he or she also had a postgraduate specialisation, denoting a higher education level achieved with respect to the bachelor, independently of the field.

For the portion of CEOs who had an advanced academic degree, such as a Master degree, a PhD, an MBA or a Master of Arts we made some further investigation. In particular, we first looked at the percentage of CEOs who have a postgraduate degree; then we went further to see the portion of CEOs with an economic or finance related degree who also possessed a post-graduate qualification, in order to see if there may be a relationship between having an economic or financial background and achieving an advanced qualification. This may also give an idea of the level of specialization achieved by CEOs with a degree in finance or economics, who are at the centre of our analysis. Another question concerned how many of the CEOs with a work experience in finance, accounting or consulting (that are no mutually exclusive) also have a postgraduate degree. Then we checked how many CEOs who had also an experience as CFOs in the same company or in a different one, also have a postgraduate degree: this was to understand whether the CEOs with a strong financial background in virtue of their work experience as financial executive, need to achieve a high level of specialisation in their studies and academic path. A degree can show that the manager has a specialized knowledge or technical skills an employer is looking for and that can be transferred to the workplace more easily.

Then, we detected the average age of CEOs who have a postgraduate degree in order to see whether there is some difference in generations with respect to the degree of specialisation and where is most concentration of postgraduates. The expectation would be that younger CEOs have a higher level of specialisation with respect to older ones.

The variable concerning postgraduate degrees was also classified according to the gender of CEOs, to look at the differences in terms of specialisation between male and female CEOs. It was also interesting to look at the average tenure of CEOs with a postgraduate degree: hypothetically, the most specialised managers should last longer as top executives in the companies. Other information was collected about the distribution of CEOs with a postgraduate degree in the different sectors analysed.

6.2. Finance degree and job experience

In order to define a financial expert profile, it was important to have a perspective about the previous job experiences that current CEOs had in their career path before taking this charge. In particular, we analysed whether the CEO had a job experience in the field of finance such as a bank or any kind of financial institution, or if they covered a role as finance

director in a firm. We also looked at possible experiences in the fields of accounting and consulting that are more specific and normally would entail a deeper specialisation. The last variable in terms of work experience was to see whether they had a past experience as CFO either in the same company that they manage as CEOs or in another organization.

The next focus of analysis after having verified the presence of a degree and a postgraduate specialization, was to see how many of the CEOs with a finance-related degree (in economics, management, finance, accounting) had also a past work experience in the financial field (such as banks or financial institutions, finance director in a company) and/or in financial consulting and/or accounting. One aspect of labour market success is the ability to utilize the investment in schooling in future employment. A study conducted by (Robst, 2006) about the match between field of study and work experience, highlights that fifty-five percent of individuals report that their work and field of study are closely related, while 25% report that they are somewhat related. Twenty percent of the sample report their field of study and work are not related, with mismatch reported more often by men.

It was interesting to give a look at how many of those with a job experience in finance and/or in consulting and accounting, have or do not have a degree or a postgraduate specialisation in the same set of subjects. The portion of CEOs who have accumulated an experience in these fields without having a prior education in the same subject matters, is an evidence of the fact that there exist people who work or have worked in the financial sector despite their non-finance related academic background. Another question concerned the relationship between postgraduates, field of study and job experience in finance, accounting or consulting: understanding the level and direction of specialisation of CEOs who accumulate work experiences in the financial field is also important.

This was also useful to understand the relationship between the field of study and the career path that a person can take. Especially for the financial area of expertise, the expectation would be that those who have a management or a financial direction position, are also required to have a basic or advanced set of skills in finance or economics. Also, we looked at how many CEOs had a work experience in finance and how many of them had a job experience in consulting or accounting, and also at those profiles who had both type of work experiences. It would be reasonable to assume that there is only a minority of CEOs who have both kinds of job experiences, unless he or she would be a financial expert.

The average age and tenure of CEOs with an economic or financial background in terms of studies and work experience was also analysed.

6.3. Experience as financial executive

In the investigation of CEOs' previous work experiences, special attention was turned to those who had an experience as chief financial officer in the same company in which they were currently CEO or in another firm. This was considered the highest level of work experience in finance, as it denotes a high degree of specialisation in the field.

The chief financial officer (CFO) is the third highest position in the management of a company, after the Chief Executive Officer (CEO) and the Chief Operations Officer (COO). The CFO is the top-level financial controller, handling everything relating to financial planning and it is responsible for managing the financial actions of a company.

Our examination of the variable CFO focused, first of all, on understanding how many CFOs have a degree in economics or finance and also a postgraduate degree. The expectation is that the result of this calculus would be close to 100%, but it was also important to see whether there are CEOs without a degree in economics or finance that have covered also a position as CFOs. For the portion of CFOs that do not have an education in finance, it is interesting to look at their

characteristics, at whether they may be owners or founders, at their average age and their gender.

Another thing that was done with CEOs that covered the role of CFOs was to explore their work experiences to see whether they also had covered some job positions related to finance, accounting or consulting. The presence of a title as CFO and a job positions in one of the above-mentioned positions would denote a financial expert profile.

We also looked at the CEOs' tenure as CFOs, to have an idea of how long was their experience as financial executives or whether they had more than one experience. This gave insights about average tenure of CEOs as CFOs and it also allowed us to answer to questions such as how many of those with longer tenure as CFOs (arbitrarily set to more than 10 years) also have a degree in economics of finance and a postgraduate specialisation. Intuitively, the longer the tenure as CFO or as CEO, the older the person in charge. Relating the variables of age and tenure to the presence of a degree allows us to make comparisons about the general prerequisites that existed in the past in order to get a position as CFO and those that are required nowadays.

As a distinction was made between CEOs who had been CFOs in the same firm and those who had covered the same role in another company, our study also answered to the question about the percentage of CFOs who have performed this role in the same firm. Finding this number means tracking a career path of the person as top executive in the same company. We also wanted to see whether, among the few women present in our sample, there are some who have covered the position of CFOs.

6.4. Age and tenure

Although it may seem the most basic characteristic that defines a person, age is an interesting variable that is suitable for a comprehensive analysis and it can be related to many other variables, with which it can have a relation of causality or covariation.

The data about age, gender and tenure of CEOs were firstly analysed as a variable per se, and then they were put in relationship with all other variables related to education and work experiences.

For simplicity, we arbitrarily divided age in ranges that comprise more than one value for age.

In particular, age was divided in:

- Range 1: up to 30 years' old (very young CEOs)
- Range 2: from 31 to 40 years' old
- Range 3: from 41 to 50 years' old
- Range 4: from 51 to 70 years' old
- Range 5: from 71 onwards ("older" CEOs)

This was useful to detect the concentration of CEOs in each age range, based on the number of observations.

The main investigations about the variable "age" regard, first of all, the age range in which most observations are concentrated, which means checking for the average, the median and the standard deviation of this variable.

Going deeper into the analysis, the next question would be to understand in which age range are concentrated the CEOs who are deemed to be financial experts and check the average age of the CEOs who had an experience in finance or accounting or consulting, as well as the average age of CEOs who have also been CFOs before. The average tenure of CEOs who are financial experts and also the tenure as CFOs was another point of investigation.

This allows us to make links between CEO's characteristics and their age, to understand possible associations that may exist. Then, as it is reasonable to assume that there is a link between age and tenure, we check whether the CEOs who have a longer tenure are those who are over 65 years old. A more interesting point is to look at the gender of "older" CEOs, as we expect them to be mostly males. For the CEOs belonging to the highest age range (over 65), the next question would be to see how many of them have a degree. For those without a degree, one would expect them to be founders or owners of the companies in which they are CEOs.

Relating age range to industry sectors, interesting questions arise about the lowest age range in which we find the youngest CEOs, to see which are the sectors in which their firm operate. We expect to find young CEOs in firms that operate in the most innovative sectors such as technological, IT services or renewable energies. In the same way, for each age range, such as the medium one (41-50) and the highest one (over 70), we look at the top sectors in which we find these CEOs.

For what concerns gender division, the average age of males and females was calculated to see whether there are some differences in career times between males and females. The average age and tenure of the CEOs with a degree in finance and of the CEOs with a postgraduate degree was also considered.

6.5. CEO's gender

The distinctive characteristics of males and females were scrutinized as they are among the most debated topics also in present literature.

According to (Chin S., Krivkovich, & Nadeau , 2018), companies with greater gender diversity perform better. McKinsey's research has shown that companies in the top quartile for gender diversity on executive teams were 21 percent more likely to outperform on profitability and 27 percent more likely to demonstrate superior value creation. Their research however, shows that women remain significantly underrepresented in the upper levels of financial-services companies. Women and men in financial services begin their careers at parity, making up roughly equal portions of entry-level staff, but higher up the ladder, women account for only 19 percent of positions in the C-suite. In 2017, on average, women accounted for 17 percent of corporate-board members and 12 percent of executive-committee members in the top 50 listed G-20 companies

Proportionally to the number of males and females, our first focus of analysis was to make track of the CEOs with the most complete financial background, to see whether there are differences in the level of specialisation related to gender.

In a more detailed way, we looked at the percentage of males and females with a degree and a postgraduate degree; then the difference between male and female related to degrees in economics of finance, to detect the most frequent field of study chosen by men and women in career. Then we looked at the percentage of male and female CEOs with work experience in finance, in consulting and accounting and those who covered the role of CFOs.

The main purpose of this part of analysis was to understand what characterises women that cover a leading position in the listed companies analysed. Relatively to male CEOs, do they have deeper financial expertise? Are they the same average age as men? Are there more postgraduates among them? Do they have more job experience in consulting, accounting or in the finance sector? Using the binary codes associated to each CEO identification code, we were able to discern the financial background of males compared to that of females.

Also, the average tenure of males was compared to that of females, with the aim to assess whether women have, on

average, a shorter tenure as CEOs, because we expect most of them to having been elected only in the last few years. The tendency of the data about the frequency of women in the CEO position was another point of interest.

We also want to see what characterises women with respect to their academic background and specialisation, to see whether there are women who do not have a degree and if these are the owners or founders of the companies analysed.

6.6. Industry Sector

As already mentioned, we used GICS classification to divide companies based on their industry sector of operations. The information available about the firms' sectors was not only used for the regression model as a control variable, but was also treated as a variable *per se* and in relation with CEOs' characteristics. In particular, we looked at the top most frequent sectors in the list of companies and we tried to crossbreed the data about industry with the data about financial expertise of CEOs. We asked for the group of financial experts, in which sector they are most present, to see whether there is a correlation between the firm's area of business and the choice of a certain profile for the chief executive. This topic has been discussed in the literature for what concerns the existence of a firm-CEO match (Allgood & Farrell, 2003); (Li & Ueda, 2006).

For each variable analysed about the CEO-firm observation, we draw connections with the sector of the firm, through pivot tables on Excel. We looked at the gender division in each sector, to see whether in some industries there was a higher concentration of women. We analysed a possible link between the sector and the tenure of the CEO, too see whether in more innovative sectors (such as Renewable energies), there was also an averagely shorter tenure of the CEO that presumably is also younger. A research conducted by (Han, 2015), shows that start-up firms and established firms have different preferences for CEOs and these differences are likely to show up in the age of their CEOs. A disproportionately high percentage of start-up firms hire younger executives when compared with established firms. He also concludes that younger CEOs can facilitate the development and growth of young start-ups, as they are more high-tech oriented, have higher risk tolerance and are better at working in decentralized organizations. Using data from Compustat and ExecuComp from 1992 to 20121, he finds that young firms are more likely to be led by young CEOs.

For all the determinants of financial expertise, namely degree in finance/economics, work experience in the financial sector, consulting or accounting field, we want to look at the distribution of financial expert CEOs in the different sectors and see whether they are mostly present in one or more specific fields. The same for CEOs who have been CFOs before: are they concentrated in a few specific industries? Presumably, for the most technical-specific sectors like engineering and pharmaceutical, CEOs that are selected show a stronger "fit" with the firm they manage, as they may be required to have a specific know-how and expertise in that particular field, acquired through their educational and professional background.

For the firms that have changed their CEO during the years analysed, which are the independent variable in the regression model that we will show below in this thesis, we added the sector as a control variable. We also asked the question about firms that changed from a financial expert to a non-financial expert and vice versa: to which industry they belong? Are there some consistent trends that can be highlighted, with regard to the passage from a type of CEO to the other and a specific industry?

6.7. Assessing financial expertise

As explained in the first chapter of this thesis (in paragraph 4.3.5), we found it useful to assemble all variables that

characterise a financial expert CEO by placing them in order on a scale that denotes different levels of expertise.

In this way, we were able to study the broad phenomenon of "financial expertise" that can have various meanings, by dividing it in different degrees of specialization. The most basic requisite of a financial expert CEO would be to have a degree, which correspond to ranking level 1, without considering the area of study. The next step was to circumscribe the CEOs with an economic or finance related degree, corresponding to ranking level 2. The following level 3 would belong to those who have a work experience in the financial field which is more general than the next level 4, composed by the CEOs with a work experience in consulting or accounting. The top level 5 is for the CEOs who have also been CFOs, in the same firm or in another one. To each of these variables we assigned a binary number and we constructed a scale with an increasing rank: as we proceed from the bottom level to the top one, we attribute a decimal number to each combination of variables. Each decimal value corresponds univocally to a certain level of financial specialisation for the CEO.

The criterion was to assign binary numbers corresponding to each combination of experiences that for our convention was arranged in a fixed order, so that by simply reading the binary code corresponding to each CEO ID, we are able to detect the CEO's financial background that includes academic and professional experiences. This was done on Microsoft Excel, with the "decimal to binary" (DEC2BIN(…)) function that is used to convert decimal numbers into binary numbers[3]. In this way, we were able to delimit a threshold for financial expertise, under which the CEO is not considered a financial expert and above which the CEO is considered a financial expert. Each level of expertise characterised by the five variables shown in figure 3, is placed in one of the bit positions as shown in the figure below. In order for a CEO to be deemed a financial expert in our study, the binary value assigned to his or her ID needs to be at least 3. Decimal numbers under 3 indicate that the CEO only has a degree that may even be non-finance related, meaning he or she can be an engineer, a pharmacist etc. Having a value of 3 (minimum in order to be considered a financial expert) means that the CEO not only has a degree, but the field of study is economics, management, finance or a related field. According to the value assigned to each variable that indicates a level of financial expertise, each possible combination of these elements gives a unique code that can only correspond to that decimal value considered as a category. In the binary code, the "1" indicates the presence of that category variable and "0" indicates its absence; this means that when reading the binary code, by simply looking at the positions of the number "1" we understand the profile of the CEO.

The classification is shown in figure 4, in the following way:

VARIABLES	Ranking of expertise	Bit position					Binary value
		4	3	2	1	0	
CFO	5	1	0	0	0	0	16
JOB EXP. IN CONSULTING/ACCOUNTING	4	0	1	0	0	0	8
JOB EXP. IN FINANCE	3	0	0	1	0	0	4
FINANCIAL RELATED DEGREE	2	0	0	0	1	0	2
DEGREE	1	0	0	0	0	1	1

Figure 3 – Variables of financial expertise and binary codes

For each binary code, we want to see where is the highest concentration of CEOs, that tells us the general tendency of CEOs for what concerns their financial expertise and background.

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[3] A binary number is a number expressed in the base-2 numeral system, which uses only two symbols: typically "0" (zero) and "1" (one). The base-2 numeral system is a positional notation with a radix of 2. Each digit is referred to as a bit.
Source: https://en.wikipedia.org/wiki/Binary_number

7. Linear Regression: model description and methods used

In a view to study the phenomenon of CEOs with a financial background and the influence that this may have on the company performance, we adopted a linear regression method of analysis. The purpose was to investigate whether the change of CEO in time "t" can have an effect on the performance of the company in the following period "t+1".

The independent variables utilized in this study are the various types of CEO changes, meant as a change of financial expertise in the top management team. The dependent variables are three ratios that can give an idea of firm performance. We also controlled for the factors that can be deemed to influence the dependent variables utilized in the models.

For the CEOs characteristics and also for the occurrence of a specific type of change (see sub-groups in figure 4 further below), we have used dummy variables. As a first step, for each sub-group category of change, we used "1" to indicate that the changed would fall in a specific sub-group category (meaning that the condition is true) and "0" otherwise. Dummy variables were extremely useful to translate qualitative variables into numbers so that they could be suitable for use in the regression models.

In this study, the three dependent variables (indicators of firm performance) will be regressed on the independent variables (related to CEO succession) together with some control variables. The main objective of the regression was to explain how much a variation in the explanatory variables (change of CEOs with certain types and levels of expertise) can explain the variation in the response variables (firm performance). As a consequence, we will create four main regression models, where we analyse the different cases of change (independent variables). Each model will have its sub-regressions, one for each dependent variable, so the total will give twelve different regression models in order to analyse the effect of the independent variables on ROA, ROE and CF/sales.

Assuming that we have one response variable (Y) for each regression and some explanatory variables (X's), then we can model the responses as a function of the explanatory variables:

Firm performance (y_i) = β_0 + β_1 CEO_change (x_1) + $\square$ β_t Control variables $_t$ + ε_i

This is a general formula, where:

β_0 = intercept
β = coefficients for each variable
x_i = independent variables
y_i = dependent variables
ε_t = error
i = 1,.....,n

The response variable is modelled by a linear function of explanatory variables plus an error term.

7.1. Multiple Regression

Multiple regression generally explains the relationship between multiple independent or predictor variables and one dependent or criterion variable. The dependent variable is modelled as a function of several independent variables with corresponding coefficients, along with the constant term. The method is broadly used to predict the behaviour of the response variables associated to changes in the predictor variables, once a desired degree of relation has been established. The term "multiple" applies to the number of predictors that enter the model (or equivalently the design matrix) with a single outcome which is the Y response (Kuhait, 2016).

As already highlighted, the sample for the regression analysis includes 620 companies and 1844 firm-year observations which were valid for detecting the occurrence of a change of CEO. For the 633 observations that had no term of comparison, there was no possibility to compare the CEO change from a year to the next one and they were filtered out from the sample.

From the initial 24 industry groups in the classification, we included in our analysis 23 sectors (financial firms were excluded) which became 22 dummy variables. The analysis used cross-sectional observations of 5 years (2014 was excluded but it was replaced with data on firm performance of 2019, which was the response variable of CEO change in 2018) for the selected firms.

We constructed 4 different multiple regression models and 8 sub-regressions in order to analyse different aspects of a same phenomenon: the relationship between the change of CEO in a company at year "t" and its performance at "t+1".

For each model, we had independent and control variables that would explain the effect on one dependent variable through a multiple regression. This analysis was repeated for each of the three response variables of the models that were placed in a hypothetical relationship with the CEO successions and the control variables.

In the independent variables, the different aspects of the change of CEO that were analysed were all translated into dummy variables. For the dependent variables, we looked at ROE, ROA and CF/Sales ratios. The control variables were a mix of categorical variables that were transformed into dummies (sectors and years of analysis were transformed in dummies with "n" categories becoming "n-1" dummies) and numerical values transformed into natural logarithms (this is the case for total revenues) or simple percentages (leverage ratios).

The main assumption which lies behind the construction of the regression models is that there exists a relationship between the change of CEO at the head of a company and the consequent company's financial performance. We will test the existence of such a link and see whether the null hypothesis, which denies the existence of any relationship, can be rejected.

Therefore, the purpose of the regression model is to test whether there is an effect of the change of CEO (in various directions based on types and levels of expertise) on the firm profitability ratios. The assumption about the sign of the relationship is that when the change is in favour of a financial expert CEO, firm performance improves; when the change is in the opposite direction, towards a non-financial expert, firm performance decreases.

Model (1.1)

- INDEPENDENT VARIABLE: change of CEO from financial expert to non-financial expert OR change of CEO from non-financial expert to financial expert ("1"), non-change of CEO ("0")
- DEPENDENT VARIABLE: firm performance measures of ROA (model 1.1), ROE (model 1.2), CF/sales (model 1.3)
- CONTROL VARIABLE: sector, firm size (natural log. of total revenues), leverage, year of analysis

H1. The change of CEO at the lead of a company in a given period has an effect on the company performance, meaning that the shift from a CEO with a type of expertise to a CEO with another type of expertise causes a variation in the company performance of the following period.

Model (2.1)

- INDEPENDENT VARIABLE: change of CEO from non-financial expert to financial expert ("1") and non-change ("0")
- DEPENDENT VARIABLE: firm performance measures of ROA (model 2.1), ROE (model 2.2), CF/sales (model 2.3)
- CONTROL VARIABLE: sector, firm size (natural log. of total revenues), leverage, year of analysis

H2. When the top executive changes from a non-financial expert to a financial expert, firm performance is affected in a positive way.

Model (3.1)

- INDEPENDENT VARIABLE: change of CEO from financial expert to non-financial expert ("1") and non-change of CEO ("0")
- DEPENDENT VARIABLE: firm performance measures of ROA (model 3.1), ROE (model 3.2), CF/sales (model 3.3)
- CONTROL VARIABLE: sector, firm size (natural log. of total revenues), leverage, year of analysis

H3. When the executive changes from a financial expert to a non-financial expert, firm performance is negatively affected.

Model (4.1)

- INDEPENDENT VARIABLE: change of CEO in different direction ("1") and change in the same direction ("0")
- DEPENDENT VARIABLE: firm performance measures of ROA (model 4.1), ROE (model 4.2), CF/sales (model 4.3)
- CONTROL VARIABLE: sector, firm size (natural log. of total revenues), leverage, year of analysis

H4. When the CEO changes from a financial expert to another financial expert or from a non-financial expert to a non-financial expert (same type of expertise), firm performance is not significantly affected.

7.1.1. Independent variables

The main independent variable that is at the centre of our regression models and our study is related to companies that changed their CEO during the years analysed. As we went deeply into the investigation of CEOs with a financial background and knowledge, the change of executive brings with it also a shift of expertise in the top management board of the company. Presumably, CEOs with different backgrounds and competencies, may shape the company's strategy and direction in different ways, based on their cast of minds.

All the phenomena under investigation were converted into dummy variables, where "1" indicates the occurrence of the event and "0" indicates the opposite. For every single year of analysis and for each company, we first distinguished between the companies with a financial expert CEO and those with a non-financial expert CEO. The criterion to determine the presence of a financial expertise was explained above in this thesis (paragraph 6.7), but basically a financial expert CEO needs to have at least a finance-related degree and a work experience (either in finance or accounting or as a CFO)

in order to be considered so. Having an economic or finance related degree or post-graduate specialisation is a necessary but insufficient condition for being considered a financial expert, therefore the CEOs who only have a degree (of any kind) were not considered financial experts. Companies with a financial expert CEO would be indicated with a dummy "1" under the column of financial expertise and companies with a non-financial expert would be signalled with a "0".
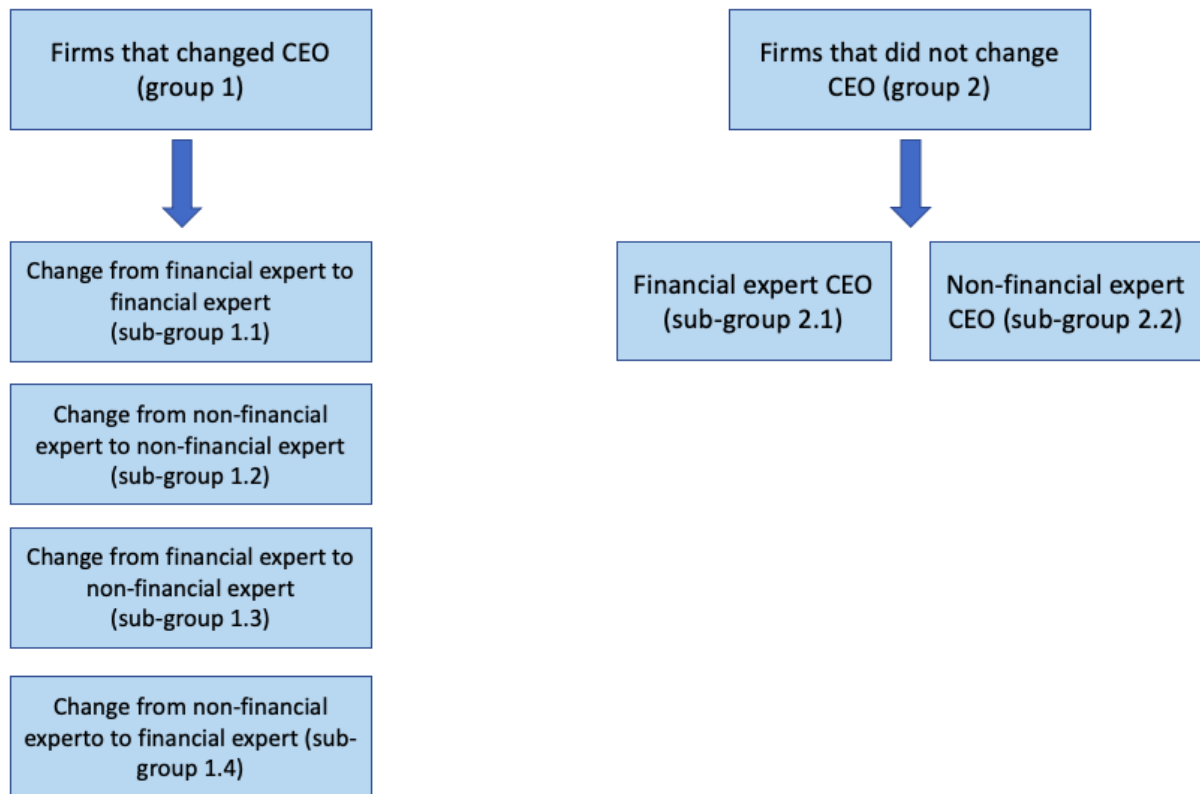
Figure 4 – Independent variables

As shown in the scheme above (figure 4), the analysis of CEO changes in the span of time from 2014 to 2018 started from the first distinction that needs to be made between companies that changed their CEO (once or more than once) in the period analysed (group 1) and companies that did not experience a change of top executive during the five years analysed (group 2).

There are 4 sub-groups belonging to the main set of companies that did experience a change of CEO in the years of analysis (group 1), corresponding to 4 different events that occurred (dummy "1") or did not occur (dummy "0"):

- companies that changed CEO from financial expert to financial expert, meaning that they changed between CEOs who have the same type of expertise in finance (sub-group 1.1);
- companies that changed CEO from a non-financial expert to a non-financial expert, which is the firms in the years analysed were headed only by CEOs that are non-financial experts, so they would fall in the same category (sub-group 1.2);
- companies that passed from a financial expert CEO to a non-financial expert CEO – in this case, the change is significant because it entails a shift in the type of expertise between CEOs who succeeded in the same firm (sub-group 1.3);

- companies that passed from a non-financial expert CEO to a financial expert CEO – also in this case, the change is significant for the same reason mentioned above (sub-group 1.4).

For what concerns the companies that did not experience a change of CEO during the years under analysis, they can also be divided in two subgroups: those who have a financial expert CEO throughout all the five years (sub-group 2.1) and those who do not have a financial expert CEO (sub-group 2.2).

Different regression models were constructed in order to analyse the phenomenon of CEOs' financial expertise in relation to the performance of the firms. For each model, we change the independent variable analysed to measure the effects of different aspects of the change of CEOs for a firm.

The first group of regression models (Models 1.1, 1.2 and 1.3) takes as independent variables the sub-groups 1.3 and 1.4, which correspond to changes from a financial expert to a non-financial expert and changes from a non-financial expert to a financial expert. In this case, the dummy "1" indicates that the firms have experienced a change of CEO and that the change falls into the subgroups 1.3 and 1.4, meaning that the focus is on all those firms for which the change of CEO entailed a change of financial expertise in the top management. The dummy "0" indicates all the other firms that did not experience a change of CEO in the years of analysis.

The second group of models (Model 2.1, 2.2 and 2.3) takes as independent variables only the change of CEO from a non-financial expert to a financial expert (sub-group 1.4), which takes the dummy value "1", while "0" for all other firms that did not change CEO during the period of analysis. The purpose in this case is to see whether a change towards a financial expert in the top management of a company, is associated to a variation of the firm performance.

A third group of regression models (Model 3.1, 3.2 and 3.3) takes as independent variables the change of CEO from a financial expert to a non-financial expert (sub-group 1.3) that corresponds to a dummy value of "1"; the dummy is "0" for the firm did not change CEO in the years analysed. This model aims at analysing whether the performance of the firm changes when the firm experiences a passage from a financial expert to a non-financial expert and how it changes. Model 3.2 and 3.3 will have the same independent variables.

In all these three cases, the population reference of the regression analysis is all the firms in the dataset for which the observations were considered valid.

In the fourth group of regression models (Model 4.1, 4.2 and 4.3), we change the population reference of the companies analysed, by restricting the sample to only those companies that have changed their CEO during the years analysed. We indicate with "0" the firms that have changed CEO and this did not cause a variation in financial expertise, namely those belonging to sub-group 1.1 and 1.2 that either changed from a financial expert to another financial expert, or changed from a non-financial expert to another non-financial expert. The dummy variable "1" instead indicates the firms that have changed CEO and this entailed a change of financial expertise, which are those belonging to sub-group 1.3 and 1.4.

For all the regression models indicated above, the differences lie only in their independent variables, while the control and the dependent variables used do not vary across the models.

On the overall dataset of 1844 valid observations for detecting the change, there are 216 observed changes of CEO, over a sample of 808 CEOs in total. There are, overall, 218 observed changes of CEO in our observations. In the classifications of the directions of changes, there are:

- 36 changes (16%) from financial expert to financial expert (group 1.1)
- 84 changes (38,5%) from non-financial expert to non-financial expert (group 1.2)
- 47 changes (21,5%) from financial expert to non-financial expert (group 1.3)
- 51 changes (24%) from non-financial expert to financial expert (group 1.4)

For the observations that did not indicate a change of CEO:

- in 685 observations, the CEO is a financial expert
- in 943 observations the CEO is not a financial expert

For what concerns the investigation of the existence of a change of CEO in the company, it was necessary to compare CEO across years. As already explained above, for all the firms, in the first year of analysis, there was no possibility to compare the CEO of that year with the previous year's CEO, so the first year in which we have data for the firms contains no information in terms of change of CEO. This automatically excludes a number of years of observations, and consequently, restricts the sample.

7.1.2. Dependent variables

The outcome variables in our models that are assumed to be influenced by the level of CEO financial expertise, are related to the performance of the company. This is because the general purpose of this study is to assess whether or not there exists a relationship between the level of CEO financial expertise and the company's success. In particular, our analysis focuses on the changes of top executives with equal or different levels of financial expertise who succeed in a given company, in order to understand whether the direction of the change (when it occurs), someway affects the profitability of the firm.

For constructing the regression model, the following measures of firm performance were selected: Return on Equity (ROE), Return on Assets (ROA) and Cash Flow to Sales ratio.

Using data from a specific point in time, these profitability ratios are indices of firm's financial success over time.

Put together, these margin ratios and return ratios should indicate how effectively the top management utilizes assets and equity in the firm and how much they are able to transform revenues into cash holdings for the company. Return ratios represent the company's ability to generate returns and value to its shareholders. Margin ratios represent the company's ability to convert sales into profits[4]. We chose to include both balance sheet and cash flow items to give a complete picture of a company's financial health status.

For ROE, ROA and cash flow to sales ratio, we also took the percentage variation of these indices in the years analysed. The formula for the variation was "final value – initial value divided by initial value", which gives the delta variation with respect to the previous year expressed in percentage. This is in line with the purpose of examining the possible effect that a phenomenon in a given year has on the performance of the following period.

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[4] Corporate Finance Institute – "What are Profitability Ratios?"
https://corporatefinanceinstitute.com/resources/knowledge/finance/profitability-ratios/

Return on equity (ROE)

ROE is a measure of a company's financial performance calculated as the ratio between net income and shareholders' equity. The denominator, average shareholders' equity, is the difference between a company's assets and its debt, this is why ROE is considered as the return on net assets. The numerator, net income, is calculated before dividends paid to common shareholders and after dividends to preferred shareholders and interest to lenders and it is taken from the income statement of a company. It is the amount of income, net of expense and taxes that a company generates for a given period (Hargrave, 2020).

Return on Equity indicates how effectively management is using a company's assets to generate profits for shareholders. As many other indicators of firm performance, the evaluation of this measure depends also on the reference industry and it needs to be compared with the company peers. It is used a performance indicator because it measures the ability for the firm to generate income from the investments it received from its shareholders, by indicating the rate of return that the owners of common stock of a company receive on their shareholdings.

Return on assets (ROA)

ROA is the ratio of net income for the year divided by total assets of a firm at the end of the year, it gives an idea as to how efficient a company's management is at using its assets to generate earnings. In other words, ROA indicates how well a company utilizes the assets it owes to generate profits (Hargrave, 2020).

This profitability measure for public companies can vary substantially and will be highly dependent on the industry. This is why it is best used when comparing similar companies or, for the same company, by comparing its performance with a previous period.

It is a suitable measure of firm's financial health because it considers not only the operational events over the year but also the relevance of the historical antecedence of the firm over the period. It is also for this reason that, in our regression models, we take the percentage variation of the ROA for each company in the period analysed. The return on assets ratio gives the possibility to compare the income that a company generates with the resources it used to earn them. As a company invests in capital for the firm, it has to generate returns on its assets.

ROA takes into account company's debt, because total assets are also the sum of the firm's total liabilities and shareholder's equity. Both of these types of financing are used to fund the operations of the company, since a company's assets are either funded by debt or equity.

This figure gives investors an idea of how effective the company is in converting the money it invests into net income. The higher ROA, the better, because the company is earning more money on less investment and it indicates more asset efficiency (Hargrave, 2020). This ratio is useful to show how well a company is performing by comparing the profit it's generating to the capital it has invested in assets: the higher the return, the more productive and efficient management is in utilizing economic resources[5].

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[5] Corporate Finance Institute – https://corporatefinanceinstitute.com/resources/knowledge/finance/return-on-assets-roa-formula/

Cash flow to sale

Cash flow to sales ratio expresses the relationship between cash flows from operating activities and sales generated by the business. It reveals the ability of a business to generate cash flow in proportion to its sales volume. It is calculated by dividing operating cash flows (CFO) by net sales of a company (the revenues earned by a company), which are items found in the financial statements of a company. Ideally, the ratio should remain more or less the same as sales increase. If the ratio declines, it can be an indicator of problems, such as:

- The firm is pursuing incremental sales that are generating a smaller amount of cash.

- The firm is offering incremental customers longer payment terms, so that cash is tied up in accounts receivable.

- The firm must invest in more overhead (and thus increase costs) as its sales increase, thereby reducing the rate of growth in cash flow.

All of these issues can indicate that a business is growing its sales at the expense of declining cash flows (Bragg, 2018). The higher the percentage of cash flow, the more cash available from sales to pay for suppliers, dividends, utilities, and service debt, as well as to purchase capital assets.

The cash flow to sales ratio is an important indicator of company's performance because it determines the capacity of the company to transform sales into cash over a period of time. The more cash is attributed to the sales generated, the more it is a positive investment indicator for the company and can also be deemed as an indicator of the quality of management decisions. Moreover, this ratio indicates the company's capacity to manage its collections and payments (A., Bazley, & Jones, 2007).

7.1.3. Control Variables

Some variables that are frequently used in firm performance relationships have been inserted in the regression models in order to control for firm-level effects on the regression results. Such additional variables are analysed as independent phenomena because they may explain changes in the performance of the company beyond the independent variable utilised in the model. This is because company performance is not only affected by the characteristics of the CEO leading it: as shown above in the literature review, it is likely that they have impact. However, firm performance and consequently, its value, can be also influenced by other variables. Therefore, control variables were included in the regression for a more complete understanding of the phenomenon.

The control variables used in this study are: firm size (measured as the log of the total revenues of the firm at the year-end), the industry sector of the firms, the leverage ratio (measured as a portion of debt to equity) and the year of analysis in which the phenomenon is measured.

The control variables are a mix of firm-specific characteristics which are endogenous and related to the company's internal dynamics, such as leverage which explains the sources of financing for the company and firm size that tells us about the dimension of the firm's operations. But we also added some exogenous characteristics related to the time period in which the phenomena analysed occur and the sector in which the firms operate that places the company in a relationship with its competitive environment.

Sector

Besides the inclusion of firm-specific characteristics in the regression, we inserted in each of the four models the sector in which the firms operate to control for industry effects. The industry in which companies conduct their operations are an important explanatory variable for the evaluation of firm performance.

In a study conducted by McGahan and Porter, the authors show that a high percentage of variance in companies' profitability is attributable to stable industry effects. Their results provide strong support for the idea that industry membership has an important influence on profitability (McGahan & Porter, 1997). The study concludes that industry effects contribute importantly to variation in business-specific profitability indices.

We add industry dummies corresponding to each sector to test the effect of this variable on the dependent variables analysed which are ROE, ROA and CF/sales. We consider this control variable as a general indicator of the competitiveness of the environment in which a company operates.

Profitability ratios such as the ones we use in our regression models are strongly affected by industry sector and they can only be comparable for firms that operate in the same industry. By comparing a company's profitability ratios to the industry's average, something may be pinpointed about the company's competitive advantage. Whether a value for ROE or ROA is considered satisfactory will depend on what is normal for the industry or company peers. For example, companies operating in the sector of utilities usually have many assets and debt on the balance sheet compared to a relatively small amount of net income. A normal ROE in the utility sector could be 10% or less. A technology or retail firm with smaller balance sheet accounts relative to net income may have normal ROE levels of 18% or more. Relatively high or low ROE ratios will vary significantly from one industry group or sector to another. When used to evaluate one company to another similar company, the comparison will be more meaningful (Hargrave, 2020).

The same is true for ROA, which, as already pointed out, is best used for comparing companies in the same industry so that their ROA can be confronted or the performance of the same company over the years, by looking at the variations of ROA year over year. ROA is most useful for comparing companies in the same industry, as different industries have different asset bases which they use as they consider most appropriate. For example, the ROA for service-oriented firms, such as banks, will be significantly higher than the ROA for capital intensive companies, such as construction or utility companies (Hargrave, 2020). Indeed, the biggest issue with return on assets (ROA) is that it can't be used across industries.

Also cash flow to sales ratios can vary according to the sector analysed, as some theorist points out, the power of cash flow analysis is enhanced by comparing ratio results against industry averages or to a selected group of comparable organizations (Amuzu, 2010).

Leverage

This ratio is one of several financial measurements that look at how much capital comes in the form of debt (loans) and assesses the ability of a company to meet its financial obligations. It provides an indication of how the company's assets and business operations are financed (using combinations of debt and equity). It is important because companies rely on a mixture of equity and debt to finance their operations, and knowing the amount of debt held by a company is useful in evaluating whether it can pay off its debts as they come due. Leverage results from using borrowed capital as a funding source when investing to expand the firm's asset base and generate returns on risk capital. Leverage is an investment

strategy of using borrowed money—specifically, the use of various financial instruments or borrowed capital—to increase the potential return of an investment. Leverage can also refer to the amount of debt a firm uses to finance assets. Leverage is the use of debt (borrowed capital) in order to undertake investment or project. A highly leveraged company, property or investment is one that is composed by more debt than equity (Hayes, 2020).

Leverage is used as a control variable for firm performance as can have an important effect on all the dependent variable used in our analysis, which are ROE, ROA and cash flow to sales ratio.

Financial ratios such as return on equity help investors determine how companies deploy capital and how much of that capital companies have borrowed. Financial leverage has a strong effect on ROE. A high ROE could mean a company is successful in generating profit internally. However, it doesn't fully show the risk associated with that return: a company may rely heavily on debt to generate a higher net profit (ROE numerator), thus boosting ROE higher[6]. This means that a higher ROE can also be explained by an excessive use of debt that the company makes. If a company has been borrowing aggressively, it can increase the returns on equity ratio through a lower equity. Equity is the difference between assets and debt, so the more debt a company has, the lower equity can fall (Hargrave, 2020).

A common factor included by researchers to determine firm profitability is capital structure. The results on the relationship between capital structure and profitability differ significantly depending on the context of the research. The statistical analysis shows that leverage has a significant negative relationship with profitability. This is in line with the pecking-order theory, implying that firms mainly use internal financing over external financing to achieve higher profitability (Andersson & Minnema, 2018).

Leverage is one of the big factors that distinguish ROE from ROA. The balance sheet's fundamental equation shows how this is true: assets = liabilities + shareholders' equity. This equation tells us that if a company carries no debt, its shareholders' equity and its total assets will be the same. It follows then that their ROE and ROA would also be the same as they would have the same numerator and denominator. But if the company takes on financial leverage, ROE would rise above ROA. The balance sheet equation, if expressed differently, can help us see the reason for this: shareholders' equity = assets - liabilities. By taking on debt, a company increases its assets, thanks to the cash that comes in. But since equity equals assets minus total debt, a company decreases its equity by increasing debt. In other words, when debt increases, equity shrinks, and since equity is the ROE's denominator, ROE, in turn, gets a boost. At the same time, when a company takes on debt, the total assets—the denominator of ROA—increase. So, debt amplifies ROE in relation to ROA (McClure, 2020).

For what concerns the relationship between leverage and cash flow, two separate strands of the literature on capital structure take it into consideration. Signalling theory suggests a positive relationship, while pecking order behaviour implies a negative relationship. Signalling theory implies a positive relationship, in which firms with higher cash flow signal their performance with higher leverage. In contrast, pecking order behaviour suggests a negative relationship, in which firms with higher internally generated cash flow require less debt. Leverage-changing event studies focus on market expectations of future cash flow and generally support the signalling view, while cross-sectional leverage studies focus on the contemporaneous relationship and generally support the pecking order view. A negative shareholders' may be explained by excessive debt or inconsistent profitability.

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[6] Corporate Finance Institute – https://corporatefinanceinstitute.com/resources/knowledge/finance/what-is-return-on-equity-roe/

These contrasting theoretical implications appear contradictory. However, both are supported in different bodies of empirical literature. Leverage-changing event studies tend to support a positive relationship while cross-sectional studies typically reveal a negative relationship. (Shenoy & Koch, 1996) propose that the appropriate pecking order relationship is contemporaneous - between current leverage and current cash flow, while the relevant signalling relationship is intertemporal-between current leverage and future cash flow. Empirical results reveal that, in the same time period, leverage and cash flow tend to be negatively related, while across time leverage is positively related to future cash flow. Thus, the apparent contradictions in the theoretical and empirical literature may be reconciled by considering both the contemporaneous and dynamic aspects of the firm's leverage/cash flow relationship.

Firm size

The variable chosen to represent the dimension of the companies in the dataset is the natural logarithm of revenues. According to scholars in industrial economics, business organization and finance, size is considered to be one of the most essential characteristics of firms in explaining profitability (Isik, Unal, & Unal, 2017). However, the question as to whether higher or lower firm size optimizes firm's profitability continues to be discussed in the theoretical and empirical literature. There are several ways in which firm size is able to influence profitability and therefore to have an impact on the indicators of profitability (ROE, ROA and Cash Flow to Sales).

Revenues directly affect the numerators of ROA and ROE which is net income and the denominator of CF/sales. Higher revenues and thus bigger firm size can explain the effects on these profitability indices.

In accordance with the economies of scale hypothesis, large firms are likely to enhance their profitability by minimizing their costs stemming from their production process. Furthermore, large firms can exploit their size to gain access to the public debt markets in an easier and cheaper way in order to fulfil their financing needs. Because large firms are known to have a lower probability of bankruptcy, borrowing more at a lower cost thanks to their size is likely to help them benefit from tax shield. In addition, the fact that large-sized firms are more diversified, have higher market power, can spend more in research and development and employ better technology could contribute positively to firm profitability. However, larger and more diversified firms could face scale inefficiencies and be less profitable because of bureaucratic processes, higher agency costs, and other costs associated with managing larger firms (Isik, Unal, & Unal, 2017).

Year effect

Another variable that was inserted to control for was the year of analysis. By definition, these effects are macroeconomic fluctuations that have an impact on all business segments to the same degree in a particular year. We used dummy variables for each of the five years analysed and the first year was excluded, because the year effect captures the influence of aggregate (time-series) trends. The contribution of macroeconomic cycles on profits can vary from year to year and it is explained by endogenous factors that have an influence on the performance of the company.

8. Empirical findings and evidence about CEOs' characteristics

This section presents the empirical results of a deep-dive analysis about all CEO-related variables that have been studied for this thesis. The objective of our analysis was to understand CEOs' characteristics and the broad phenomenon of financial expertise, in order to detect tendencies, correlations and descriptive statistics.

An examination of each variable concerning CEO characteristics, taken one by one, reveals some important insights that provide an overview about CEOs and their financial background for all the companies analysed. The data was mostly collected from the personal and work information present on the CVs. For each variable that was searched, some facts and figures may be worth to be highlighted and discussed. Nearly 95% of chief executives have obtained a degree, therefore there is only a small portion of managers who have reached this high position without an academic qualification. It will be interesting to understand the most relevant characteristics of the minority of CEOs without a degree, such as their average age and tenure, in order to look for some congruencies that characterise these "non-qualified" managers. The 71% of CEOs with a degree have also a post-graduate qualification, that delineates a more articulated academic profile and maybe a specialization in a specific field or subject: there is uniformity of data between male and female CEOs. In the subset of individuals with a degree, it is interesting to note that the 55% have a degree in a finance-related subject, that can vary from economics, management, finance, statistics to marketing and so on. This means that a bit more than half of the CEOs of the biggest firms in Europe have an economic or finance related academic background, showing that the choice of a particular educational orientation can have a strong impact on the career undertaken by an individual and on the positions that he or she may occupy in an economic entity like a firm. In this case, is important to highlight that this percentage of CEOs operates in non-financial companies. In the sample analysed, a very small portion is composed by women. These low percentages have to be interpreted a consequence of the very scarce presence of women in the management boards and in the board of directors of the companies. The issue concerning the extremely low representation of women in the companies' boards of directors would deserve further examination and there are several studies on the phenomenon of glass ceiling and the difficult path for women to reach senior leadership positions. However, the trend seems to be gradually changing as presumably claims for gender parity in workspaces are becoming stronger. In fact, from 2014 to 2018 (the years analysed), female CEOs have increased by almost 50%: in 2014, there were only 13 women in the entire database of companies, while in 2018 the women were 25. This may suggest that in the next years the presence of women in the board of directors of firms will gradually intensify.

The paragraphs below will present the most important findings and statistics on all the variables analysed about CEOs' characteristics.

8.1. Age and tenure

For the variable of age there were 2462 valid observations available. The following table (2) shows the main descriptive statistics: we can see that the average age of all CEOs in our sample stands around 55 years old. The youngest CEO is 30 years old, while the oldest is 83 years old and the standard deviation from the mean value is 6,5 years, indicating a discrete amount of dispersion for the values of age.

AGE				
Mean	Median	Minimum	Maximum	Standard Deviation
54,84	55	30	83	6,46

Table 2 – Age Descriptive Statics
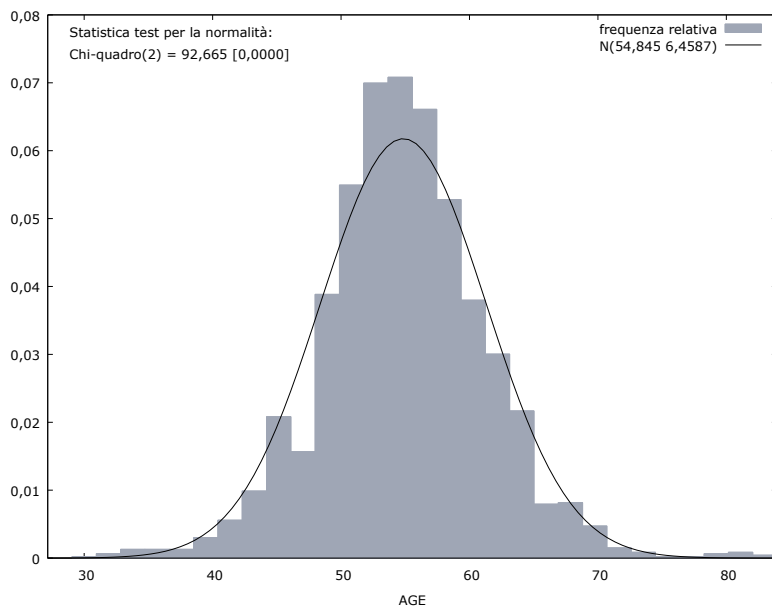
Figure 5 – Age distribution graph

This graph in *figure 5* shows the concentration around the mean value of 54,8 years old. It is interesting to look at the minim and maximum values found: the minimum age for CEOs is never lower than 30 years old, showing that a certain maturity and experience is required for achieving this position in a company. Referring to our division of age ranges (paragraph 6.4), we do not find CEOs in the range 1, which was the lowest and would include the youngest generation of executives "under 30s". This is maybe due to the fact that young people at that age are still occupied with their university studies and it is quite early for these young managers to affirm themselves as a top executive. The oldest CEO is 83, which can be easily imaginable for those people who have spent most of their career in that same company or have been appointed CEOs at an older age. The standard deviation for age shows a short distance from the mean, indicating that, more or less, CEOs' age is close to the average value that corresponds to a middle age. It is important to highlight that the age of CEOs was measured as the difference between their date of birth and the year of analysis, therefore it refers to the age at the moment in which the CEO was in charge. This may be indicating a generation of managers who get this important responsibility at a certain age and point in their career. The graph shows what was indicated in table 2: the highest portion of CEOs is concentrated around an average age range that goes between 50 and 60 years old, which has been previously defined as a "medium" range. We find the minimum and maximum age in the tails of the graph and the highest concentration of CEOs in the age range at the centre, which corresponds to the median value of 55 years old (very close to the mean).

By adding the variable of CEO gender to the descriptive statistics about age, the following information comes out:

	Avg. age	St. Dev. Age	Min Age	Max Age
F	51,35	4,8	39	63
M	54,96	6,47	30	83
Total	54,84	6,45	30	83

Table 3 – Age and gender: descriptive statistics

St. Dev.* = standard deviation

Average age for female CEOs is lower and also less variable than the age of men. However, females' minimum age is nine years higher than that of men, probably showing a more struggling path for female managers to get important managerial positions. The youngest CEO and also the oldest CEO in our sample are males, but this may also be due to an unbalanced sample in terms of gender. The maximum age for women is decisively lower that for men, confirming the fact that there are no old women in the top positions of the listed firms analysed. There was a very low representation of female executives in the past years.

For the variable of tenure as CEO there were 2476 valid observations:

TENURE AS CEO				
Mean	Median	Minimum	Maximum	Standard Deviation
6,65	5	0	58	6,64

Table 4 – Tenure as CEO: descriptive statistics
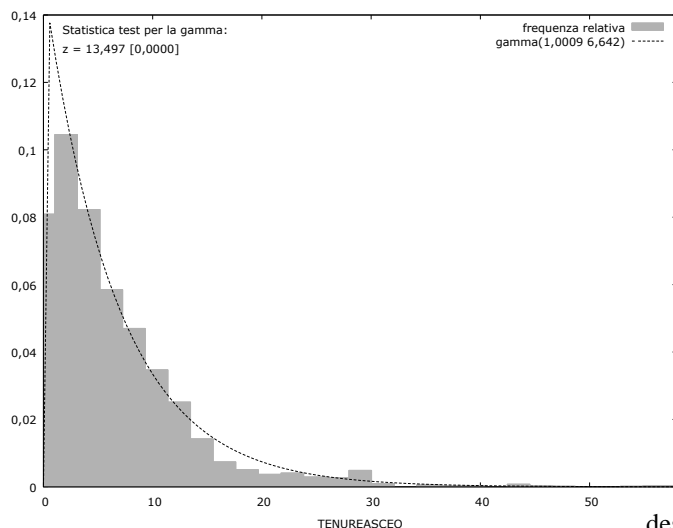
Figure 6 – Tenure distribution graph

Table 4 shows that the average tenure for CEOs is close to seven years and the intermediate value found in our sample is 5 years. The minimum value of tenure is zero because there are some CEOs who have not reached one year in this position. The longest tenure that the CEOs in our sample have reached is 58 years in this position: this should be the case for older CEOs who may also be the owners or founders of the company they manage. Further below we will provide more details about the CEOs with a tenure longer than 20 years, that deserved a special attention for their characteristics.

The curve in the graph of tenure shows a high concentration in the range between 0 and 10 years of experience as CEO, with a lower frequency of observations as we proceed onwards with the years.
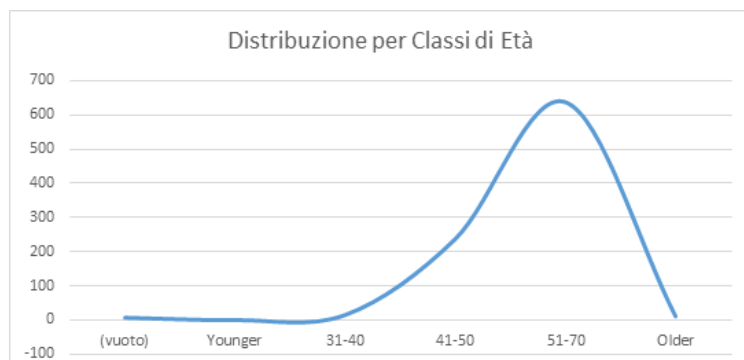
Figure 7 – Distribution for age ranges

Figure 7 shows the distribution of CEOs according to the age ranges in which they are found: the line is flat on the first age range (corresponding to young ages) and gets curvier as the age range increases.

The trend of the curve confirms that most CEOS are between 50 and 70 years old, but in particular the most part of them in concentrated in the range from 50 to 60 years old, which corresponds to those born in 1960's who cover this role in the years analysed. Also financial expert CEOs are concentrated in this age range, although we will see they are slightly younger on average.

Our first hypothesis was that the average age of top executives would follow a decreasing trend in the years of analysis.

CEOs in the youngest range have not increased in number during the years analysed, while those from 31 to 41 years old have slightly increased. CEOs from 41 to 50 years old have decreased, but the CEOs from 51 to 70 years old, the most numerous age group, have increased from 2014 to 2018. The number of CEOs in the highest age range has remained stable. This shows that, contrary to our expectations, the probabilities for young and talented people to get an important promotion earlier in their career path have not risen in the years. This conclusion is clearly based on the available sample

that we examined and may not represent the entire population of CEOs.

Age range	2014	2015	2016	2017	2018	TOTAL
(void*)	2	3	4	2	3	**8**
"Younger"			1			**1**
31-40	5	8	8	6	9	**16**
41-50	116	106	117	105	96	**238**
51-70	345	364	362	375	395	**637**
"Older"	5	4	4	4	5	**12**
TOTAL	**473**	**485**	**496**	**492**	**508**	**808**

Table 5 – CEOs for age range for every year

Table 6 shows the link between age and tenure: as it would be expected, the highest average tenure (31 years) belongs to those in the "older" range of over 70's (indicating a correlation between age and tenure) and there are only males in this category. This tells a lot about the fact that women only conquered top management positions in the recent past (we can see that average tenure for women is lower than for men in the same age ranges) and there are no female CEOs in the higher age range, which would entail a higher tenure and a longer experience. Average total tenure is higher for CEOs in the range from 31 to 40 years old than for those in the following range, and it does not vary drastically when we move on to the next age range of 51-70. This may signify that in the ranges where we observe most CEOs, average tenure is more or less stable (varying between 5 and 7 years) notwithstanding the 40 years of difference between the second and the fourth age range.

Average Tenure	F	M	Total
(void*)	8	3	**3,45**
Younger		1	**1**
31-40	1	6,09	**5,94**
41-50	4,86	4,95	**4,95**
51-70	6,16	7,35	**7,32**
Older		31,19	**31,19**
Total	**5,63**	**7,03**	**6,98**

Table 6 – Average tenure for age range and gender

*void= no information available

The fourth hypothesis stated that CEOs with a long tenure (arbitrarily fixed to more than twenty years' time) are also founders or owners of the company they manage and are predominantly men, meaning that tenure is not only related to age but also to gender. There are 34 CEOs in our sample who have a tenure beyond 20 years. They are characterised by an absence of women and in terms of education they show the following trend: the vast majority, 26 out of 34 have a degree (the 76%), 8 of them do not have a degree, 15 out of 26 graduated CEOs have also a postgraduate degree. For what concerns financial expertise, a minority of them are financial experts (26%), 7 have a job experience in finance (20,5%) and only 2 of them have a past work experience in the fields of consulting or accounting.

We went further into the analysis to see whether they are shareholders, founders or co-founders of the companies under analysis, that may explain why they have such a long tenure as CEOs. We found indeed that a high majority of them (the 73%) are founders or shareholders of the firm that they lead. These executives with a very long tenure may have started

their career and spent many years in the company, they may have been particularly successful in their job that the company has not changed them during the years.

We assumed that female CEOs would have a shorter average tenure with respect to their male peers, as they have reached top executive positions only in the last few years. Data confirm our hypothesis and indicate that female tenure is 5,6 years on average (without considering the year of analysis or age), which is indeed shorter than their counterpart male average tenure of 7 years.

	void*	Young	31-40	41-50	51-70	Older	Tot. CEOs
Nr.* CEOs with Degree							
2014	2		5	108	330	3	448
2015	3		8	97	347	3	458
2016	4	1	8	107	347	3	470
2017	2		6	99	359	4	470
2018	3		9	94	376	4	486
Nr. CEOs with Finance Degree							
2014			4	58	170	1	233
2015	1		6	51	184	2	244
2016	2	1	6	64	179	2	254
2017	2		5	64	185	3	259
2018	3		6	65	193	1	268
Nr. CEOs with Postgraduate							
2014	2		3	83	243	2	333
2015	3		5	73	257	2	340
2016	2	1	6	82	260	3	354
2017	1		5	73	274	3	356
2018	2		6	71	288	2	369
TOT. Nr. CEO with Degree	8	1	16	223	606	9	766
TOT. Nr. CEOs with Finance Degree	4	1	11	132	321	4	419
TOT. CEO with Postgraduate	5	1	11	173	451	4	575
TOT. CEOs	**8**	**1**	**16**	**238**	**637**	**12**	**808**

Table 7 – Age ranges and types of degree

*Void = no information available about these CEOs
*Nr. = number

Our hypothesis about age and degree was that the vast majority of young CEOs, in the age group between 20 and 35 years old, have acquired a degree and possess some academic background that can be related or not to the role that they perform and the sector in which they work. This hypothesis is confirmed by the results: 1 out of 1 CEO in the "young" category and 16 out of 16 (100%) CEOS in the age between 31-40 years old have a degree. There is a little more variation in the higher age ranges, with decreasing shares in the higher age ranges (94% in the range 41-50, 95% in the range 51-70 and 75% in the older range) but overall, the trend is still predominantly towards CEOs with a degree.

For what concerns the variable of "postgraduate degree", in the range 31-40 years old, 11 out of 16 CEOs have a postgraduate (69%). If we move on towards higher age ranges, we see that the share of postgraduate does not decrease significantly, indeed 173 out of 238 CEOs (73%) between 41 and 50 years old have a postgraduate, 451 out of 637 CEOs (71%) in the range 51-70 have a postgraduate. Only when we look at the older range, we notice a significant fall in the portion of postgraduates, with 4 out of 12 specialised CEOs (33%). Results demonstrate that younger CEOs are, on average, more specialised only with respect to much older CEOs. Only when the distance gets very large in terms of age, we notice a decreasing trend of specialisation. In the intermediate age ranges, the percentage of CEOs with a postgraduate degree is stable and keeps high.

For the variable of "finance-related degree" relative to the CEOs who have a degree, we see that in the age range 31-40, 11 out of 16 graduated CEOs have a finance related degree (69%). In the next range (41-50), 132 out of 223 graduated CEOs have a degree in finance or economics (59%). As we go on with age ranges, the share of finance related degrees goes down to 53% in the range 51-70 and 44% in the older range. These results confirm the fact that we find more CEOs with a financial background in the lower age ranges. As we go upwards with age, we find fewer CEOs specialised in finance or economics.

Table 7 also shows the data mentioned above in the evolution across the five years of analysis.

8.2. Gender
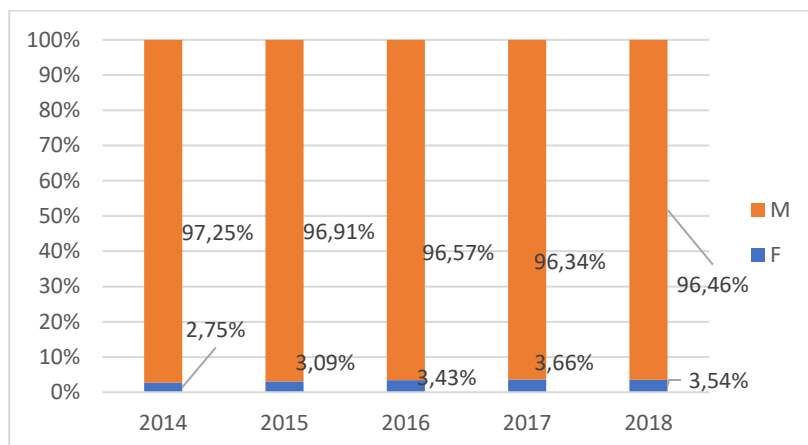
Figure 8 – CEOs distribution per gender

For what concerns gender, as already mentioned, we firstly studied it as a variable *per se* and then in relation with other variables about CEOs characteristics.

With an aim to look at the presence of women as top executives in the years analysed, we distributed the data on every year as shown in *Figure 8*.

In line with our second hypothesis which stated that the vast majority of CEOs in our sample would be composed by men: the variable of gender shows an unbalanced picture: there are only 25 women out of 808 analysed CEOs (representing the 3% of our sample). However, from 2014 to 2018 there was a discrete increase of 5 women present in our sample of companies, as in 2014 female CEOs are 13, while in 2017-2018 they have slightly risen in number to 18 women. This indicates a variation in the presence of women in top executive positions for listed companies, which is related to a slight decrease male representation. This in shares corresponds to the 2,75% of women in the sample in 2014, that becomes a 3,54% in 2018, showing a gradually increasing female representation. However, from 2017 to 2018 there is a small decrease in the share of women, that is in countertrend with the previous years. At the same time, the share of male CEOs with respect to females decreases a bit during the years, from 97,2% to 96,9%.

This result more or less confirms our third hypothesis about gender, that in the years analysed, the male-female balance

would slightly change and a growing number of women would be appointed as top executive by large European companies.

For what concerns financial expertise and gender:
- among female CEOs, the 44% are financial experts and the 56% are non-financial experts
- among male CEOs, the 40% of them are financial experts, while the 60% are not experts in finance

Therefore, the small number of women in our sample are more financially expert than men.

8.3. Degree
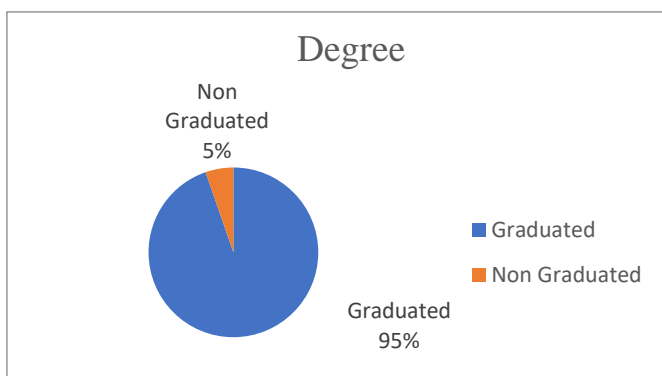
Figure 9 – Degree pie chart

For what concerns the variable of "degree", without looking at the specific field of study, we see that most CEOs in the companies analysed (95%) have a degree. It is worth to highlight that there are no female CEOs without a degree, meaning that for the few women that we have in our sample, 100% of them is academically qualified.

Therefore, with zero women without a degree and a 95% of men with a degree, there remains only a 5% of CEOs who cover this top executive role without having an academic title. For this small portion of CEOs, as in the case of those with a very long tenure, we went further into the analysis to look at whether they are owners, founders or successors, as our hypothesis was that the CEOs who reached this position without an academic qualification (degree) would have some shareholding or ownership tie with the company. We found no strong evidence for this hypothesis, because only the 23% of CEOs without a degree are also the owners or founders of the firms they lead.

However, table 8 below shows that CEOs without a degree have a tenure of 11 years on average with respect to the lower average tenure of 6,8 years for CEOs who have a degree. This may indicate that this portion of CEOs belongs to an older generation that has occupied this position historically for a long time or, anyway, that the importance of managers' prerequisites such as a degree has increased along the years. CEOs without a degree may have been elected in the past and remained in charge for a long time, for many reasons. This result is in line with our seventh hypothesis, claiming that CEOs without a degree are averagely older and/or have a longer tenure as CEOs in that firm. However, most of them do not have ownership ties with the firm.

Average tenure		
	No Degree	**Degree**
F		5,63
M	11,25	6,81
Total	**11,25**	**6,77**

Table 8 – Average tenure per gender and degree

Average Age		
	No Degree	**Degree**
F		51,35
M	55,26	54,95
Total	**55,26**	**54,82**

Table 9 – Average age per gender and degree

Average tenure for females with a degree is slightly lower than their male counterpart. If we add the variable of "degree" to the analysis of gender, we see that the average age for female CEOs with a degree is still lower (51,3 years old) than

the average age of male CEOS with a degree (54,9 years old). This is in line with the information shown above about average age that was classified only by gender and not by degree (table 3).

The average age of CEOs with a degree is slightly lower than the age of CEOs with no degree, both for men and for women. Male CEOs without a degree are on average slightly older than male CEOs with a degree, showing no big difference in terms of age between graduated CEOs and ungraduated ones. Therefore, the average age does not vary a lot when we insert the variable of "degree" into the analysis, and we did not expect to find a lot of young CEOs without a university education.

	Number of CEOs		Share graduated CEOs		Total	Total share
	F	M	F	M		
Graduated	25	741	100,00%	94,64%	766	94,80%
Non-Graduated		42	0,00%	5,36%	42	5,20%
Total	25	783	100,00%	100,00%	808	100,00%

Table 10 – Shares of graduated CEOs per gender

Table 10 shows that, on a total number of 808 CEOs, 766 of them (corresponding to the 94,8%) are graduated and 42 (the 5,2%) do not have a degree. A further division between men and women shows that 100% of women have a degree, and the "95-5%" balance belongs only to men.

	Female	Male	Total
Share Degree on Total CEOs	100,00%	94,64%	94,80%
Share PG* on Total CEOs	72,00%	71,14%	71,16%
Share Degree Finance on Total CEOs	52,00%	51,85%	51,86%
Share Finance Degree on Graduated	52,00%	54,79%	54,70%

Table 11 – Shares per gender and types of degree

*PG = Postgraduate

Table 11 gives a first overview of the education level classified according to gender, of CEOs with a degree (95%), those that are further specialised with a postgraduate degree (71%) and the CEOs with a finance-related degree (52%) on the total sample of CEOs. If we look at the CEOs with a finance degree but in relation to the group of CEOs who have a degree, they represent the 55%. If we analyse the values by gender, we can notice that in terms of academic qualifications, women have always slightly higher shares with respect to men in terms of degree, postgraduate and financial knowledge.

8.4. Postgraduates

Table 12 below gives a complete picture of the variable "postgraduate" placed in a relation with all the other variables that concern both academic qualifications and work experience of CEOs.

Values	F	M	Total
Nr. CEOs with postgraduate	18	557	575
Total CEOs	25	783	808
Postgraduate on Total CEOs (%)	**72,00%**	**71,14%**	**71,16%**
Nr. CEOs Finance-related Degree with Postgraduate	10	312	322
Nr. CEOs Finance-related Degree	13	406	419

Values	F	M	Total
CEOs Finance Degree + Postgraduate on CEO with Finance Degree (%)	**76,92%**	**76,85%**	**76,85%**
Nr. CEOs job experience in finance with postgraduate	5	180	185
Nr. CEOs job experience in finance	8	246	254
Share Postgraduate on Job Experience in Finance	**62,50%**	**73,17%**	**72,83%**
Nr. CEOs experience in consulting/accounting with Postgraduate	7	106	113
Nr. CEOs experience consulting or accounting	10	139	149
Share Postgraduate on Job Experience Consulting/Accounting	**70,00%**	**76,26%**	**75,84%**
Nr. CEOs Ex CFO with Postgraduate	4	88	92
Nr. CEOs ex CFOs	5	114	119
Share CFOs with Postgraduate	**80,00%**	**77,19%**	**77,31%**

Table 12 – Postgraduate

As we already found, the 71% of CEOs have a postgraduate degree. In the relationship between the field of study and the level of specialisation, we find that 77% of CEOS with a finance-related degree have also a post-graduate degree: this gives an indication of a high level of specialisation that is achieved by managers who pursue an economic or finance study path. 73% of CEOs with a job experience in finance have a postgraduate degree, while the 76% of those with an experience in consulting or accounting have a postgraduate specialisation. This denotes a higher degree of academic qualification for the CEOs who have a more specific work experience in the fields of accounting and consulting. The percentage of postgraduates increases to 77% when we measure the share of CEOs who have been CFO before that also have a master, doctorate or any postgraduate specialisation. As we get on from the most general work experience in the financial field, to the more specific roles in accounting and consulting firms and the position of financial executive, we see that the share of postgraduates increases: it is intuitive that in highly specialised work environments, there are more experts who perform specific tasks.

POSTGRADUATE			
	Average Age	**Average Tenure**	**Number of CEOs**
0	54,93	8,26	233
1	54,8	6,47	575
TOTAL	**54,84**	**6,98**	**808**

Table 13 – CEOs with Postgraduate: descriptive statistics

Concerning the average age and tenure of CEOs with a postgraduate degree, there is no significant difference relative to age between specialised CEOs and those without an advanced qualification, but there is a slight difference in the average tenure, which is higher for CEOs without a postgraduate (8,3 years) than for CEOs who have it (6,5 years). This shows to be in line with the fact that CEOs who have taken their leading position more recently are more specialised than CEOs who have been there since longer.

We see more or less uniform data between the "degree" variable and the "postgraduate" related to age and tenure and this may tell us the same thing: the threshold in terms of prerequisites for taking managerial roles has increased with respect to the past.

8.5. Finance-related degree

For what concerns the variable of "economic or finance-related degree", we looked at the part of CEO who have studied these types of subjects. We used dummies where "1" indicates the presence of a finance-related degree and "0" otherwise.

On the total amount of 808 CEOs, 51,85% of male CEOs have a degree in finance, while 52% of female CEOs have a degree in finance. By restricting the sample to only the CEOs who have a degree, we found that around 55% of graduated CEOs (male and females) have a degree in finance or a related subject and the 45% do not have such a degree. The portion of women with a finance-related qualification does not change according to the sample basis, because 100% of the women analysed have a degree.

Graduated CEOs	Female		Male		Total number	Total share %
	Nr. CEOs	%	Nr. CEOs	%		
Finance Related Degree	13	52,00%	406	54,79%	419	54,70%
Non-Financial Degree	12	48,00%	335	45,21%	347	45,30%
Total	25	100,00%	741	100,00%	766	100,00%

Table 14 – Type of degree per gender

Among the 766 graduated CEOs, 347 (45%) have a degree in finance and 419 (55%) have a degree in another subject that can be engineering, medical, humanistic fields etc.

To give a further detail for what characterises male and females, the percentage division is composed only for a small part by women and for the most part by men. We can look at table 14 both horizontally and vertically. Among the women, a bit more than half of them have a degree in finance or economics and the other half has a degree in other subjects. For men, the division is slightly different because the percentage of those with a degree in finance is higher than for women. The 45,3% of CEOs who does not have a degree in finance or economics is composed for the 1,57% by women and the 43,73% by men. On the other hand, the 55,7% who has a finance-related degree is composed for the 1,70% by women and 53% by men. Women, as a whole, represent the 3,3% of the graduated CEOs while men are the vast majority (96,7%).

FINANCIAL RELATED DEGREE		
	Avg.* Age	Avg. CEO Tenure	Num. CEO
Not Financial	55,97	7,48	389
Financial	53,77	6,51	419
TOTAL	54,84	6,98	808

Table 15 – CEOs with finance related degree: descriptive statistics

*Avg. = average

More than half CEOs in our sample have a degree that is related to finance. Table 15 shows us that both average age (53,7) and tenure of CEOs (6,5) with a financial-related degree are lower than the age (55,9) and tenure of CEOs (7,5) with a non-financial degree.

8.6. Job experience in finance or consulting-accounting

The investigation that was made about the previous work experiences of the CEOs in our sample includes both experiences in the financial sector and experiences in financial consulting or accounting companies. As shown by table 16, around 19% of CEOs had a job experience in consulting / accounting while a higher percentage of CEOs, the 31%, had an experience in a financial institution or performed a financial task in a company. This is in line with our hypothesis

that the share of CEOs with experiences in finance would be higher than that of CEOs with experiences in the more specific fields of consulting or accounting.

	F	M	Total
Share JobExpCons* on Total CEOs	40,00%	17,75%	18,44%
Share JobExpFin* on Total CEOs	32,00%	31,42%	31,44%

Table 16 – Shares of Job Experience' types

*JobExpCons = Job experience in consulting or accounting
*JobExpFin = Job experience in finance

When gender is added to the analysis, we get an important information: the share of CEOs with an experience in financial consulting or accounting is significantly higher for women than for men (40% foe females > 17% for males). For the variable of job experiences in finance, there is no difference related to gender as it stands around the 32% of CEOs for both men and women.

CEO JOB EXPERIENCE	Num. CEO	% on tot. CEOs
Nr. CEOs with finance-related degree	419	51,86%
Nr. CEOs FinDeg* with job experience in finance and/or consulting	218	26,98%
Total CEOs with Job experience in finance and/or consulting-accounting	314	38,86%
Nr. CEOs Degree with job experience in finance and/or consulting-accounting	308	38,12%
Nr. CEOs with no degree and job experience fin* and/or consulting-accounting	6	0,74%
Nr CEOs with job experience in finance	254	31,44%
Nr CEOs with experience in consulting or accounting	149	18,44%
Nr CEO FinDeg with job experience in finance and consulting-accounting	89	11,01%

Table 17 – CEOs' job experience

*FinDeg = Finance related degree
*Fin= Finance

In the group of CEOs who have a finance-related degree, the 27% of them has carried on with a job experience in finance and/or an experience in consulting-accounting, meaning that they have followed a linear path remaining in the same field from their university studies to their job career.

Overall, the 39% of CEOs have a work experience in finance and/or consulting and almost all of them (except 6) have a degree. The conjunctions "and/or" between finance and consulting-accounting, means that they belong to the group of executives that either has one of the two work experiences or both of them.

314 out of 808 CEOs had a job experience in finance and / or in consulting-accounting, but 218 of them have a degree in finance (the 70%). This means that 96 CEOs (the 30% of those with a job experience in finance and / or in consulting) have occupied financial roles without having a finance-related degree. Therefore, there is a part of people that work in the financial sector without having a background education in the same field.

The 31% of all CEOs have a job experience in finance, and a lower portion, the 19%, have a job experience in consulting or accounting. However, only the 11% of those who have a financial degree has both types of work experiences.

This is in line with our hypothesis that most financial expert CEOs have had some job experience in finance or a related field, and fewer have previous experiences in financial consulting or accounting that are more specific and require further specialisation.

The following table (18) shows the relationship between having a finance-related degree and doing a job experiences in finance and consulting-accounting in more detail.

CEOs' job experience	F	M	Total
Nr. CEOs job experience in finance and/or consulting-accounting	11	303	314
Nr. CEOs finance degree with job experience in finance and/or consulting	8	210	218
Nr. CEOs with finance degree	13	406	419
Share CEOs JobExp* Fin and/or Cons-Acc.* with FinDeg* on JobExp Fin and/or Cons-Acc.	72,73%	69,31%	69,43%
Share CEOs JobExp Finance and/or Cons-Acc. on FinDegree	61,54%	51,72%	52,03%
Nr. CEO FinDeg with JobExp Finance and Consulting-accounting	7	82	89

Table 18 – CEOs' job experience per gender

*JobExp = Job experience
*FinDeg= finance related degree
*Fin = finance
*Cons-Acc = consulting-accounting

The share of CEOs with a job experience in finance or consulting-accounting who also have a degree in finance, on the group of CEOs that have a job experience in finance or consulting-accounting is 69,4% and it is the ratio between 218 (CEOS with a degree in finance and a job experience in finance and / or consulting- accounting) and 314 (CEOs with a job experience in finance and / or consulting-accounting). This indicates that the majority of those with a work experience in finance and / or consulting-accounting has achieved a degree in a related field.

Looked at the other way around, the share of CEOs who have had a job experience in finance and/or consulting-accounting on the group of CEOs with a finance related degree is the 52%, corresponding to the ratio between 218 (CEOS with a degree in finance and a job experience in finance and / or consulting-accounting) and 419 (CEOs with a finance related degree). This share indicates, among the CEOs who followed a financial or economic study path, those that have continued with a work experience in the same field.

The last row of the table includes the CEOs who have a financial degree and have accumulated both experiences in finance and in consulting-accounting. It gives us an important detail: 7 out of 25 women (28%) fall in this profile, while 82 out of 783 men (10%) have these requisites.

In this table too, we can notice that shares for women are higher than for men in terms of financial expertise and specialisation (73% for females > 69% for males) and (61% for females > 52% for males).

8.7. Experience as CFO

In our sample of CEOs, only the 15% has been CFO before (119 out of 808), and the 10% of these have been CFOs in the same company where they are CEOs. The following table shows the main statistics for this group of CEOs who have been financial executives.

CEOs ex CFOs	F	M	Total
Nr. CEOs ex CFOs	5	114	119
Nr. CFOs with Degree	5	113	118
Nr. CFOs with Finance Degree	4	96	100
Nr. CFOs with Postgraduate	4	88	92
Nr. CFO Postgraduates with Finance Degree	3	74	77
Nr. CFOs Job Experience in Finance and/or consulting-accounting	5	103	108

CEOs ex CFOs	F	M	Total
Nr. CFOs tenure as CFOs > 10 years		20	20
Nr. CFOs tenure as CEOs > 10 years		6	6

Table 19 – CEOs ex CFOs

On the 119 CEOs who have been CFOs, all of them except one have a degree and 100 have a finance-related degree (the 84%). However, there is a 16% of people who have been chief financial executives without having a degree in the same field. The characteristics of this small number of people (19 CEOs) are: they are all men except one woman, they are all financial experts (as they have a degree plus they have at least a job experience in finance and / or accounting-consulting), 11 of them have been CFOs in the same company (denoting multiple experiences as a top executive within the firm), only one of them did not have a job experience in finance or consulting-consulting (this CEO is a financial expert because he has been CFO and has a degree), only one of them is not graduated but is still a financial expert due to an accumulated job experience in the field of finance. 6 of them were born in 1950's and the majority were born between 1960 and 70's. The average tenure for this group of CEOs who have been CFOs before is 5,8 years but with a high variance of 28 years and a standard deviation from the mean of 5,4 years.

There are 92 out of 119 CEOs ex CFOs (77%) with a postgraduate, denoting a high level of study qualification for those who have performed this financial management role. Moreover, almost 65% of CEOs who have been CFOs (77 out of 119) have postgraduate and a finance related degree.

The 91% of CEOs who have been chief financial officers (108 out of 119), have also a job experience in finance and or in consulting-accounting, which makes them financial experts of a high profile due to their professional career.

There are also 20 CEOs ex CFOs who have a tenure longer than 10 years and all of them have a degree in finance.

	Average Tenure as CFO	Number of CEOs ex CFOs
2014	5,86	57
2015	6,6	66
2016	6,16	75
2017	6,74	74
2018	7,26	82
TOTAL	**6,57**	**119**

Table 20 – Tenure as CFO

We see that average tenure as CFOs is 6,6 years which does not differ significantly from the average tenure as CEOs which is 7 years. We can see that the number of CEOs in our sample who have had an experience as CFOs has increased over the years, along with an increase of financial experts at the top management level of companies.

8.8. Industry sectors

Industries	*Observations*
Industrial Goods	69
Industrial & Commercial Services	58
Cyclical Consumer Services	41
Energy - Fossil Fuels	36
Telecommunications Services	35
Food & Beverages	33
Pharmaceuticals & Medical Research	32

Industries	Observations
Chemicals	31
Utilities	28
Mineral Resources	27
Healthcare Services & Equipment	25
Software & IT Services	25
Retailers	25
Cyclical Consumer Products	24
Technology Equipment	22
Transportation	21
Automobiles & Auto Parts	20
Real Estate	18
Food & Drug Retailing	12
Applied Resources	12
Personal & Household Products & Services	10
Renewable Energy	3
Industrial Conglomerates	3
TOTAL	*610*

Table 21 – Industry sectors distribution

Table 21 contains the distribution of observations along a classification of 24 industry sectors: most firms are concentrated in the first three sectors which are industrial goods, industrial and commercial services and cyclical consumer services and correspond to almost 27,5% of companies.

Sector and gender

Female executives are almost completely absent on primary sources sectors, while they are more present in sectors related to consulting and services (in line with the fact that a high portion of female CEOs had experiences in accounting and consulting).

We find the highest share of women in the sector of transportation, during all the years analysed. The second sector in which they are most represented is telecommunications (for the 15%), followed by real estate, pharmaceuticals, utilities, industrial and commercial services, chemicals and food and beverages, cyclical consumer services. Women CEOs are completely absent in the following sectors: software and IT services, healthcare services and equipment, food and drug retailing, personal and household products and services, cyclical consumer products, technology equipment and renewables, energy and fossil fuels, mineral resources, industrial conglomerates and fossil fuels. There is one woman in retailing, one in automobiles, one in applied resources and one in industrial goods. The absence of women in certain sectors is also due to their very scarce presence in the samples of CEOs.

Financial experts classified by sector

Figure 10 shows the presence of financial expert CEOs, also divided by type of financial experience, in each sector: we can see that the sector of industrial goods and services is the one with the highest concentration of financial expert executives, but these industries represent also the most numerous in terms of observations. The absolute values do not tell us a lot about the incidence of financial expertise in the different sectors.

Industry Sectors	Nr. CEOs ex CFOs	Nr. CEOs JobExp in Finance	Nr. CEOs JobExp in Consulting	CEOs financial experts	Number CEOs
Applied Resources	4	7	4	10	17
Automobiles & Auto Parts	4	5	5	7	26
Chemicals	7	12	4	13	44
Cyclical Consumer Products	4	14	10	17	34
Cyclical Consumer Services	8	19	9	22	55
Energy - Fossil Fuels	7	13	4	16	51
Food & Beverages	5	15	7	17	43
Food & Drug Retailing	1	4	2	5	15
Healthcare Services & Equipment	1	6	2	6	29
Industrial & Commercial Services	10	21	18	29	79
Industrial Conglomerates	1	3		3	5
Industrial Goods	17	27	15	36	97
Mineral Resources	8	19	7	20	34
Personal & Household Products & Services	1	3	3	5	13
Pharmaceuticals & Medical Research	4	8	4	11	47
Real Estate	5	12	4	12	20
Renewable Energy	1	2	1	2	4
Retailers		4	7	11	32
Software & IT Services	6	10	11	20	33
Technology Equipment	3	6	3	8	26
Telecommunications Services	11	22	14	27	51
Transportation	6	10	6	13	28
Utilities	5	14	10	18	37
Total	**119**	**254**	**149**	**325**	**808**

Figure 10 – Financial expertise in the industry sectors

Industry Sectors	CFOs	Job experience in Finance	Job experince in Consulting	Number of CEOs
Real Estate	25,00%	60,00%	20,00%	20
Industrial Conglomerates	20,00%	60,00%		5
Mineral Resources	23,53%	55,88%	20,59%	34
Renewable Energy	25,00%	50,00%	25,00%	4
Telecommunications Services	21,57%	43,14%	27,45%	51
Cyclical Consumer Products	11,76%	41,18%	29,41%	34
Applied Resources	23,53%	41,18%	23,53%	17
Utilities	13,51%	37,84%	27,03%	37
Transportation	21,43%	35,71%	21,43%	28
Food & Beverages	11,63%	34,88%	16,28%	43
Cyclical Consumer Services	14,55%	34,55%	16,36%	55
Software & IT Services	18,18%	30,30%	33,33%	33
Industrial Goods	17,53%	27,84%	15,46%	97
Chemicals	15,91%	27,27%	9,09%	44
Food & Drug Retailing	6,67%	26,67%	13,33%	15
Industrial & Commercial Services	12,66%	26,58%	22,78%	79
Energy - Fossil Fuels	13,73%	25,49%	7,84%	51
Technology Equipment	11,54%	23,08%	11,54%	26
Personal & Household Products & Services	7,69%	23,08%	23,08%	13
Healthcare Services & Equipment	3,45%	20,69%	6,90%	29
Automobiles & Auto Parts	15,38%	19,23%	19,23%	26
Pharmaceuticals & Medical Research	8,51%	17,02%	8,51%	47
Retailers		12,50%	21,88%	32
Total	**14,73%**	**31,44%**	**18,44%**	**808**

Figure 11 – Financial experts in the industry sectors (%)

The picture becomes clearer in *figure 11*, where we present the values in shares, in order to have a better view about the importance attributed to CEOs with a financial background in each sector, without taking into account the numerousness of firms / CEOs in that sectors.

We see here that real estate and industrial conglomerates are the sectors which mostly recruit CEOs with an experience as CFO and or an experience in finance. Also the sector of mineral resources has more than half CEOs that had a previous experience in finance, and it is followed by the sector of renewable energies. "Software and IT services" is the one that has most CEOs with experiences in consulting-accounting, which is also somehow explicable by the fact that it is a sector of companies that provide consultancy services.

We notice that sectors which are highly technical where a specific know-how is required, such as healthcare services and equipment, pharmaceutical and medical research, chemicals etc. present a low percentage of financial experts among their

CEOs: this result is completely in line with our expectations stated above in this thesis, and can be due to their preference for specialised executives that have an educational and professional background which is more suitable to the products and services that they supply (firm-CEO fit). More commercial sectors such as that of food and beverages or retailing may look for CEOs with a marketing or commercial background rather than a financial one.

Changes of CEOs for sectors

Table 22 shows, for each sector analysed, the observed changes of CEO that belong to the sub-groups 1.3 and 1.4 mentioned above in this thesis. These are the firms that change CEO from a financial expert to a non-financial expert and the firms that pass from a non-financial expert to a financial expert during the years analysed.

The sectors in which more changes are observed are: chemical industry firms that opt for financial experts, cyclical consumer services that change from financial experts towards non-financial experts, food and beverages companies that switch to financial experts, industrial goods that present changes in both directions and telecommunication services which also change in both ways, energy firms present more changes towards non-financial experts. In more innovative sectors such as renewable energies, IT, technology equipment but also real estate and retailers, there are a few changes observed.

	sub-group 1.3 - f/e - nf/e*	sub-group 1.4 n/fe – fe*
Applied Resources	2	1
Automobiles & Auto Parts	0	1
Chemicals	3	4
Cyclical Consumer Products	1	3
Cyclical Consumer Services	5	3
Energy - Fossil Fuels	4	3
Food & Beverages	0	6
Food & Drug Retailing	1	2
Healthcare Services & Equipment	1	1
Industrial & Commercial Services	4	4
Industrial Conglomerates	1	1
Industrial Goods	7	8
Mineral Resources	0	3
Personal & Household Products & Services	2	0
Pharmaceuticals & Medical Research	3	3
Real Estate	0	1
Renewable Energy	1	0
Retailers	1	1
Software & IT Services	0	1
Technology Equipment	1	0
Telecommunications Services	4	4
Transportation	1	0
Utilities	4	1
TOTAL	**46**	**51**

Table 22 – CEO changes in industry sectors

*f/e - nf/e = financial expert to non-financial expert
n/fe – fe = non-financial expert to financial expert

The change from a type of expert to another one may be due to several reasons, but generally it may be a consequence of a shift in priorities and objectives for the company, a change of orientation, a better fit with a certain profile of CEO rather than another one or many other circumstances.

	Avg. age	Var. Age	Min. Age	Max. Age	Avg. Tenure	Var. Tenure	Min. Tenure	Max. Tenure
Personal & Household Products & Services	59,85	8,72	47	83	12,38	17,69	1	58
Automobiles & Auto Parts	58,76	7,66	38	77	6,11	4,59	1	21
Food & Drug Retailing	56,6	5,59	45	69	6,53	6,14	1	25
Industrial Conglomerates	56,53	4,03	49	62	2,85	1,82	1	7
Pharmaceuticals & Medical Research	56,25	7,21	40	83	7,41	6,88	1	31
Energy - Fossil Fuels	56,04	6,64	41	68	6,02	5,79	1	30
Utilities	55,96	6,57	39	68	5,16	3,72	1	14
Applied Resources	55,84	4,63	48	69	6,64	4,18	1	14
Mineral Resources	55,82	7,36	38	68	4,97	3,51	1	14
Technology Equipment	55,33	4,51	45	65	7,43	4,65	1	19
Healthcare Services & Equipment	55,09	4,5	43	63	5,84	3,85	1	19
Industrial Goods	54,96	5,65	43	73	5,86	5,43	1	31
Industrial & Commercial Services	54,89	6,02	40	71	7,91	7,15	1	31
Chemicals	54,51	5,2	39	64	7,3	5,36	1	24
Food & Beverages	54,33	6,03	42	70	7,04	5,39	1	36
Transportation	54,32	5,4	43	71	6,7	6,5	1	44
Real Estate	54,3	5,36	42	73	6,42	4,52	1	18
Cyclical Consumer Products	54,26	7,04	41	75	10,27	9,4	1	47
Renewable Energy	54,08	4,48	46	60	2,58	1,39	1	5
Cyclical Consumer Services	53,83	7,37	30	74	8,22	9,21	1	46
Software & IT Services	53,82	7,3	36	65	7,81	5,81	1	24
Telecommunications Services	53,23	4,91	43	70	5,67	5,49	1	30
Retailers	48,84	6,86	32	60	8,83	6,65	1	32

Figure 12 – CEOs' descriptive statistics for sectors

Figure 12 shows various descriptive statistics for CEOs' age and tenure but based on the sectors in which the CEOs work. There are some interesting highlights that can be done. There are some sectors that show some important tendencies about age and tenure of their CEOs. The first in the list, personal and household products and services can be highlighted as it has the highest average age (59), the highest variance of CEO age (8,72), the highest minimum age (47), the highest maximum age (83), the highest average tenure (12,3) and variance of tenure (17,7), and also the highest maximum value for tenure (58). This may indicate that in our sample, this sector is characterised by older CEOs with a longer tenure and high average age. It may be classified as a "traditional sector".

On the other side, the sector of renewable energies in the sample analysed is characterised by the lowest maximum age of CEO (60 years old), the lowest average CEO tenure (2,58) and also the lowest variance of tenure (1,4). It also has the lowest maximum tenure (5 years). This tells us that firms that belong to this innovative sector in our sample have young CEOs with a short experience in terms of tenure and in general do not have CEOs older than 60 years old.

Such results are in line with our stated expectations about industry sectors and the match with certain CEOs profiles, as we presumed that the most innovative types of companies would also have the youngest CEOs.

Firms in the sector of retail, have the lowest average age with a very low minimum age and very low maximum age, also indicating a presence of CEOs in a young age range. Industrial conglomerates show stability in terms of age and tenure, as they have the lowest age variance and the lowest average tenure, with a maximum tenure of 7 years in our sample, which is also very low.

8.9. Evidence from financial expertise

On the total of CEOs, 60% are financial experts and 40% are non-financial experts. However, when we control financial expertise for gender, the trend slightly changes between males and females. In the category of male CEOs, the tendency is confirmed with 60% of financial experts and 40% of non-financial experts. For females there is a different picture:

women are, proportionally to men, more financially experts, with 56% of financial experts and 44% of non-financial experts: they have on average a more complete financial background.

Figure 13 – Bar chart for levels of financial expertise and gender

The bar chart in *figure 13* shows an evolution of all the variables that were added in the analysis. The first bar shows the division of total CEOS according to gender: there are 783 men and only 25 women in our sample. The second bar shows the total number of CEOs who have a job experience in finance which are 254 CEOS over 808, the 31,4%, composed by 8 women and 246 men.

The third bar shows the 149 CEOS with a job experience in consulting-accounting, which are fewer than those with an experience in finance. It is interesting to note that there are 10 women with a job experience in consulting and 8 women with an experience in finance, again denoting a higher degree of specialisation for female CEOs.

There are 119 CEOs who have previously been CFO, which is clearly a smaller portion with respect to the total sample of CEOs: also in this case, there are 5 women out of 25 who have had an experience as chief financial officers. The last bar shows a more detailed picture of the CEOs who have been CFOs in the same company in which they are also CEOs, which are 82 (69%) and here there are some women too in this group. Women are strongly underrepresented in this sample but they show to have a stronger financial background relatively to men.

We may imagine the scale of financial experts as a bottleneck that is larger at basic levels of expertise and gets much narrower as we move forward to higher level of financial expertise.

The following table (23) shows the descriptive statistics of age and gender crossed with financial expertise:

	Average age	St. Dev. Age	Min. Age	Max. age
Financial Expert				
F	49,3	4,71	39	59
M	53,64	6,35	33	73
Financial Expert Tot.	53,48	6,35	33	73
Non-Financial Expert				
F	53,12	4,12	45	63
M	55,88	6,39	30	83
Non-Financial Expert Tot.	55,79	6,36	30	83
Total	54,84	6,45	30	83

Table 23 – Descriptive statistics of age for financial and non-financial experts

It tells us that financial experts are, on average, younger than non-financial experts. Women are generally younger than men. The deviation from the mean value of age is stable but lower for women than for men, this may also be due to an unbalanced sample composed mostly by men. Minimum age is higher for women, but it is globally lower for financial experts than for non-financial experts. Maximum age is lower for women, but globally lower for financial experts than for non-financial experts. This again confirms that women and financial experts are on average younger than other types of CEOs and that non-financial experts are mostly the older ones.

The different levels of financial expertise have been ordered according to a growing specialisation "method" and have been associated to binary codes of 5 digits (one per level of expertise) where "1" indicates the presence of a specific experience and "0" corresponds to its absence.

In order to simplify the representation and the sorting of the different levels of financial expertise in graphics and tables, the binary numbers have been converted in the corresponding decimal values.

Table 24 shows the list of binary-coded combinations of financial expertise and the frequency of CEOs found in each combination, classified by gender and totalized on the last column.

decimal value	Experience as CFO	Experience in Consulting / Accounting	Experience in Finance	Finance Related degree	Degree	Frequency of CEOS by different combinations of financial expertise and gender		
						F	M	Total
0							36	**36**
1					■	9	247	**256**
3				■	■	5	186	**191**
4			■				3	**3**
5			■		■		42	**42**
7			■	■	■		67	**67**
8		■					2	**2**
9		■			■	1	20	**21**
11		■		■	■	2	32	**34**
13		■	■		■	1	9	**10**
15		■	■	■	■	2	25	**27**
17	■				■		1	**1**
19	■			■	■		10	**10**
20	■		■				1	**1**
21	■		■		■		8	**8**
23	■		■	■	■	1	43	**44**
25	■	■			■		2	**2**
27	■	■		■	■		1	**1**
29	■	■	■		■	1	6	**7**
31	■	■	■	■	■	3	42	**45**

Table 24 – Frequency of CEOs by financial expertise level

The bar chart in figure 14 provides a visual insight of the content shown in table 24, where the decimal values of binary codes are placed on the "x" axis and the frequency of CEOs associated to each binary category are represented on the "y" axis.

This is the legenda of binary code combinations of CEO's financial expertise:

- 0: no degree and no job experience in finance or consulting/accounting;

- 1: degree;

- 3: degree and finance-related degree;

- 4: only job experience in finance;

- 5: degree (not in finance) and job experience in finance;

- 7: degree, finance-related degree and job experience in finance;

- 8: only job experience in consulting-accounting only;

- 9: degree (not in finance) and work experience in consulting or accounting-consulting;

- 11: degree, finance-related degree and job experience in consulting-accounting;

- 13: degree (not in finance), job experience in finance and job experience in accounting-consulting;

- 15: degree, finance-related degree, job experience in finance and in accounting-consulting;

- 17: degree (not in finance) and experience as CFO;

- 19: degree, finance degree and experience as CFO;

- 20: job experience in finance and experience as CFO;

- 21: degree (not in finance), job experience in finance and experience as CFO;

- 23: degree, finance related degree, job experience in finance and experience as CFO;

- 25: degree, job experience in consulting and experience as CFO;

- 27: degree, finance degree, job experience in accounting-consulting and experience as CFO;

- 29: degree (not in finance), job experience in finance, job experience in accounting-consulting and as CFO;

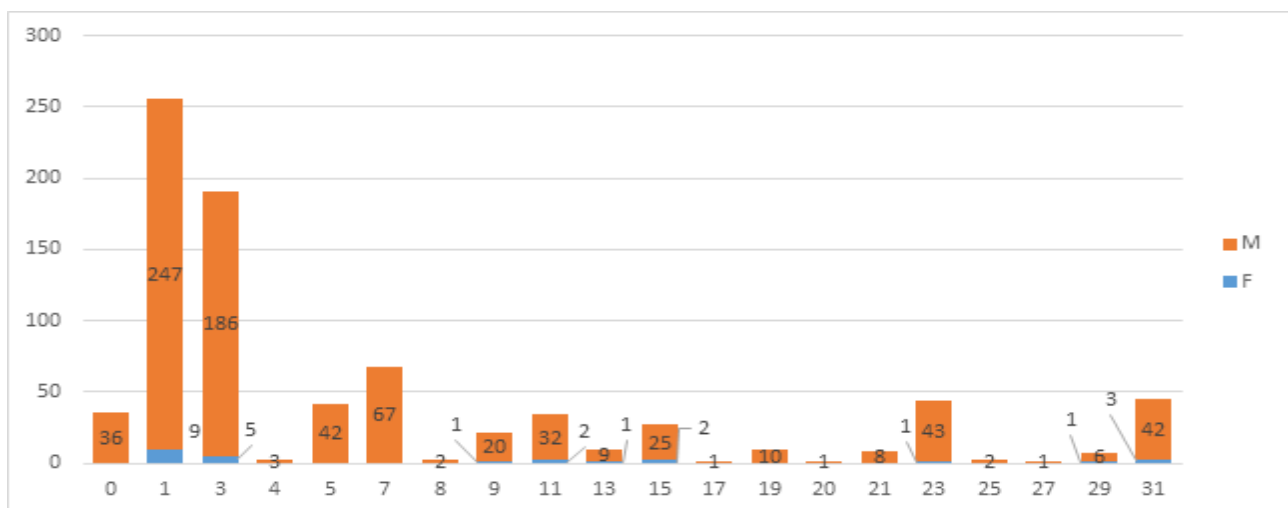- 31: degree, finance degree, job experience in finance, job experience in accounting-consulting and as CFO.

Figure 14 – Bar chart for binary sums of financial expertise

We can see clearly that most CEOs are concentrated in two binary categories that are related to the educational background: "1" that corresponds to the presence of the variable "degree", a minimum prerequisite for becoming a CEO and "3" which is the category of CEOs who have a finance-related degree.

The third most frequent value found is 7, indicating a good concentration in the first three levels of financial expertise: degree, finance-related degree and job experience in finance. The next most present value is "5" which corresponds to the CEOs who have a degree (not in finance) and a work experience in finance, "23" that denotes a more financial expert CEO (with a degree in finance, a job experience in finance and an experience as CFO) and "31" which indicates the

highest level of financial expert with a finance-related degree, a job experience in finance, in accounting-consulting and as CFO.

It is interesting to note that most CEOs fall in extreme categories, which correspond either to a low level of financial expertise or to a very high one, showing a sort of polarization between those that are financial experts and those who are maybe specialised in other fields.

Financial Experts			
	Average Tenure	**Average Age**	**Number of CEOs**
2014	6,43	53,21	189
2015	6,4	53,15	199
2016	6,41	53,3	213
2017	6,47	53,64	204
2018	6,77	54,02	208
TOTAL	**6,5**	**53,47**	**325**

Table 25 – Age and Tenure of financial experts

Table 25 that the number of financial expert CEOs increases along the years, together with their average tenure and average age. This may denote a rising importance of financial expertise as a criterion for selecting specific executives. Average tenure for financial experts is 6,5 years and average age is 53,47, which is lower than the average age and tenure of non-financial experts. However, both tenure and age for these profiles have an increasing trend from 2014 to 2018.

Average age	Financial expertise	
	Non-expert	**Expert**
F	53,12	49,3
M	55,88	53,64
TOTAL	**55,79**	**53,48**

Table 26 – Average age and financial expertise

Avg. CEO Tenure	Financial Expertise	
	Non-Expert	**Expert**
F	5,95	5,21
M	7,37	6,54
TOTAL	**7,32**	**6,50**

Table 27 – Average tenure and financial expertise

Tables 26 and 27 show the average age and tenure as CEO for men and women classified according to their being financial experts or non-financial experts. This means that financial experts are on average younger and they have been in charge for a shorter period than non-financial experts, and this is true both for women and for men (53,6 < 55,8 for men and 49,3 < 53,12 for women). However, women are still averagely younger than their male counterparts, both in case of financial experts and non-financial expert. In particular, female CEOs who are financially expert are much younger.

Interestingly enough, in the case of financial expert CEOs, the difference in the average age between males and females gets wider, indicating that women who pursue a financial career path reach top positions earlier than men who study and work in the same field, although they may go through a harder path.

Data about tenure is in line with that about age, because non-financial experts have a lower average tenure than financial experts. Also in this case, tenure for women is lower than for men, both for financial experts and non-financial experts.

8.10. Correlation among all CEOs' characteristics

The correlation matrix in *figure 15* was constructed by inserting all CEOs characteristics and gives us an overview of the correlation for between each two variables.

The red boxes indicate a positive correlation and blue boxes a negative one, with different shades based on the strength of the relationship between the variables.
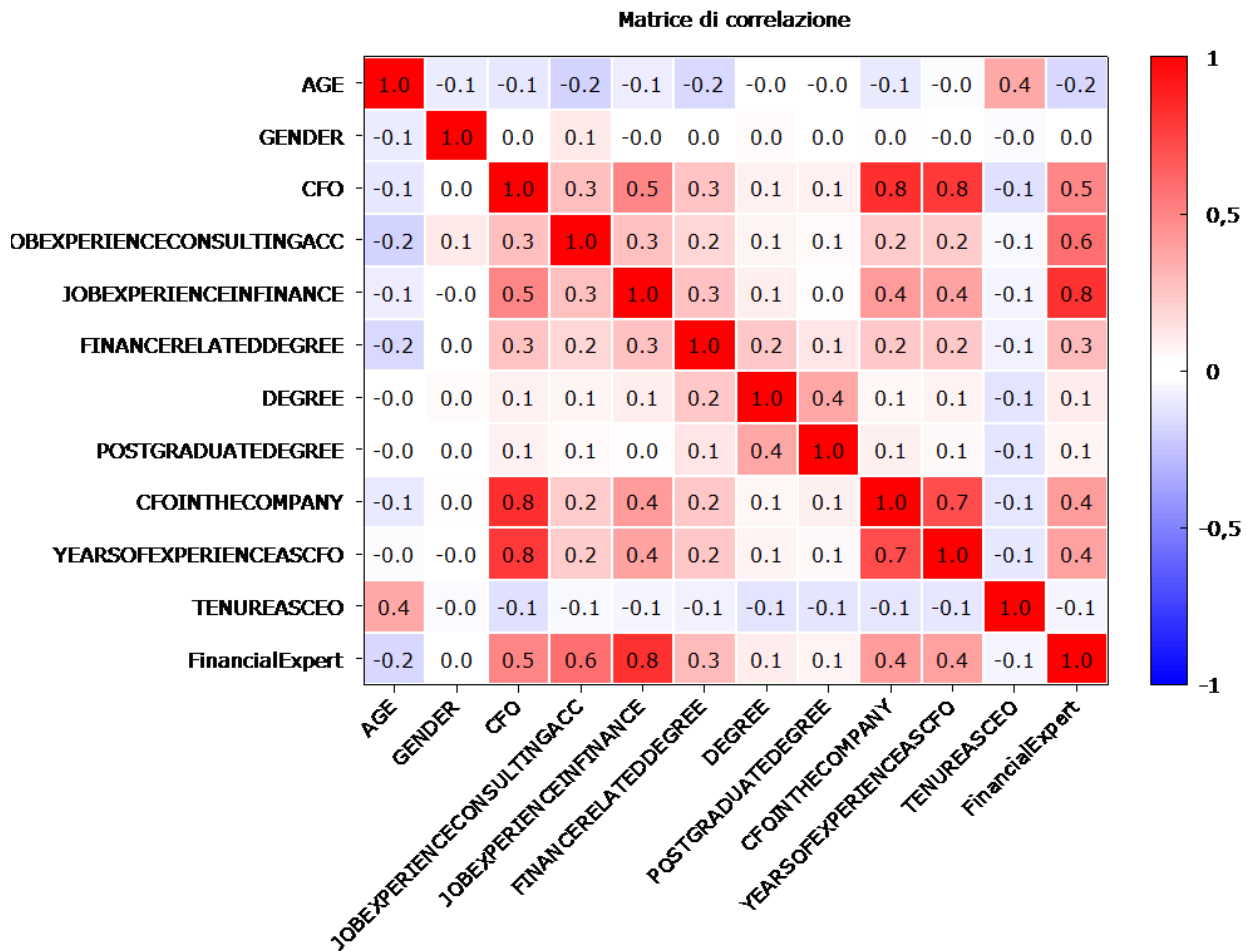

Figure 15 – Correlation matrix about CEOs' characteristics

Age is negatively correlated with all variables of financial expertise, especially with finance-related degree and job experience in consulting- accounting, confirming that CEOs who are financially expert are younger on average, so the higher the age, the lower the financial expertise.

Gender is negatively correlated to age (women are younger than men on average) and positively correlated with job experience in consulting-accounting: indeed, we saw that women have more experience in consulting and accounting relatively to men.

The variable of CFO is strongly and positively correlated with job experience in finance, job experience in accounting - consulting, finance-related degree and "financial expert", denoting clearly a financial background for CEOs who have performed this function before. It is negatively correlated to age (CEOs who worked as CFOs are younger on average than CEOs who have not been CFOs) and to tenure as CEO, which is also due to their younger average age.

Job experience in consulting / accounting is negatively correlated to age (older CEOs have less financial expertise) and positively correlated to gender (due to women), and to all variables of financial expertise (CFOs, CFO in the same firm, job experience in finance and finance degree). Job experience in finance is strongly and positively correlated to the variable of CFO, job experience in accounting and consulting and all variables of financial expertise. It is negatively correlated to age and to tenure as CEO (these CEOs are younger).

Finance related degree is negatively correlated to age and tenure as CEO (again due to lower average age for these CEOs), meaning that as age increases, we find fewer CEOs with a finance related-degree and, in general, fewer financial expert CEOs. It is positively correlated to all variables of financial expertise, especially CFO and work experience in finance.

Degree has a very weak but negative correlation to age: indeed, we have seen that most CEOs analysed have a degree, independently from their age. It is positively and quite strongly correlated with postgraduate, again confirming a good percentage of CEOs with a postgraduate qualification.

Tenure as CEO and age are positively correlated, while tenure as CEO and tenure as CFO are negatively correlated, showing that those who have performed the role of CEO for a long time do not have a long experience as CFOs and vice versa. Tenure as CEO is negatively correlated with all variables of financial expertise, showing that financial experts are younger and have been occupying the CEO positions for a shorter time.

9. Results of Regression Analyses

This section presents the empirical results of the regression analyses that have been conducted in this thesis, with the objective to test the hypotheses (stated in paragraph 7.1) that assumed the existence of a possible relationship between the change of CEO in a company in a given period (t) and the performance in the following period (t+1). The regression models were also introduced above in this thesis, in paragraph 7.1.

The first part of this section will present the descriptive statistics about dependent, independent and control variables used in the regression models. The second part will exhibit the results of the inferential statistics methods that were used to assess and evaluate the hypotheses.

Table 28 shows the summary statistics for each of the variables that were used in the regression analysis:

Variables	Observations	Mean	Standard Deviation	Median	Min	Max
Dependent variables						
ROE	1870	15,45%	35,67%	12,63%	-784,51%	543,24%
ROA	1908	5,95%	8,34%	4,92%	-74,20%	74,61%
CF/Sales	1852	12,41%	14,29%	9,86%	-92,47%	98,14%
Independent variables						
X Model 1*	1844	0,05	0,22	0,00	0,00	1,00
X Model 2*	1679	0,03	0,17	0,00	0,00	1,00
X Model 3*	1674	0,03	0,16	0,00	0,00	1,00
X Model 4*	216	0,45	0,50	0,00	0,00	1,00
Control variables						
(LN) Revenues	1815	11,36	6,97	14,86	0,00	19,66
Leverage	1858	85,84%	113,38%	60,06%	0,00%	972,03%

Table 28 – Regression Variables: Descriptive Statistics

*X Model 1 = independent variable of models 1.1, 1.2 and 1.3
*X Model 2 = independent variable of models 2.1, 2.2 and 2.3
*X Model 3 = independent variable of models 3.1, 3.2 and 3.3
*X Model 4 = independent variable of models 4.1, 4.2 and 4.3

For the categorical variables that were present in our regressions, namely sectors, years of analysis and changes of CEOs, we dropped one dummy variable. This was done to avoid falling in the so-called "dummy variable trap". Therefore, for the categorical variables that can take *k* values, we used *k-1* dummy variables and this prevented us from creating a severe multicollinearity problem in the analysis.

The number of observations vary from a variable to another because in some cases there wasn't any available information about these measures. The only missing control variables are industry sectors and years of analysis.

The response variables were all numerical values and they are: Return on Equity, Return on Assets and Cash Flow on Sales ratio. The explanatory variables in our regressions were all dummy variables: the X of Model 1 corresponds to change of CEO from financial expert to non-financial expert OR change of CEO from non-financial expert to financial expert ("1"), non-change of CEO ("0"); the X of Model 2 is the change of CEO from non-financial expert to financial expert ("1") and non-change ("0"); the X of Model 3 is the change of CEO from financial expert to non-financial expert

("1") and non-change of CEO ("0"); the X of Model 4 is the change of CEO in different direction ("1") and change in the same direction ("0") of expertise.

For what concerns the independent variables used in the analysis, ROE for the companies analysed is on average much higher (15,45%) than ROA (5,85%) but it is also more variable in terms of the minimum and maximum values it can take. Cash flow to Sales also presents an average value which is not too far from ROE (12,41%) and a quite high standard deviation (14,29%).

The control variables included in the analysis were the natural logarithm of companies' revenues and leverage ratio.

We can notice that leverage is the variable with the highest standard deviation from the mean as it can take a multitude of high and low values. This ratio presents a big variation, with firms that do not make use of leverage at all (so they have no short or long-term debts) and firms that rely heavily on financial debt (thus having a negative equity value). This component is linked to the firm's financial policies and strategies.

In model 4 we see a significantly lower number of observations but this is due to a reduced sample for this type of variable. The number of observations depends on the availability of data about the ROE, ROA and CF/sales, while for the 4 models the observations are based exclusively on the sample used, that varied accordingly to each independent variable.

Table 29 presents the results of a univariate analysis that was made for each variable used in the regression models:

Variables	Panel 1: Firms that changed CEO			Panel 2: Firms that didn't change CEO			Test of Difference	p-value
	Observations	Mean	Variance	Observations	Mean	Variance	Z-TEST	
Dependent variables								
ROE	216	12,3	27,87	1245	16,47	33,79	-2,1047**	0,0353
ROA	160	4,86	8,98	1268	6,16	7,8	-2,0333**	0,042
CFOP	158	16,51	14,78	1232	12,86	14,3	-0,7274	0,467
Independent variables CEO Changed	216	1	0	1628	0	0		
Control variables								
Revenues	152	15,54	7,17	1208	15,59	6,94	-1,2273	0,2197
Leverage	155	118,91	136,19	1242	115,2	111,08	-0,2639	0,7919

Table 29 – Univariate test for firms that changed CEO vs. firms that did not change CEO

**Significance at the 5% level.

The two samples that were used to conduct the test took into consideration the entire dataset that was available for this study.

The first panel includes the companies that in the years of analysis have experienced one or more changes of CEOs, and the second panel includes the companies that had the same CEO throughout the entire period of analysis from 2014 to 2018. For each group we have computed the mean and variance for each variable analysed. In the next column we conducted the *z-test* of difference, that is used to determine whether two-samples means are different when the variances

are known and the sample size is large. The "z" statistic is assumed to have a normal distribution and it has the objective to accept or reject the null hypothesis that the difference between the mean values of two samples is equal to zero. In other words, the null hypothesis proposes that no significant difference exists in a set of given observations.

The last column contains the *p*-values that measure the level of statistical significance and can range between 0 and 1. The p-value measures the strength of the evidence provided by the samples against the null hypothesis. Therefore, the smaller the p-value, the stronger the evidence that the null hypothesis should be rejected, so that there is significance.

For what concerns the difference in the descriptive statistics between firms that changed CEOs and companies that did not change CEO, the average ROE and ROA are higher for firms that did not change CEO, while the cash flow ratio is higher for firms in Panel 1, that changed CEO during the years analysed. The average revenues look similar between the two types of companies while leverage ratio is higher for firms that changed CEO.

We compare the z statistics with the p-value (with a significance level $\alpha = 0,05$) and the critical two tails "z", to see if we have evidence against the null hypothesis (H_0).

In the case of ROE and ROA, we have a statistically significant measure because the p-value is under 5%: we can reject the null hypothesis that proposes no difference between the observations.

When the calculated "z" statistic is greater than the critical "z" value for two-tail, we can reject the null hypothesis that the ROE and ROA for the two panels of firms are equal. This is confirmed by a p-value lower than 5%: we do not have enough evidence to state that the ROE and ROA for the two panels of firms are equal, the two groups are statistically and significantly different.

In the case of CF/Sales, revenues and leverage, the actual "z" score is lower than the critical two-tail "z" value, we cannot reject the null hypothesis as there is no strong evidence against it. This is also confirmed by a high p-value (well above the 5%), that brings us to assume that there is no difference between the two groups for what concerns these measures: they are not statistically significantly different.

The univariate test gives us a first macro-picture of the phenomenon we are approaching and it indicates that there exists a significant difference in terms of performance (at least for profitability ratios of ROE and ROA) between firms that have changed CEO during the years of analysis and firms that have not changed their executives in the five years. Therefore, the two events may deserve to be further analysed through a regression.

9.1. Evidence from Multiple linear regression

We have made the Breusch-Pagan test for heteroscedasticity for all our regression models, which aims at detecting problems of heteroscedasticity under the null hypothesis that the error variances are the same across all variables. Homoscedasticity is violated when the error term variances are not equal. The tests performed on all the models found that there was a problem of heteroscedasticity in our sample. To solve this issue, all the models were corrected for heteroscedasticity through White's consistent standard errors (or robust errors). Heteroscedasticity is a problem because ordinary least squares (OLS) regression assumes that all residuals are drawn from a population that has a constant variance (homoscedasticity).

OLS regression seeks to minimize residuals and in turn produce the smallest possible standard errors. By definition, it gives equal weight to all observations, but when heteroscedasticity is present, the cases with larger disturbances have more "pull" than other observations. A more serious problem associated with heteroscedasticity is the fact that the standard errors are biased. Because the standard error is central to conducting significance tests and calculating

confidence intervals, biased standard errors lead to incorrect conclusions about the significance of the regression coefficients. Robust standard errors were used to correct this bias.

Linear regression is an inferential model that allows to infer real and true relationships in the population by using a sample. Starting from the null hypothesis that the gradient is zero, so that there is no relationship between the actual variables, a sample is used in order to see if there is enough evidence to reject this null hypothesis (H_0: $\beta = 0$). We can infer that that the variable is significant if the sample coefficient is non-zero $H_1 = \beta \neq 0$ and that the population coefficient is not zero.

For each of the models described below, we have run the regression analyses whose results are shown in the tables and we have also conducted the analysis of variance (ANOVA). The results of each model indicate, for all the variables listed in the left column, the coefficients and the intercept (constant), the standard errors, the *t-statistic* and the *p-value*.

The coefficient value for each variable signifies how much the dependent variable changes given a one-unit shift in the independent variable, while holding other variables in the model constant. This property of holding the other variables constant is crucial because it allows to assess the effect of each variable in isolation from the others. The sign of a regression coefficient indicates whether there is a positive or negative correlation between each independent variable the dependent variable. The size of the coefficient for each independent variable gives us the size of the effect that variable is having on the dependent variable, while the sign indicates the direction of the effect.

In our analysis, for every additional change / not change of CEO, the dependent terms should increase or decrease by the amount of the coefficient: the larger the coefficient, the bigger the effect.

The standard error is the error associated with the prediction. The standard error is an estimate of the standard deviation of the coefficient, the amount it varies across cases. It can be thought of as a measure of the precision with which the regression coefficient is measured. The *t-statistic* (a standardised value) is the coefficient divided by its standard error.

If 95% of the t-distribution is closer to the mean than the t-value on the coefficient we are looking at, then we have a P-value of 5%. This is also referred to a significance level of 5%. A P-value of 10%, 5% or less is the generally accepted point at which to reject the null hypothesis. With a P-value of 5% there is only a 5% chance that results we see would have come up in a random distribution, so we can say with a 95% probability of being correct that the variable is having some effect, assuming that the model is specified correctly.

The coefficients for each variable (except years of analysis and industry sectors) are shown as they describe the mathematical relationship between each independent variable and the dependent variable. The p-values for the coefficients indicate whether the relationships described by the model are statistically significant.

The table also shows the r-squared for the model, which is also called "coefficient of determination" and is a statistical measure that determines the proportion of variance in the dependent variable that can be explained by the independent variable. This figure, however, does not disclose information about the causation relationship between the independent and dependent variable. As the R-squared measures the degree to which the data is explained by the model, in nearly all the cases, we found a low effect of the explanatory variables on the dependent variables and the relationship is not even statistically significant.

The standard error, P-value and t-statistic tell us one piece of information for variable, just in different ways.

A high standard error term (sum of square errors) denotes a low R^2, while a low standard error indicates a high R^2.

The mean square error corresponds to the mean square of the residual. It is also called standard error of the regression (SER): it tells us how much is each observation missing the prediction by indicating the deviation of the variables from the mean. The higher the error term, the worse-fitting the model is.

The ANOVA is analysis of variance and it answers the question "how much variation is there in the dependent variable?" Each of our dependent variables (ROE, ROA or CF/sales) has a measure and a mean value.

The sum of squares (SS) is a calculation of each observation minus the mean squared. It indicates the amount of variation available in the "y" variable and through the regression we try to explain some of that variation via the "x" variable. The ANOVA table also shows, out of the total amount of the Sum of Squares, how much is explained by the model and how much by the residuals.

The MS (mean square) is the ratio between sum of squares and their respective degrees of freedom. This measure again tells us whether the null hypothesis can be rejected or not. The F-statistic is the ratio between the mean square of the model and the mean square of the residuals, it allows us to reject the null hypothesis (H0) at a 5% level of significance. We will see that in no case we can reject the null hypothesis.

Multicollinearity should not be an issue in our regression analyses because for each regression model, we have only one independent variable which is related to different types of CEO change, while all the rest are control variables. Industry and year of analysis' dummies are included in all regression models but their coefficients are not shown in the tables.

Table 30 below presents a summary of the results for all the regression models that have been tested. It shows the outcomes of the regression analysis and of the variance analysis (ANOVA), by synthetizing all the models in a single scheme that gives an overview of the results. As previously mentioned, what differentiates the various models analysed are the independent variables selected, whereas the dependent and control variables used are the same for all the models. The table shows all the regression and variance statistics that have been presented above in this paragraph.

		Model 1			Model 2			Model 3			Model 4		
Dependent Variables		ROA $_{t+1}$	ROE $_{t+1}$	CF/Sales $_{t+1}$	ROA $_{t+1}$	ROE $_{t+1}$	CF/Sales $_{t+1}$	ROA $_{t+1}$	ROE $_{t+1}$	CF/Sales $_{t+1}$	ROA $_{t+1}$	ROE $_{t+1}$	CF/Sales $_{t+1}$
Constant	coeff	0,4365	- 3,5179	- 1,9170	0,1495	- 5,0937	- 2,1779	0,3286	- 3,9839	- 1,4397	1,8913	14,1964	0,9838
	Std Err	0,7676	4,2330	1,2249	0,7700	4,2949	1,2581	0,8171	4,5803	1,3693	3,0708	14,1917	4,8326
	t-value	0,5686	- 0,8311	- 1,5650	0,1941	- 1,1860	- 1,7310	0,4021	- 0,8698	- 1,0510	0,6159	1,0000	0,2036
	p-value	0,5697	0,4060	0,1178	0,8461	0,2358	0,0836	0,6876	0,3845	0,2932	0,5387	0,3184	0,8389
Independent Variables													
CEO_Expertise_1	coeff	- 0,5414	- 4,3798	0,1150									
	Std Err	0,9671	3,4702	1,7101									
	t-value	- 0,5598	- 1,2620	0,0673									
	p-value	0,5757	0,2071	0,9464									
Change_nfe_to_fe	coeff				0,4399	0,3811	2,5303						
	Std Err				1,0209	2,3770	2,4255						
	t-value				0,4309	0,1604	1,0430						
	p-value				0,6666	0,8726	0,2970						
Change_fe_to_nfe	coeff							- 1,7839	- 9,8270	- 2,6010			
	Std Err							1,6853	6,7362	2,3184			
	t-value							- 1,0590	- 1,4590	- 1,1220			
	p-value							0,2900	0,1448	0,2621			
Change_all_direct	coeff										0,6718	- 2,4610	0,3906
	Std Err										1,1879	3,9122	2,2139
	t-value										0,5655	- 0,6291	0,1764
	p-value										0,5724	0,5301	0,8601
Control Variables													
Firm Size	coeff	0,4273	1,0554	0,7670	0,4351	1,0805	0,7516	0,4316	1,0787	0,7547	0,3473	0,5689	0,8585
	Std Err	0,0208	0,1700	0,0402	0,0228	0,1837	0,0432	0,0220	0,1841	0,0416	0,0716	0,2578	0,1599
	t-value	20,5200	6,2090	19,0900	19,1200	5,8820	17,4100	19,6500	5,8580	18,1500	4,8500	2,2070	5,3680
	p-value	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	0,0285	<0,0001
		***	***	***	***	***	***	***	***	***	***	**	***
Leverage	coeff	- 0,0049	0,0401	0,0079	- 0,0057	0,0409	0,0088	- 0,0052	0,0384	0,0089	- 0,0030	0,0387	0,0056
	Std Err	0,0020	0,0172	0,0032	0,0024	0,0196	0,0036	0,0022	0,0189	0,0034	0,0030	0,0212	0,0065
	t-value	- 2,4180	2,3240	2,4880	- 2,4010	2,0860	2,4290	- 2,3030	2,0290	2,5780	- 0,9818	1,8290	0,8679
	p-value	0,0157	0,0202	0,0129	0,0164	0,0371	0,0153	0,0214	0,0426	0,0100	0,3275	0,0690	0,3865
		**	**	**	**	**	**	**	**	**		*	
Sectors		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year of Analysis		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REGRESSION ANALYSIS													
Mean dependent variable		5,6059	14,9087	12,6414	5,7656	15,3805	12,7604	5,6962	15,1896	12,6708	4,5011	10,8525	12,0465
Sum of square residuals		82900,50	2595773,00	312867,70	74171,09	2470076,00	284498,60	77432,49	2550527,00	280603,70	10035,92	122164,40	39067,41
R-squared		0,2232	0,0892	0,2326	0,2279	0,0886	0,2303	0,2225	0,0859	0,2298	0,2753	0,1934	0,3021
Num Obeservations		1844	1844	1844	1679	1679	1679	1674	1674	1674	216	216	216
F-TEST		37,8316	17,4644	39,0832	34,7864	15,8912	35,1782	34,8857	15,0165	35,7790	41,1372	18,2695	17,6385
Std. Dev. dep. variable		7,6094	39,3246	14,8735	7,5661	40,1892	14,8417	7,7156	40,8385	14,7573	8,0256	26,5409	16,1357
Std. error of regr.		6,7583	37,8177	13,1293	6,7046	38,6913	13,1310	6,8609	39,3760	13,0606	7,3258	25,5595	14,4540
Adj. R-squared		0,2112	0,0752	0,2208	0,2148	0,0732	0,2172	0,2093	0,0703	0,2167	0,1668	0,0726	0,1976
P-value(F)		0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
ANOVA ANALYSIS													
Sum of Squares	Regression	23.815,2	254.293,0	94.843,1	21.887,6	240.177,0	85.124,9	22.162,9	239.674,0	83.736,8	3.812,4	29.285,8	16.910,2
	Residual	82.900,5	2,59577e+006	312.868,0	74.171,1	2,47008e+006	284.499,0	77.432,5	2,55053e+006	280.604,0	10.035,9	122.164,0	39.067,4
	Total	106.715,7	2,85007e+006	407.711,1	96.058,7	2,71025e+006	369.623,9	99.595,4	2,7902e+006	364.340,8	13.848,3	151.449,8	55.977,6
Degree of freedom	Regression	28,00	28,00	28,00	28,00	28,00	28,00	28,00	28,00	28,00	28,00	28,00	28,00
	Residual	1.815,00	1.815,00	1.815,00	1.650,00	1.650,00	1.650,00	1.645,00	1.645,00	1.645,00	187,00	187,00	187,00
	Total	1.843,00	1.843,00	1.843,00	1.687,00	1.678,00	1.678,00	1.673,00	1.673,00	1.673,00	215,00	215,00	215,00
Mean Squares	Regression	850,54	9.081,89	3.387,25	781,70	8.577,75	3.040,17	791,53	8.559,79	2.990,60	136,16	1.045,92	603,93
	Residual	45,68	1.430,18	172,38	44,95	1.497,02	172,42	47,07	1.550,47	170,58	53,67	653,29	208,92
	Total	57,90	1.546,30	221,22	57,25	1.615,17	220,28	59,53	1.667,78	217,78	64,41	704,42	260,36

Table 30 - Regression Summary Table

Model 1.1: OLS, observations 1-1844
Dependent variable: ROA_{t+1}
Robust standard errors with respect to heteroscedasticity, variant HC1

ROA $_{t+1}$= β$_0$ + β$_1$ Change_expertise_Model1 + β$_2$ Firm size + β$_3$ Leverage + β$_4$ Year of Analysis + Σ *Industries* + ε

ROA $_{t+1}$= 0,437 – 0,541 * Change_expertise_Model1 + 0,427 * Firm size - 0,00491 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

The explanatory variable of Model 1 corresponds to a change in expertise at the executive level (from financial expert to non-financial expert and vice versa) and has a dummy value of zero in case of non-change. The beta coefficient of the independent variable lets us presume that a change in the kind of management expertise has a weak but negative effect on ROA, which indicates firm performance in this model.

This model presents a total correlation coefficient of 22,3% but a very high p-value, meaning that the relationship is not statistically significant. The variables in the model explain 22,3% of the variation in the ROA of the following period.

As the sample coefficients have to be far enough from zero in order to infer the existence of a relationship, in this case we cannot state that there exists a relationship between ROA and change of CEO with different types of expertise.

Through this regression model, we are explaining a low portion of the total amount of the sum of squares (amount of model). Only 22,3% of the variation in the dependent variable is being explained by the "x", while the residuals corresponding to 78% remain unexplained. We cannot reject the null hypothesis.

Model 1.2: OLS, observations 1-1844
Dependent variable: ROE_{T+1}
Robust standard errors with respect to heteroscedasticity, variant HC1

ROE $_{t+1}$ = β$_0$ + β$_1$ Change_expertise_Model1 + β$_2$ Firm size + β$_3$ Leverage + β$_4$ Year of Analysis + Σ *Industries* + ε

ROE $_{t+1}$= -3,52 - 4,38 * Change_expertise_Model1 + 1,06 * Firm size + 0,0401 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

The R-squared of the regression is the fraction of the variation in the dependent variable (ROE at "t+1" in this model), that is accounted for (or predicted by) the independent variables of CEO change. If there is no correlation, there is no association between the changes in the independent variable and the shifts in the dependent variable. Here the low r-squared (8,9%) tells us that the model is not very much explanatory. The p-value for the independent variable is 20%, not as high as in other models, but it shows that the relationship between ROE and change of CEO expertise is not statistically significant.

Through this regression model, we are explaining a very low portion of the total amount of the sum of squares (amount of the model) and the standard error of regression also indicates that the data do not fit very well with the regression line. Therefore, we cannot reject the null hypothesis.

Model 1.3: OLS, observations 1-1844
Dependent variable: $CF/Sales_{T+1}$
Robust standard errors with respect to heteroscedasticity, variant HC1

CF/Sales $_{t+1}$ = β$_0$ + β$_1$ Change_expertise_Model1 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

CF/Sales $_{t+1}$= -1,92 + 0,115 * Change_expertise_Model1 + 0,767 * Firm size + 0,007 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

In this model, the two tailed p-value, which is a test for the coefficient, is extremely high (94%) to reject the null hypothesis, and it gives us a very low level of significance of the independent variable.

The model presents a correlation coefficient of 23,3% but the relationship between change of CEO (that implies a change of expertise) and cash flow to sales is not statistically significant.

Through this regression model, we are explaining a low portion of the total amount of the sum of squares (amount of model). As this is also the ratio to calculate the R-squared, only 23,3% of the variation in the dependent variable is being explained by "x". The residuals corresponding to 77% remain unexplained. We cannot reject the null hypothesis.

Model 2.1: OLS, observations 1-1679
Dependent variable: ROA_{T+1}
Robust standard errors with respect to heteroscedasticity, variant HC1

ROA $_{t+1}$= β$_{0 +}$ β$_1$ Change_nfe_to_fe_Model2 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

ROA $_{t+1 =}$ 0,149 + 0,440 * Change_nfe_to_fe_Model2 + 0,435 * Firm size - 0,0057 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

The independent variable of Model 2 is the change of CEO from non-financial expert to financial expert and zero in case of non-change. The coefficient for the independent variable is positive, showing a positive relationship between ROA and change of CEO in favour of a financial expert.

This model presents an R-squared value of 22,8% but a very high p-value (66%), meaning that the effect of the change of CEO from a non-financial expert to a financial expert is not statistically significant but due to chance alone.

Through this regression model, we are explaining a low portion of the total amount of the sum of squares (amount of model). As this is also the ratio to calculate the R-squared, only 22,8% of the variation in the dependent variable is being explained by the change of CEO. The residuals remain unexplained. We cannot reject the null hypothesis.

Model 2.2: OLS, observations 1-1679
Dependent variable: ROE_{T+1}
Robust standard errors with respect to heteroscedasticity, variant HC1

ROE $_{t+1}$ = β$_{0 +}$ β$_1$ Change_nfe_to_fe_Model2 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

ROE $_{t+1}$ = - 5,09 + 0,381 * Change_nfe_to_fe_Model2 + 1,08 * Firm size + 0,0409 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

The correlation coefficient of the independent variable in this model has a positive sign and it is quite high, indicating a positive effect of the change towards a financial expert CEO on the firm value (ROE at "t+1"). However, the P-value indicates a very high probability (87%) of this coefficient occurring just due to random chance, as there is no statistically significant effect of the change from a non-financial to a financial expert CEO. The sample just happened to be so, and the coefficient happened to be higher than 0. The standard error of regression is also quite high with respect to other models analysed.

The r-squared for the model is also low (8,8%) showing a weak relationship between the change of CEO from non-financial expert to financial expert and the ROE in the following period. Through this regression model, we are explaining a low portion of the total amount of the sum of squares (amount of model) and residuals remain unexplained. Therefore, we cannot reject the null hypothesis.

CF/Sales $_{t+1}$ = β$_0$ + β$_1$ Change_nfetofe_Model2 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

CF/Sales $_{t+1}$ = - 2,18 + 2,530 * Change_nfetofe_Model2 + 0,752 * Firm size + 0,00879 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

The change of CEO from non-financial expert to financial expert would have a positive effect on the cash flow / sales ratio, as shown by the positive beta coefficient for the explanatory variable, but the relationship between the change of CEO from a non-financial expert to a financial expert and the cash flow is not statistically significant. In fact, the p-value is close to 30%, showing that these results are occurring just for random chance.

The correlation coefficient for the model is 23% and the regression model represents a very low portion of the total sum of squares. As a consequence, we cannot reject the null hypothesis.

ROA $_{t+1}$= β$_0$ + β$_1$ Change_fe_to_nfe_Model3 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

ROA $_{t+1}$= 0,329 - 1,784 * Change_fe_to_nfe_Model3 + 0,432 * Firm size - 0,00518 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

The independent variable of Model 3 is the change of CEO from financial expert to non-financial expert ("1") and non-change of CEO ("0"): the coefficient in the table indicates that the passage to a non-financial expert has a weak but negative relationship with all the measures of firm performance.

For what concerns this model, the change in a given period from a financial expert CEO to a non-financial expert has a negative effect on the ROA in the following period. The p-value shows a low significance level, but the coefficient is not too far from the 10% probability threshold. The correlation found in the model is 22,2%, therefore the regression accounts for a small portion of the total sum of squares. In this case too, we cannot reject the null hypothesis.

ROE $_{t+1}$= β$_0$ + β$_1$ Change_fe_to_nfe_Model3 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

ROE $_{t+1}$= - 3,983 - 9,827 * Change_fe_to_nfe_Model3 + 1,08 * Firm size + 0,0384 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

This model shows that the change from a financial expert to a non-financial expert CEO has a negative impact also on ROE. It is not statistically significant, but also in this case its p-value is not too far from 10%, which is better than other models presenting an extremely low level of significance. The R-squared shows a low proportion (8,6%) of the total variation in ROE which is being explained by the change of CEO. The regression makes for a small portion of the total sum of squares, therefore we cannot infer a true relationship existing in the population: the null hypothesis cannot be

rejected. This model presents a higher standard error of regression with respect to the others, indicating a high distance of the data from the regression line, on average.

<div align="center">

Model 3.3: OLS, observations 1-1674
Dependent variable: CF/Sales$_{T+1}$
Robust standard errors with respect to heteroscedasticity, variant HC1

</div>

CF/Sales $_{t+1}$ = β$_0$ + β$_1$ Change_fe_to_nfe_Model3 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

CF/Sales $_{t+1}$ = - 1,44 - 2,600 * Change_fe_to_nfe_Model3 + 0,755 * Firm size + 0,0088 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

For this model too, the change of CEO from a financial expert to a non-financial expert has a negative effect on cash flow to sales ratio as shown by the sign of the beta coefficient, but it has a p-value of 22,9%, indicating a low level of statistical significance. This is also clear from the ANOVA table, showing the low weight of the regression in the sum of squares. The largest part of the model remains unexplained, as only a small portion of the change in cash flow / sales ratio is due to the independent dummy variable. We cannot reject the null hypothesis.

<div align="center">

Model 4.1: OLS, observations 1-216
Dependent variable: ROA$_{T+1}$
Robust standard errors with respect to heteroscedasticity, variant HC1

</div>

ROA $_{t+1}$= β$_0$ + β$_1$ Change_direction_Model4 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε
ROA $_{t+1}$= 1,89 + 0,672 * Change_direction_Model4 + 0,347 * Firm size - 0,0029 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

This model and the following two models are characterised by a smaller sample because they include only the firms that changed CEO during the years of analysis. The explanatory variable is a dummy that indicates a change in the same direction of expertise ("1"), so either from a financial expert to another financial expert or from a non-financial expert to a non-financial expert. The opposite case ("0") indicates a change in different directions in terms of CEO expertise.
We can see a positive sign of the relationship between the dependent and explanatory variables in the model; the r-squared is higher than the one found in other models (27,5%), showing a certain degree of association between change of CEO and ROA in the following period, but the p-value is also too high (57%), indicating no statistical significance at all. Therefore, we cannot reject the null hypothesis.

<div align="center">

Model 4.2: OLS, observations 1-216
Dependent variable: ROE$_{T+1}$
Robust standard errors with respect to heteroscedasticity, variant HC1

</div>

ROE $_{t+1}$ = β$_0$ + β$_1$ Change_direction_Model4 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε
ROE $_{t+1}$ = 14,2 - 2,46 * Change_direction_Model4 + 0,569 * Firm size + 0,0387 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

This regression analysis indicates that the change of CEO in the same direction of expertise has a negative impact on ROE of the next period, as shown by the negative beta coefficient of the independent variable.

It presents a correlation of 19,3% (R-squared) but a very high p-value for the independent variable (53%), showing no significant effect of the change of CEO at a given year on the ROE of the following year. The regression makes for a small portion of the total sum of squares, therefore we cannot infer a true relationship existing in the population. There is also a quite high standard error of regression in this model. Here again, the null hypothesis cannot be rejected.

<div align="center">

Model 4.3: OLS, observations 1-216
Dependent variable: $CF/Sales_{T+1}$
Robust standard errors with respect to heteroscedasticity, variant HC1

</div>

CF/Sales $_{t+1}$ = β$_0$ + β$_1$ Change_direction_Model4 + β$_2$ Firm size + β$_3$ Leverage + Σ Year of Analysis + Σ *Industries* + ε

CF/Sales $_{t+1}$ = 0,984 + 0,390 * Change_direction_Model4 + 0,858 * Firm size + 0,0056 * Leverage + Σ Year of Analysis + Σ *Industries* + ε

In the case of this last regression model, the change of CEO in the same direction of expertise (financial or non-financial) appears to have a positive impact on the cash flow ratio, as shown by the beta coefficient. This model has the highest r-squared found so far between the dependent and independent variable (30%), but also a very high p-value that denotes no statistical significance for the relationship. The null hypothesis cannot be rejected.

9.2. Conclusions from regression

With regards to the hypotheses that were advanced above in section 7.1 about each regression models, we have tested that the first hypothesis (H1) is not demonstrated, because the change of CEO is not found to have any effect on the company performance, therefore the shift from a CEO with a type of expertise to a CEO with another expertise does not imply a variation in the company performance. As the other three hypotheses were directly correlated with the first one, it comes automatically that if the change of CEO has no statistically significant impact on the firm performance, then the sign and direction of this impact is not significant either. However, for the purpose of completeness, we will answer to the three remaining hypotheses.

The second hypothesis (H2) stated that, when the executive changes from a non-financial expert to a financial expert, firm performance is affected in a positive way: results show that this is indeed right, as we observed a positive coefficient of the independent variable in Model 2 with respect to all the dependent variables of firm performance. However, this effect has no statistical significance.

The third hypothesis (H3) assumed that, when the executive changes from a financial expert to a non-financial expert, firm performance is negatively affected. We have observed that the coefficients of the explanatory variable in Model 3 are negative with respect to all the response variables of firm performance, therefore the effect is negative, but not statistically significant.

The fourth and last hypothesis (H4) affirmed that, when the CEO changes from a financial expert to a financial expert or from a non-financial expert to a non-financial expert (same type and direction of expertise), firm performance is not significantly affected. In fact, in Model 4 we have seen that the coefficients of the independent variable are positive with respect to ROA and CF/Sales and negative with ROE, but they are not statistically significant. A change classified according to the direction of expertise of the succeeding CEOs gives no uniform answer for what concerns the impact on firm performance.

We can see that in almost all the cases, there is a low probability that the relationships observed in our sample also exist in the larger population. Therefore, we cannot reject the null hypothesis that the different types of CEO changes have no correlation with the firm performance. In other words, there is insufficient evidence to conclude that there is effect at the population level.

It is not very appropriate to interpret results that are not statistically significant: if the t-test for a regression coefficient is not statistically significant, it is not useful to explain the coefficient. We see very low "t" statistics for the independent variables, which indicates a low significance in terms of magnitude.

We can then conclude that no statistically significant linear dependence of the mean of the Y variables on the X variables was detected.

10. Discussion and conclusive remarks

The research conducted for this thesis had as a main purpose to deepen the understanding of the backgrounds of CEOs with different degrees of financial expertise. The first part of the study was focused on reviewing the existing literature about the topic of top executives with a background in finance and the effect that this may have on the firm performance and strategic direction. The remaining and wider empirical part presented the results of the research, both about the CEOs' background and about the linear regression.

An investigation was made about the phenomenon of the academic and professional experiences of the chief executives and we used a panel of non-financial firms included in the Stoxx600 Europe during the period 2014-2018. As shown in the literature review presented in the first sections, the importance of top management profiles with this kind of expertise has increased along the years and it is perceived as a required skill for setting the right goals for the company.

We developed several hypotheses both about CEOs characteristics and about the regression models that we tested by using different instruments. We first scrutinized the phenomenon of financial expertise for CEOs and their personal and professional characteristics; in a second phase, we evaluated the event in which companies changed their top executive during the years analysed and this would entail a shift of expertise; at the last stage, we placed this event in a possible relationship to firm performance to assess whether some connection existed.

The outcome of our analysis has shown some highlights and trends for what concerns financial expert CEOs and their characteristics. With the focus on CEO turnover, different linear regression models were constructed in order to answer the main following question "does the change of CEO, with a related change of expertise, have an effect on the firm performance?". Evidence found in our sample has shown that the change of top executive does not have a particular effect on the performance indicators that were used, or, if it does, in no case it is statically significant.

The basic assumption of regression was that there is a true relationship in the population that we can estimate through the sample by constructing a regression function. However, the models have not been successful in demonstrating the existence of an effect that the change of CEO for a company or a non-change at a given period (t), may have on the performance of the same company in the following period (t+1).

The high P-values in the models show us that with a high probability, the movements or correlations we find in the models are due to random chance alone. No matter the level of significance used (it could be 1%, 5% or 10%), there is no way to reject the null hypotheses (H_0) which state that there is no relationship between dependent and independent variables. Therefore, we have to accept the H_0, according to which the coefficients at population level are zero for every variable: there is no effect of CEO change on firm performance and the models do not explain a relationship.

The extent to which CEOs influence firm performance is fundamental to scholarly understanding of how organizations work, but this linkage is poorly understood. Previous empirical efforts to examine the link between CEOs and firm performance using variance decomposition, suffer from methodological problems that systematically understate the relative impact of CEOs on firm performance compared to industry and firm effects (Mackey, 2008).

A study conducted by (Beatty & Zajac, 1987) argues that the CEO succession and firm performance relationship is a function of two distinct but complementary phenomena: manager effects and succession effects. They tested their hypotheses with a sample of 209 large corporations. The results suggest that announcements of CEO changes are typically

associated with a reduction in the value of the firm, as reflected in the perceptions of the stock market, and that CEO successors tend to significantly influence the production and investment decisions of their firms in terms of attitude to risk.

Relative to our research, this may suggest us that CEO change may have a more direct effect on the way companies are perceived by capital markets, in terms of reaction of investors and stakeholders to the announcements made about top executive team, rather than on firm performance itself. For what concerns investment strategies of the company, we analysed measures of return on equity and return on assets which indicate the profitability of investments, but we did not find a statistically significant impact that could be due to the shift of CEO with a different type of expertise. (Lieberson & O'Connor, 1972) noted that the leadership impact varied widely, depending on which performance variables were used.

10.1. Possible limitations of the study

The results of the regression analyses may be explained by the fact that our sample was composed by top capitalisation firms in Europe and their performance may not depend exclusively on what occurs at the executive level. The movements occurring in the top management team in a given period cannot influence the profitability measures of the firm in the following period.

The study conducted for this thesis may present some limitations related to the sample and the variables utilised, which may lead to supplementary research about the topic. The evidence found in our sample belongs exclusively to a specific context of top capitalization European firms, which present certain characteristics in terms of market, cultural environment, history and dynamics that may explain certain results. If the research was conducted on firms in a different framework characterized by different contingencies, the results may not correspond to those we found. The types of companies that made up our sample have specific traits in terms of dimensions and geographical area, so the evidence that came up may be specifically related to this kind of firms.

The approach used for studying CEOs' managerial characteristics and their relationship with other variables can also present some limitations. The most important one is the fact that not all CEO characteristics are measurable. Age, tenure, compensation and gender are basic statistical and measurable facts about a person. However, this does not describe what kind of approach the CEO may have towards certain tasks, how he or she reacts in different situations and contexts, and what personality characterises the CEO. These features are hard and time-consuming to measure, and sometimes may not even be easy to access or available. It is possible to conduct a deeper research about these characteristics and their effect on firm value (Diks, 2016).

A small portion of firm performance is explained by the independent variables. More independent and control variables can be added to better specify it. Furthermore, the influences of CEOs decreased over the past years due to regulations and better corporate governance. The companies that are investigated are usually listed large firms and it is harder for a single individual to have a real influence or impact on the performance of such big companies (Diks, 2016).

A problem of the models arises from endogeneity. This is tested with the fixed effects model using industry and time control variables. However, there are more possible omitted variables that can be tested in order to be sure that the correlations have the right signs and numbers (Diks, 2016).

The focus on the sole figure of the CEO and not on the whole top management team may be another limitation in order to understand the impact on firm strategic direction and performance, because liability for decision-making may be shared in most cases.

Another problem emerges from reverse causality. While several tests have been made in order to see whether CEO characteristics are able to influence firm performance, it can also be possible that firm performance influences CEO

characteristics. This would mean that the relationship of causality goes the other way around. For example, it is possible that the reason for higher CEO's compensation (which normally is the independent variable) is the high performance of the firm (normally considered as dependent variable) instead the other way around. Because the company has a good performance, it has the ability to pay higher bonuses to its managers and workers, instead of having a compensation model that is based on performance. This example is to explain that it is hard to test and to make statements about what way the variables affect each other. Therefore, there is a possibility that the results are biased (Diks, 2016).

Moreover, the sample size of our study may be too small in order to give consistent results: when we restrict the sample to only firms that have changed their CEO (as occurred in Model 4), results may be even less significant.

For these and other reasons, this research may give an input to enrich the existing literature regarding the relationship between CEOs with financial expertise, CEO changes and firm performance, in order to improve the methodologies and solve the issues that arose here.

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