

The hidden value of intangibles: Do CEO characteristics matter?

1. Introduction

The relationships between intangible assets and firm performance have been studied in recent years. One of the intangible assets that has been analyzed deeply is the human capital of the firm. Human capital includes knowledge, skills, and abilities of people working in the company (Coff, 2002). In particular, there has been considerable debate regarding the impact of the CEOs on firm performance.

The role of the CEO on firm performance

Some scholars have argued that CEOs actions influence their firm performance (Quigley and Hambrick 2015). Others have shown that CEOs are greatly constrained – by organisational inertia, path-dependence, rigid resource configurations and pressures to adopt institutionalised norms – such that, leaders do not have much influence on what happens to their companies (Fitza, 2014). This debate reveals the importance of the study of the CEO role in organisational science. Researchers have always tried to understand the impact that leaders have on their organizations (Peni, 2014). Thus, in this paper we want to answer some questions such as: to what extent do CEOs, in general, influence company performance? What are the CEO characteristics relevant to the company's results?

Upper Echelons Theory: Different approaches of CEO characteristics and firm performance

Scholarly attention to CEOs remains robust (Hambrick and Quigley 2014). From a theoretical point of view, Upper echelons theory (UET) has been the most important

theoretical perspective to address the role of the CEO in the firm (Hambrick and Mason 1984). The core thesis of UET is that “executives' experiences, values, and personalities greatly influence their interpretations of the situations they face and, in turn, affect their choices (Hambrick 2007, p. 1) “and, through these choices, organisational performance” (Hambrick and Mason 1984, p. 197).

From this, three approaches of research have emerged. The first one examines the individual CEO characteristics that are related to firm performance taking into account mediation strategies (Simsek et al., 2010). The mediators highlighted in previous studies appear to account for different stages (e.g., TMT processes and strategic choices: Ling et al., 2008) in the effects of CEO characteristics on firm performance. This first approach would be the closest to the core of the UET theory: the characteristics of the CEO affect the strategic decisions and those decisions determine the performance.

The second approach considers the influence of the CEO on decisions or choices, but not directly linked to firm performance, instead the CEO characteristics are associated with specific strategic choices, with the implicit assumption that these strategic choices have implications for firm performance. Thus, firm performance is not measured (Simsek et al., 2010).

The third approach accounts for how individual CEO characteristics directly impact on firm performance (Gow et al., 2016) assuming that there is an implicit behaviour of the CEO that are mediating this relationship but without measuring it. Our work is framed within this last stream.

Wang et al., (2016) developed a meta-analysis investigation based on UET of the CEO influence to firm strategic actions and firm performance. The conclusions of this work provide a general vision on what characteristics of the CEO influence performance. That

paper examined different CEO characteristics: demographic aspects of the CEO (age, sex), professional background (experience, tenure, training) as well as personality style (leadership, extraversion, self-esteem). Among the possible future research section, the authors suggested: “Encourage researchers to explore interplays among the CEO characteristics. There are ways that the CEOs’ characteristics could interactively influence their strategic choices and future firm performance” (Wang et al., 2016, p.825).

The aim of this paper

Our work tries to explore that path suggested by Wang et al., (2016). A great deal of research has examined the relationship between a single CEO attribute and a single measure of firm performance, as far as we know, no attempts have been made to integrate them to create a more global vision of both. Therefore, we are going to take a step forward to combine different CEO characteristics with different firm performance measures in order to show that a certain managerial profile would have an impact on several variables of firm performance.

Our work makes some contributions to the literature. Firstly, we contribute to the critical approach to examine the relationships between organizations’ intangible assets and its performance, trying to explain whether and what kind of possibilities exist to increase performance through intangible assets, in particular, the human capital of the CEO. Secondly, we contribute to UET by taking into account different types of CEO characteristics that would impact on CEO decisions and therefore on the firm performance. Although the influence of owners on strategic decisions can be strong, CEOs have a direct influence on firm strategies. Thirdly, instead of taking into account a single variable of firm performance, as previous scholars, using a novel methodological approach to the topic, the Canonical Correlation Analysis (CCA), we are able to create different CEO’s profiles that influence on different combinations of firm performance

variables. Lastly, the context of small firms has a particular interest because understanding CEO background in the context of small enterprises is fundamental, as they are companies where resources and administrative systems are often lacking (Lubatkin et al. 2006). There is a lot of applied research regarding large listed firms, but there is not much research on small firms. In short, we bring some light to the debate on the importance that an essential intangible can have on performance, the CEO.

The paper is organised as follows. The following section explains the theoretical reasoning that justifies our hypothesis. Section 3 describes the sample, the variables, and the CCA procedure. Section 4 summarizes the results of our empirical tests. The final section exposes the findings and provides discussion and conclusion of the paper.

2. Theoretical Framework

Human Capital has been studied as an Intangible Asset of great value to the company. More specifically, the characteristics of the CEO have been described as an indisputable part of the managerial capabilities of the company and have often been associated with organizational performance (Wang et al., 2011). However, the influence of the CEO's on other type of performance measures has been less studied. A very consistent approach is offered by Hambrick and Quigley (2014).

According to these authors, the academic field of management relies in great part on the premise that the effectiveness of managers has certain consequences in the organization, which means that CEOs matter. Some researchers have emphasised the role of CEOs in setting strategy or make decisions about how to invest, how to compete and how to create value in these companies (Porter, 1980). On the other hand, it is widely accepted that executives, including CEOs, face considerable constraints on their actions. They are

limited by their organisations' pre-existing asset configurations and entrenched cultures. Therefore, given the importance of the role of the CEO on the one hand and its restrictions on the other, this makes it very interesting to study, and this is why many researchers have pointedly explored the CEO impact on firm performance.

According to UET, the CEOs are the main decision makers of their companies, therefore, their way of being, their preferences and style of leadership will have a lot of influence in their organizations (Hambrick, 2007). The characteristics of the CEO are reflected in different strategic decisions, which in turn influence future firm performance. Hambrick and Mason (1984) showed that CEOs' cognitive bases and personality traits will influence their field of vision, perception, and interpretation. In this way, these personality traits shape their strategic choices by influencing "their personalised interpretation of the strategic situations they face" (Hambrick 2007, p. 334). Due to the difficulties of collecting data related to the personality of the CEOs, UET suggests that researchers can examine observable characteristics of the CEOs. In our study, we are going to use seven objective characteristics that define the background (see Figure 1).

As for the methodologies used, for more than 40 years, research has employed numerous variance partitioning methods (VPM) to calculate the CEO effect. This CEO effect is calculated once the effects of contextual factors are isolated. Lieberman and O'Connor (1972) used sequential ANOVA. They added the impact of the CEOs to the model after taking into account the variance explained by contextual factors. Most recently, Crossland and Hambrick (2007) used simultaneous ANOVA and in 2011 used multilevel modelling, which addresses the non-independence of effects. In sum, classical methodologies based on VPM have been used to examine relevant questions about the influence of the CEOs to the company performance or what are the CEO characteristics relevant to the company's results.

However, in recent years Fitza (2014, 2017) offers a very critical view with the methods based on variance partitioning. In his works, he considers that the CEO effect is oversized since part of the success or failure of the company must be assigned at random and not to the CEO. On the other hand, Quingley and Graffin (2016) using the same data as Fitza (2014) and methodologies based on the Multilevel modeling show that 20% of the ROA (return on assets) variations may be due to the CEO effect. This stimulating debate is giving rise to a growing interest in quantifying the importance of the CEO in the firm performance. Table 1 summarize these studies.

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The table shows that previous experience and work style seem to be predictive of future performance, while personal choices and background are only modestly predictive. Up to now, all the papers studying the CEO effect on firm performance have taken into account particular characteristics of CEOs on the one hand, and operational or economic performance on the other. Most of the papers have measured firm performance with the ROA (Hambrick and Quigley 2014; Gow et al., 2016). Although the ROA is a good and very common indicator of firm performance, there could be some characteristics of the CEO that can influence in other dimensions of performance such as firm innovation or growth. This could be a reason why some research has not found a significant influence of a unique CEO characteristic on ROA *per se*; for instance, CEO age and tenure could be more associated with firm growth than firm financial performance.

Trying to answer new calls from Wang et al., (2016) or Liu et al., (2018) about a more global vision of the CEO characteristics, we propose a more holistic view connecting different CEO characteristics to different firm performance variables. No matter how important the CEO may be about the company's results, it would be naive to think that a single characteristic of the CEO could have a direct huge impact on a single variable of

results. Our aim in this paper is not to measure how much effect the CEO has over firm performance. Our goal is to show that a certain managerial profile would have an impact on several variables of firm performance.

As regard the dependent variables, in this work we use different measures of firm performance, which are the ones that the literature defines as the most susceptible to be modified by the CEOs' actions (see figure 1). Some variables are related to the subjective evaluation of the CEO, who is the respondent, such as sales expectations, success in outperforming competitors (Simsek, 2007). However, there are other objective measures that capture employment growth (increase in numbers of workers, Baum and Locke, 2004), innovative performance (Wu, et al., 2005), and market share. Through capturing and combining these subjective and objective measures, we are also getting a multidimensional approach to the overall idea of firm performance.

CEO characteristics and firm performance

Based on the UET, younger CEOs are less risk averse and more aggressive than older CEOs (Hambrick and Mason 1984). Researchers at MIT and UPenn did find that firms with younger CEOs pursue innovation more aggressively, as measured by the number of patents they file. Besides, younger CEOs tend to hire younger inventors, and the presence of younger inventors correlates strongly with innovative activity. Consequently, younger CEOs would present higher levels of innovation. In addition, Serfling (2014) further agrees that firms with younger CEOs would invest more and have bigger growth opportunities.

Education is also a good indicator of an individual's value (Hambrick, 2007). A high level of CEO education can be viewed as a measure of the initial human capital invested in the firm (Cooper et al., 1994), and it can significantly affect firms' strategic decision.

Papadakis (2006) found a positive association between formal education and product and process innovation. Almus and Nerlinger (1999) found that it had a positive impact on firms' growth while Bhagat, et al., (2010) come to opposite conclusions.

Since CEOs may favour a specific business strategy based on their prior career experience (Hambrick and Mason, 1984), their professional experience would also be important (Colombo and Grilli, 2005). Top executives with work experience in technology sectors recognized better technological alliance opportunities than those with other kinds of experience (Tyler and Steensma, 1998). The rationale behind this is that a high level of experience can enhance a firm's knowledge resources (Hambrick and Mason, 1984). Previous experience provide to the CEOs strong information processing capability that enables an individual to search for and analyse complex knowledge taking advantage of the external knowledge.

In addition, Colombo and Grilli (2005) discovered that prior entrepreneurial experience could highly influence firms' growth. Similarly, Siegel et al. (1993) found that long industry experience in an entrepreneurial team is an important factor distinguishing high- and low-growth ventures. CEO work experience could hence be an important managerial guideline for innovation in SMEs. Long years spent in industry may enable CEOs to deal with the intrinsic uncertainty of innovation through their accumulated experience in other firms.

As regards of the CEO tenure, the literature suggests both a positive and a negative relationship. On the one hand, long-tenured CEOs are expected to have a deeper understanding of the firm's resources and links to its environment. This should help the firm to achieve greater operating efficiency and therefore to grow faster. On the other hand, Miller (1991) explains that longer-tenured CEOs become complacent and tend to cling to outdated paradigms. As a result, they become less open to change and less

prepared to innovate and sustain the growth of their firms. The key could be in the type of tenure. If the CEO has more external tenure (years working in other similar companies as a manager), his/her mind could be more open to invest and growth. However, if the tenure comes from the same firm (years working as a manager in the same firm) the CEO could be accommodated to his/her work position becoming less risk averse and therefore less willing to growth.

Thus, according to all these arguments, we propose two hypotheses:

H1: Young, well-educated and external experiences CEO profile will enhance innovative performance and firm growth.

H2: Old and internal and external experiences CEO profile will enhance the exploitation of external knowledge.

3. Methods

3.1. Data collection

The data used in this research are a representative sample of small Spanish firms belonging to high and medium-high technology manufacturing and service industries. To get the sample, we use the SABI database, the most complete dataset of firms in Spain.

We searched for small firms, less than 50 employees, developing its primary activity in high or medium high technology sectors (manufacturing or service industries). For this purpose, we employed the classification of the (OECD) and the National Statistical Office (INE).¹ The population with those characteristics were 10,565 firms; we selected a sample of 10,200 firms. The selection sample process was made randomly taking into account

¹ See www.ine.es/daco/daco42/daco4217/1stsectcnae.xls for a list of high and medium high technology industry sectors.

representativeness of industrial sectors, legal form of the firm and size strata. With a confidence level of 95 percent sampling error was ± 2.34 percent. Firms were randomly selected within each industry segment using computer-assisted telephone interviewing (CATI) software. They were conducted in 2010 by a firm specialized in market studies. Finally, 10,200 of firms were contacted, of which 1,500 agreed to participate achieving a 14.70 percent response rate. It was the CEO who responds the questionnaire. Missing values and outliers² reduced the sample to 1,236 firms. In terms of size, industrial sector or legal form, there are no differences between firms that agreed to participate and those who refused.

3.2. Variables

CEO CHARACTERISTICS

To measure the background of the CEO we have seven variables that we describe below. Table 2 shows mean (average), standard deviation, and range of CEO characteristics.

General education: is the highest level of education that the CEO has achieved. Information is provided through an ordered variable that goes from 1 to 4. When the CEO has not completed studies or primary studies, the variable takes the value 1. It is equal to 2 when the CEO has a bachelor degree or vocational training. It is equal to 3 when the CEO has completed university studies and takes the value 4 if the CEO has completed postgraduate studies (masters or doctorate).

Business education: is measured by a dummy variable that takes the value 1 if he or she has any kind of formal education related to business administration and 0 otherwise.

² In order to avoid the influence of outliers on the results of the CCA, we have eliminated 13 observations following the criterion of leverage out of range, in the same way as it is done in the regression models.

CEO internal tenure: is a variable that measures the number of years as a CEO of the firm.

Entrepreneur experience: is a variable that captures the number of firms that he/she has participated in its foundation.

CEO external tenure: is a variable that measures the number of companies in which he/she has worked as manager for over a year.

CEO age: is a variable that measures the age of the CEO.

Industry experience: is a variable that measures the number of years of the CEO's labour experience in the industry sector in which he/she is working.

These seven variables collect varied information in terms of the main dimensions that make up CEO personal background.

PERFORMANCE VARIABLES

In the survey we have a set of indicators that are clearly related to the company's performance not only in terms of its competitive advantage (change in market share, to what extent the firm exceeds its competitors, changes in workforce), but also in terms of the orientation towards innovation (products or processes) and future projection (ability to apply new knowledge and sales expectations). All the performance variables except *expectations* and *new knowledge applicability* are capturing the effect in the last three years. We describe below the variables (see Table 2).

Process innovation: is a discrete variable measured on a seven-point Likert scale that captures the strength of innovation in new processes applied to existing products. The variable goes from "1 = no changes at all" to "7= very important changes".

Product innovation: is a discrete variable measured on a seven-point Likert scale that captures the strength of innovation in new products or services. The variable goes from “1 = no new products or services” to “7= many new lines of products and services”.

Success: is a variable on a scale of 1 to 5 that measures to what extent the company has outperformed its competitors (none, some, several, almost all, and all).

Market share: is a variable on a scale of 1 to 5 that measures the evolution of market share (from it has worsened a lot to has improved a lot).

Employment growth: In the survey, there is information on the number of full-time workers currently and three years ago. The variable used measures that difference, relativized by the situation of the workforce three years ago. It is expressed in percentages.

Expectations: is a variable that measures the CEO expected sales for the next year. The answer is given in percentages (with positive or negative sign according to the expectation of sales).

New knowledge applicability: is a variable that measures the capacity of the company to apply new external knowledge to internal work; it is defined on a scale of 1–5.

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3.3 Joint Analysis

Business research is often concerned with analysing relationships between two sets of variables. One suitable method for this type of analysis is Canonical Correlation (CCA). CCA is especially indicated when one wants to test the hypothesis that one set of

independent variables (predictors) are related to another set of dependent variables (performance).

CCA addresses two main goals: Identification of dimensions among the dependent and independent variable sets and, maximisation of the relationship between the dimensions.

Following Hair et al. (1998), we can consider CCA as a generalisation of other multivariate methods: Regression Analysis, Factor Analysis.

Like Factor Analysis (FA), CCA can create an optimised structure for a set of variables. But as FA seeks to identify new variables that maximise the amount of variance, CCA identifies new variables in both sets (named canonical variables) with the requirement of maximising the coefficient of correlation between them.

Denoting by R_{xx} the correlation matrix of predictors, R_{yy} the correlation matrix for dependent variables and R_{xy} , the correlation matrix between both sets, we need to calculate the eigenvalues of $R = R_{yy}^{-1} R_{xy}^{-1} R_{xx}^{-1} R_{xy}$ to get the maximum correlation between canonical variables.

Once the canonical pairs are obtained, hypothesis test based on Wilks Lambda or its F approximation are carried out to verify the significance of the correlation between canonical variables. It is a sequential procedure, starting from the highest correlation. At the moment that a relationship is not significant, the others are not checked because their correlation coefficient is smaller.

In order to interpret the new canonical variables, we look at their loadings in the way in which the original variables correlate with the newly constructed dimensions. In addition, it is interesting to know what part of the original information we maintain when we decide to retain the significant canonical couples.

4. Results

To carry out the analysis we consider the following issues:

- Adequacy of data.
- Statistical significance of the correlation between canonical variables.
- Practical significance and interpretation of canonical variables.
- Robustness check: stability of the solution.

Regarding the adequacy of the data, firstly, there is a significant relationship between predictor variables and dependent variables (Rxy) that can be seen in Table 3. Secondly, we have carried out Bartlett's sphericity test within the set of variables of the same type (Rxx and Ryy) and an adequate structure of correlations is observed. In other words, there is a latent structure of interrelated variables both in the set of CEO characteristics and in performance variables³.

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Regarding the statistical significance of the correlation between canonical variables, the number of canonical pairs of variables that can be defined is seven. Only three of them show a significant correlation.

³ In both sets of variables, the hypothesis that the correlation matrix is identity is rejected. The KMO statistic provides desirable values. For CEO characteristic variables: X^2 statistic = 2,398 p <0.000 (Reject Ho) KMO = 0.705. For the performance variables: X^2 statistic = 474 p <0.000 (Reject Ho) KMO = 0.613.

The correlation between canonical variables is moderate but statistically significant, with coefficients of 0.33; 0.16, and 0.13 for the first three pairs.

Although the main goal of CCA is not to capture the maximum variability of the original information, the three canonical variables constructed from CEO characteristics jointly collect around 60 percent of the variance and the three canonical variables identified from the performance measures jointly capture 56 percent of the variance.

Practical significance and interpretation of canonical variables.

The three pairs of canonical variables present the following structure of correlations (see table 4).

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The first canonical variable that emerges from the CEO background variables captures information on educational background and external experience versus tenure and experience in industry. That is, the highest values in this canonical variable correspond to the CEOs with more training and less experience and tenure in the industrial sector or in the company itself. Besides, the variable relative to the CEO external tenure (experience as manager in other companies) points positively. Age or having been the founder of new companies have no statistical relevance in this first canonical variable. This linear combination of variables is positively and significantly related to the first canonical variable obtained from the set of performance variables. This canonical factor captures information on the variables of improvement in employment, market share, and good expectations as well as proactive attitudes towards process and product innovation.

The second relationship associates a canonical variable that includes age, experience in the industrial sector, business education, and managerial knowledge in other companies with the applicability of new knowledge and process innovation (see figure 2).

Regarding the third relationship, CEO profile with internal experience (years working as a CEO in the same firm) is more important than the CEO external experience. This profile is associated with a worse evolution in employment, although good results in innovation (see figure 2)

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In a first approximation to these results we can observe that there are variables related to education, especially business education, which are positively associated with most performance variables. Besides, variables such as age, CEO internal tenure, and industry experience appear to be more frequent in all the profiles. On the contrary, variables such as “entrepreneur experience” and "success" do not appear with any significant presence in any of the canonical variables analysed.

Thus, after having carried out the CCA we can support our two hypothesis: first and second relationship correspond with the first and second hypothesis respectively. We have also found a third relationship, but the solution is less robust.

Stability of the solution

In order to validate the significance of the CCA, we carry out a study of robustness of the results. For this purpose, we carry out 6 additional CCAs analysis for random subsamples with different sample sizes⁴.

The first relationship remains stable in all simulations performed. As for the second canonical relationship, the results are stable in five of six of the analyses performed. Finally, the third canonical pair is stable in two of the simulations and turns out to be a less robust result. However, in all the subsamples, a larger internal tenure with little

⁴ The results of the stability analysis are available upon request.

external tenure is associated with a stagnation of employment and a lower applicability of knowledge.

5. Conclusions, discussion, limitations and future research

Conclusions

The main contribution of this article stems from the utilization of the UET in taking into account different kind of CEO characteristics that configure a managerial profile that has an impact on the results of the company.

Our results suggest that there are three significant relationship from which we can extract some interesting conclusions.

From the first functional relationship between the two sets of variables, we can conclude that there is a notable association between a particular CEO profile that can be associated with better results of the firm in specific areas. It is expected as a result, that better training and external experience will produce better results. However, it should be noted that the canonical variable also includes the fact of having little experience in the sector and little seniority as a manager in the company. Thus, we have identified the profile of a successful CEO, well-trained and with external managerial knowledge, who however, does not have much seniority in the company or the industrial sector (figure 2).

Having a good general and business education makes the CEO very good at taking efficient decisions, with more vision and influence. CEOs with a high educational background are more self-confident and more proactive in taking risky decisions that could improve the innovative performance of the firm. In addition, having more external tenure in other companies makes it easier to identify opportunities and to deal with higher levels of uncertainty. On the other hand, long experience in the same industrial sector and

in the same firm, can lead to a certain routine, a trend to accommodate to the reality, and be risk averse, without many aspirations for growth.

For the second relationship, we can conclude that external knowledge (industry experience, CEO external tenure) generates a deeper understanding of the environment and a greater applicability of new knowledge. This second relationship is associated with more specific results. The applicability of new knowledge is only possible if CEO knows the industrial sector in deep (industry experience and age), there is specific training in business, and some managerial experience in other companies (external CEO tenure). Besides, CEOs with these characteristics are associated with a bigger trend to innovate in process but not necessarily in products.

Finally, for the third relationship, we can conclude that a high internal experience linked to limited external experience in the company causes a stagnation in terms of employment, in the growth of the company. This relationship shows how an excessive seniority in the same company is not always a desirable attribute for a manager. This result should be observed with more caution due to less robustness.

Overall, we observe that the role of education combined with external tenure is essential in order to achieve better firm performance. By itself, experience does not guarantee good results. Finally, it is important to distinguish between different types of experience.

Discussion

Our results are consistent with the previous studies. In the first place, our study has responded to the call from Wang et al., (2016) trying to combine different characteristics of the CEO that can influence the results in a joint way. In addition, we have given response to the concern from Liu et al., (2018) that suggest that: “Although a great deal of research has examined elements of the relationship between CEO characteristics and

firm performance, few attempts have been made to integrate them to create a more holistic picture” (Liu et al., 2018, p. 789). In this sense, we have developed a global view for connecting CEO characteristics to firm performance.

Our results are hardly comparable with those of other authors due to the methodological approach followed. However, in general, our results can be considered closer to the conclusions of the other studies:

In the debate between Fitza (2014, 2017) and Quigley and Graffin (2016), where the former considers that the CEO has little relevance to performance while the latter assign a significant effect, our work clearly aligns with the second one: depending on the characteristics of the CEO, different performance is obtained.

Regarding the CEO education there are also mixed results. According to Ng and Feldman (2009) education has a clear influence on performance, while Bhagat, et al (2010) come to opposite conclusions. In our work, we find that the variable “Business education” always appears with a positive sign with significant coefficients and associated with good performance results. It must be highlighted, however, that this variable appears together with other characteristics as part of the canonical variables. In particular, a business education profile linked to external experience is associated with improvements in employment growth, market share and sales expectations as well as a more proactive attitude towards innovation.

In relation to the CEO's experience and tenure, from a theoretical perspective, greater experience has been associated with improved performance (Hambrick, 2007). From the empirical point of view, most of the papers that analyse the importance of the CEO experience refer to large companies. A similar context to our work, is the one reflected in the work of Liu et al., (2018) that analyses, for small and medium-sized companies, the association between CEO tenure and a set of objective and subjective performance

measures. These authors find a positive association between CEO tenure and firm performance. Our work differs from others in that we consider three possible variables of experience: CEO internal tenure, CEO External tenure and Industry Experience. According to our results, we cannot affirm, in general terms, that these three variables are associated with better performance. As already mentioned, the CEO External Experience together with a good educational level is associated with strong growth in employment and good results in all indicators. On the contrary, the experience accumulated in the same industry and linked to a single company is associated with a negative employment growth. Miller (1991) also warned of the stagnation that could occur in the company when the CEO has been in the same company for a long time. In summary, our methodology and results differ from those other authors in the distinction we establish between External or Internal tenure and industry experience, while other authors simply refer to “experience” or “tenure”.

Regarding the entrepreneurial attitude of the CEO, it has been associated in the literature with a greater tendency towards innovation (Ardagan and Lusardi, 2010) while in our work it does not appear as a CEO characteristic that is significantly associated with the main result. Its presence in the three main canonical variables is irrelevant.

Finally, regarding the performance variables, we differenced ourselves from other scholars who used financial variables in order to measure firm performance such as revenue growth (Baum and Locke, 2004) or return on assets (Chung and Luo, 2013). This study accounts for alternative nonfinancial measures of firm performance, such as employment growth or applicability of new knowledge, highly relevant in the context of small technology companies in which our work is framed. Like other researchers we use self-report perceptual measures of firm performance (Simsek, 2007) incorporating, in

addition, the idea of performance profile through the combinations of these self-report variables.

As regards to the specific context (firms with less than 50 employees operating in medium high and high-tech industrial or service sectors) we found two relevant aspects to consider. Regarding the managerial profiles that we have described as more valuable, it should be noted that large companies carry out their CEO selection processes following exhaustive procedures, often outsourced. In small companies, on the contrary, the CEO is sometimes the owner, the founder or has been chosen in a very restricted process. Our results emphasize the fact that, although the company is small, a well-trained CEO with external experience can bring great value to the company. The selection of a CEO in a small firm, as in any other, must be done with rigor, professional criteria and away from endogamy.

Regarding the performance variables associated with these managerial profiles, our results include innovation, employment growth and knowledge applicability. In high-tech sectors, innovation and knowledge applicability are at the core of their competitive advantage. Although the company is very small, you have to look for a CEO oriented to those results.

Our findings suggest that the CEO background is important, so, political choices should be made. We should promote training programs capable of supporting efforts related to the education and experience of the CEOs, keeping in mind that the individuals who hold the power to induce changes in their organizational environment are the CEOs.

Practical implications

Our research also has some practical implications.

In the first place, from the point of view of the CEO profiles, our results can help in the recruitment process of small companies that compete in high technology sectors. The profile of the CEO, their characteristics and skills are very relevant to decide the strategies to develop in order to have an impact on the success or failure of the organization.

Based on our results, we can affirm that there are no good or bad characteristics of CEOs, but that there are profiles or groups of characteristics that affect possible results. In the selection processes, we should be able to detect those managerial profiles that emerge in our analysis. In general, all the characteristics studied for CEOs are desirable (education, knowledge of the sector, internal and external experience, etc.). However, our study shows that some of them, if another does not accompany them, can be harmful. For example, in the case of the internal experience variable, by itself, it seems an appropriate characteristic for a manager. A deep knowledge of the organization seems to be a minimum requirement for its survival. However, from our analysis we deduce that a manager who only brings internal experience in the company (necessarily accompanied by age and knowledge of the sector) will lead his company to a certain stagnation. In the same way, a manager with a good educational level is always desirable, but if certain experience in other companies is incorporated, the CEO develops skills that are more easily aligned with growth and innovation objectives.

From the point of view of performance, practical implications are also deduced. Companies can have different objectives depending on their life cycle, the type of market in which they operate or intensity of competition. Thus, depending on these objectives, a CEO profile will be more or less appropriate. In high and medium technology environments, there are many small companies that face constant innovations and find difficulties to apply new knowledge. For many of these small companies, their main objective, even temporarily, is to survive and adapt to a changing technological

environment. These are companies that do not aspire, at least in a short term, to increase their workforce or to improve their market share. For these companies, a manager with a lot of experience in the industrial sector may be suitable, but who has developed his work in different companies and not only in a single one. This CEO profile is different from that required by well-established organizations that seek to expand their markets and grow in size and sales.

From the empirical point of view, we also have some findings that may be useful in the selection process of Human Resources. In our sample is easy to find managers of a certain age with a lot of experience accumulated in the same company and with a high knowledge of the industrial sector; however, these managers have less educational level than the average. On the contrary, in our sample, it is difficult to find managers who have had some entrepreneurial experience, but all of them also have external experience and educational level well above the average.

Taking into account all of this, this paper may offer some power to predict firm performance. This could led to a benefit for the strategist who is trying to predict a competitor's moves and countermoves. Predicting this move, the competitor could prepare an adequate countermove. This prediction capacity can become a competitive advantage of the company.

Finally, although it is true that, generally speaking, there are no good CEO characteristics per se, we have detected from all the analyses, robustness studies and reliability simulations of the canonical variables that: any managerial profile that is added formal education and external experience improves any type of result.

Limitations and future research

Our work has some limitations that need to be pointed out. Firstly, our sample consists entirely of small Spanish firms in environmental context of economic and financial deep crisis. Any generalization to another geographical economic or financial context must be done with extreme caution.

Secondly, the global economic crisis context may have modified the competitive environment of firms, as well as influencing the impact of manager decisions on firm performance. It is difficult to know if these managers in a different competitive environment would have made the same decisions and what would have been their effect on the firm performance.

Thirdly, this paper does not explain the way of how CEO's profile is connected to firm performance. We assume that some CEO characteristics would push them to take certain actions and decisions or even transfer these actions to the TMT (Liu et al., 2018) that will have an impact on firm performance but we do not measure these choices or actions.

Fourthly, the CCA technique in many cases there is great difficulty in interpreting results, as unusual combinations of variables are constructed.

A possible extension of this work would be to study the mediating role of the strategic decisions of the CEO. In addition to studying the mediating role, it can also be analyzed other variables of the CEOs associated with their personality, leadership style, self-confidence. All these characteristics have been recognized by academics of the industrial psychology as very relevant in the decision making process. Adding these personal characteristics will provide us a much more complete CEO profile.

In conclusion, we have shown that intangible assets matters in order to potentiate firm performance. We show how different combinations of CEO characteristics have an impact on different measures of firm performance.

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Table 1: Previous research on CEO attributes and firm performance.

Authors	CEO attributes	Dependent variable	Sample	Findings
Thomas (1988)	Presence/absence of the CEO in the model	Profits, sales, and profit margin	12 British retail companies,	CEOs are responsible for 3.9% to 7.0% of firm performance
Mackey (2008)	Presence/absence of the CEO in the model	ROA	92 CEOs at 51 companies.	CEOs account for 29.2% of variance in company profitability.
Kaplan et al.,(2012)	Personal and managerial attributes	Successful CEO	316 CEO candidates at 224 firms.	Managerial attributes might be predictive of performance.
Hambrick and Quigley (2014)	Managerial discretion	ROA	830 CEOs at 315 companies	CEOs account for 35.5% of firm outcomes.
Fitza (2014)	Presence/absence of the CEO in the model	ROA	19,746 observations.	CEO influences less than 5%.
Falato et al.,(2015)	CEO experience	ROA	2,195 CEOs at S&P 1500 companies.	Experienced CEOs perform better.
Cai et al., (2015)	CEO experience	ROA and Tobin's Q	2,335 CEOs at S&P 1500 companies	Managerial training is associated with better performance.
Benmelech and Frydman (2015)	CEO with a military background	fraudulent activity	4,013 CEOs, 2,402 companies,	CEO background might be predictive of outcomes.
Gow et al.,(2016)	CEO personality	ROA and cash flow	4,591 CEOs.	CEO personality might influence outcomes.
Wang et al.,(2016)	Review of the research literature on CEO attributes and firm performance.		Review	CEO age, tenure, formal education, and prior career experience are positively related to performance.
Quigley and Graffin (2017).	Presence/absence of the CEO in the model	ROA	19,746 observations.	CEO influences 20%.
Liu et al., (2018)	CEO emotion and cognition, with TMT and organizational processes.	Financial and non-financial measures.	Review	Link CEO attributes with firm Performance.

TABLE 2. Descriptive Statistics of CEO's characteristics and firm performance variables

	Mean	SD	Range
X1 General Education	2.84	0.76	1-4
X2 Business Education	0.56	0.49	0-1
X3 CEO Internal Tenure	12.1	8.5	1-48
X4 Entrepreneur Experience	0.34	0.7	0-6
X5 CEO External Tenure	1.28	1.5	0-10
X6 Age	45.3	10,2	21-76
X7 Industry Experience	19.2	11.4	0-57
Y1. Process Innovation	3.83	2.13	1-7
Y2. Product Innovation	3.40	1.91	1-7
Y3. Success	2.58	0.91	1-5
Y4. Market share	3.03	0.89	1-5
Y5 Employment Growth(%)	0.00	46	-90, 300
Y6. Expectations(%)	6.12	18	-100, 150
Y7. Applicability	3.88	0.78	1-5

TABLE 3: Linear Correlation's Coefficients between dependent and independent variables

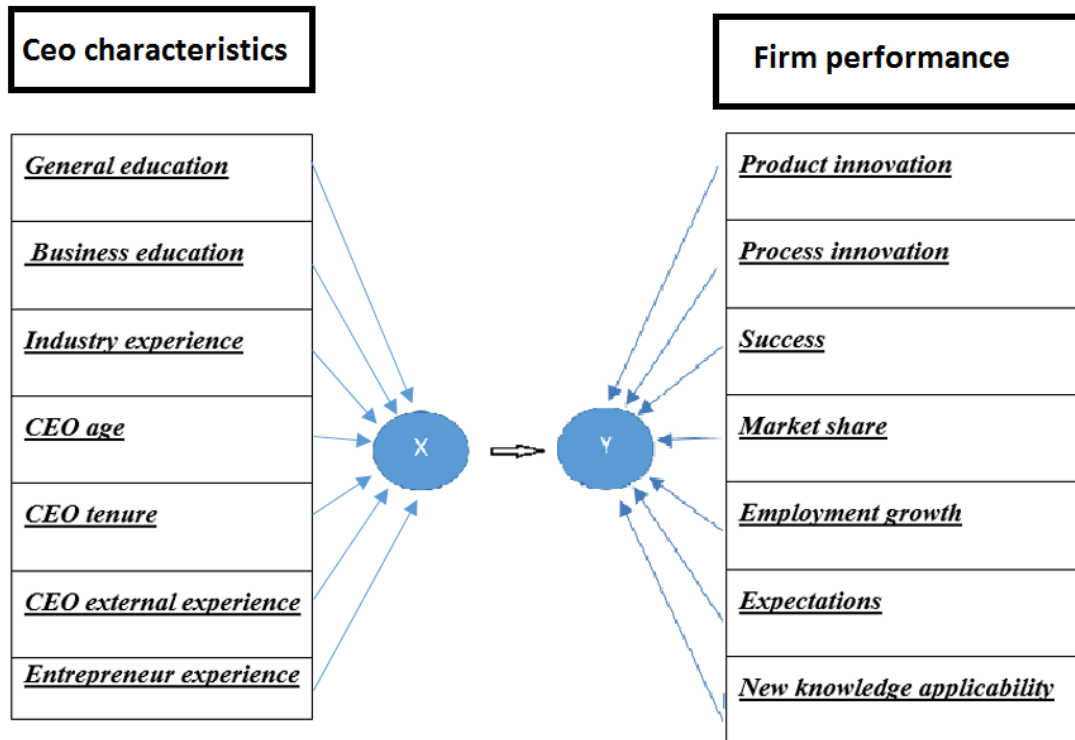
	Process Inno.	Product Inno.	Success	Market Share	Employ. Growth	Expect.	Applica.
General Education	0.151**	0.161**	0.083**	0.164**	0.152**	0.108**	-0.071**
Business Education	0.179**	0.131**	0.054	0.067**	0.061**	0.097**	0.031
CEO Int. Tenure	-0.070**	-0.074**	-0.038	- 0.122**	-0.184**	-0.120**	0.000
Entrepreneur Experience	0.079**	0.075**	0.049	0.036	0.031	0.058**	0.016
CEO Ext. Tenure	0.112**	0.065**	0.081**	0.100**	0.131**	0.086**	0.059
Age	-0.014	-0.011	0.013	-0.060**	-0.114**	-0.045	0.069**
Industry Experience	-0.064**	-0.065**	- 0.026	-0.113**	-0.156**	-0.140**	0.089**

** Significant at $p < .05$

Table 4: Statistical significance of canonical pairs and Correlations between original variables and canonical variables

	1	2	3
X1 = General education	0.77	-0.27	0.27
X2 = Business education	0.51	0.55	0.39
X3 = CEO internal tenure	-0.59	0.17	0.65
X4 = Entrepreneur Experience	0.27	0.25	0.19
X5 = CEO External tenure	0.5	0.43	-0.41
X6 = Age	-0.29	0.51	0.32
X7 = Industry Experience	-0.61	0.55	0.22
	1	2	3
Y1 = Process Innovation	0.6	0.5	0.47
Y2 = Product Innovation	0.54	0.19	0.44
Y3 = success	0.31	0.21	0.05
Y4 = Market share	0.56	-0.14	-0.14
Y5 = Employment growth	0.63	-0.17	-0.65
Y6 = Expectations	0.56	0.02	-0.05
Y7 = Applicability	-0.09	0.82	-0.43
Statistical significance of canonical pairs			
Wilks's lambda (p value)	0.110 (0.000)	0.027 (0.000)	0.018 (0.021)
Canonical correlation	0.332	0.163	0.134
F (p value)	4.5 (0.000)	2.08 (0.000)	1.66 (0.021)

Figure 1: Theoretical Framework



Being X and Y linear combinations of the original variables. The CCA analysis will provide linear combinations of predictor variables (CEO characteristics) that correlate significantly with linear combinations of dependent variables (performance variables).

Figure 2: Simplified representation of the main variables in first and second pair of canonical variables.

