PSL Quarterly Review, vol. 70 n. 282 (september 2017), 311-353

How much is CEO education worth to a firm? Evidence from European firms

OTTORINO MORRESI*

Universities are becoming relational services in which demand and supply cooperate to design a satisfying output, which is mostly measured by the student's career after graduation (Petruzzellis et al., 2006). Students choose a university in response to a large number of inputs such as the physical distance between the university's location and the student's home, the quality of university services and teachers, the choice made by friends, the influence of parents, and so on. Some of these factors are emotional and personal and, as such, hard to measure, but many others, such as the quality of the university, are to a certain extent more objective and measurable. Both emotional and objective factors should affect the value students expect to have attributed to their achievements during their working life, which may be measured to a large extent in terms of standard of living. Education may therefore be seen as a first class ticket for a life that is likely to affect the student's professional career.

Among the variables affecting the decision of the candidate, we focus on the quality of the university. According to Dill and Soo (2005) and Merisotis (2002), there has been a huge increase in the demand for consumer information on academic quality as a result of increased access to and globalization of higher education. The *Education at a Glance 2016* report (OECD, 2016) shows that on average across Organization for Economic Co-operation and Development (OECD) countries, people who have completed tertiary education account for 35% of 25-64-year-olds and 42% of 25-34-year-olds. In 1998 the last percentage was set to below 20% for most OECD countries (OECD,

* Roma Tre University, email: ottorino.morresi@uniroma3.it. I wish to thank Caterina Mariscoli for help in data collection and analysis.

2000). This means that millions more young men and women have to make informed choices regarding the selection of a university and require suitable instruments to help them.

Our choice to concentrate on the quality of the university is therefore strongly linked both to the increasing importance that students, institutions and firms give to the quality of the school and to the significant growth of the industry engaged in analyzing and measuring the quality of education. This growth is due, on the one hand, to the fact that candidates need to have a quick and reliable evaluation tool aimed at reducing information asymmetries between applicants and universities. As the number of universities and courses has increased dramatically, the information required to make a good choice has become more complex to analyze. At the same time, employers pay increasing attention to a university's quality and need an easy-to-use instrument that can give them an overall view of schools and their ranking.

If university rankings provide a good measure of the quality of each school, and assuming that better schools use recruitment mechanisms that are able to select more talented students and provide them with better skills, then top managers (e.g. CEOs) who have graduated from highly ranked universities should be better trained and skilled and therefore more successful in managing their firms. This should result in better firm performance in the years following their appointment.

There are few empirical investigations on the link between CEO education and firm performance and they are almost all focused on the US education system, as it provides rich, homogeneous, and reliable data. Europe has been overlooked and only recently has an effort been made by public and private institutions to construct standardized and cross-country measures of the level and quality of education that can help researchers conduct systematic and comprehensive analyses. Our main contribution is therefore to offer an analysis of whether CEOs who are selected from better-ranked universities and/or have a particular educational background have improved managerial skills

that translate into a higher performance in the context of European firms.

In detail, we examine 612 CEOs that have led a sample of listed firms headquartered in the UK, France, Germany, Italy, Spain, and the Netherlands with market capitalization of more than one billion euros from 2006 to 2015. For each CEO we collected information on his/her education, professional experience, personal characteristics (e.g. age, founder yes/no, country of birth, etc.), firm characteristics (e.g. debt ratio, firm size, industry, etc.) and compared it with the accounting- and market-based performance of the firms they managed in the three and five years after their appointment. We only focus on CEOs rather than the whole top management team because we believe that his/her power in the firm is far higher than that of other managers and that it significantly influences the firm's course and the conduct of all the other employees.

We find weak evidence of better performance by firms managed by CEOs who have graduated from better-ranked schools. The results appear to be sensitive both to the performance measure and the type of university ranking chosen: although market-based performance produces results that are often statistically significant and consistent with our assumptions, accounting-based measures are almost never statistically significant. Moreover, despite the fact that all rankings provide similar outcomes, Quacquarelli Symonds (QS) World University Rankings and *Times Higher Education* (THE) World University Rankings give rise to more consistent evidence than Webometrics – Ranking Web of Universities. We also find that firms led by their founders, by younger CEOs at the time of their appointment, and by people with an MBA (Master in Business Administration) degree perform better than others.

1. Literature review

Theoretical foundations of the influence of CEO education on firm performance may be found in three main lines of research. First, there

is the *upper echelons theory* proposed by Hambrick and Mason (1984). They argue that if we want to understand why firms go in a certain direction, perform in a certain way, and implement a certain strategy, we have to know the personal characteristics of their leaders, since they act in response to their values, experiences, and personalities and affect the way top managers face and interpret strategic situations. For example, according to this approach, a CEO who has graduated in medicine or chemistry or has had several years of experience in the pharmaceutical industry is more likely to invest in R&D (research & development) than a CEO who has graduated in philosophy. This means that a firm may invest a great deal in R&D when a CEO with certain personal characteristics such as his/her education or professional experience is leading it. As a consequence of a given strategic choice (e.g. greater investment in R&D), we can infer a likely outcome in terms of firm performance (e.g. stock market returns, profitability change, etc.). There is wide evidence that goes in this direction and documents the effect of CEO characteristics (e.g. teamwork attitude, overconfidence, personal integrity, efficiency, experience, and so on) on firm performance (e.g. Bertrand and Schoar, 2003; Kaplan et al., 2012; Crossland et al., 2014).

The second approach is based on the *resource-based view* (Penrose, 1959; Barney, 1991) according to which intangible assets, such as human capital, may be a source of competitive advantage and superior firm performance.

However, to be an effective source of competitive advantage, human capital should possess a set of qualities represented by the so-called VRIN model. According to this, a resource must be *valuable*, in the sense that it should allow firms to implement positive NPV (net present value) strategies; *rare*, a resource may have a value if and only if is scarce and, as such, allows the firm to gain above-average returns; *inimitable*, in order to make the competitive advantage sustainable, the resource should not be replicable by competitors; and *non-substitutable*, the resource should not have a substitute in the sense that competitors should not be able to carry out a competing value-

creating strategy that reduces prices to the point of erasing any economic rent.

According to Barney and Arikan (2001), given that the impact that top managers can have on a firm's strategy is outstanding, it follows that firms that have high-quality top managers are likely to outperform firms that have low-quality ones. The choice of high-quality managers is strategically important and should be based on sound criteria such as the quality of the university they attended. Graduating from a better university may be a proxy for greater human capital for the firm, since it means both complying with the more stringent admission criteria highly ranked schools use to recruit the best candidates and the excellent concepts and competences students should be learning there. If so, graduates from better universities are likely to represent a VRIN resource and provide the firm with competitive advantage that should result in significantly better performance. The evidence that finds a significant impact of resources on firm performance is extensive and analyzes a large number of intangible assets such as company reputation, employee know-how, product reputation, innovativeness, culture, etc. (Barney and Arikan, 2001, provide an excellent review of the empirical tests on this theory). It should be mentioned that investigations on the managers' educational background as an intangible asset have almost never been done.

The third line of research can be found in the *job market signaling model* (Spence, 1973). The model assumes the presence of asymmetric information between employers and employees: the former have less information on the level of competences of the latter, who therefore need to signal the quality of their abilities if they want to increase their salary to a level above that of poorer workers. In turn, a number of poorer workers are not interested in doing this since they may take advantage of the hard work of better employees and camouflage themselves among good workers.

Hiring a worker may be seen as an investment decision under uncertainty. The higher the information asymmetry is, ceteris paribus, the lower the wage the employer will be willing to pay since it is equal

to the expected marginal product. Better employees may signal their quality by means of education. Investing in education is costly, but a good employee benefits from this investment in terms of higher wages an employer will pay as a result of the higher productivity signaled (Weiss, 1995). However, for the signal to be effective, the cost structure between the good and the mediocre worker must be different. This happens when the cost to send the signal and productivity are inversely correlated. In other words, the cost of an additional unit of education should be lower for a good worker than a bad one.

Under the assumptions of asymmetric information and a different cost structure of the signal between good and bad workers, higher education is a correct signal of higher labor productivity and a worker's better skills.

Spence's signaling theory has been subject to empirical tests at the employee level. Bishop (1994) finds that additional years of schooling generally do not have statistically significant effects on a worker's initial productivity. Schooling is, however, positively related to productivity after a year. This suggests that schooling helps the individual learn the job. Schooling also helps workers have higher starting and prospective wage rates.

Empirical evidence on the effects of CEOs' education on firm performance is less straightforward than the theory and the evidence shown above. It shows a mix of results that do not provide clear support for any theory. One of the first works that tested whether a better education of managers could result in higher performance was that of Chevalier and Ellison (1999). Their study focuses on the performance of mutual funds and examines whether it can be explained by the managers' educational background. They found that managers who attended higher-SAT (Scholastic Aptitude Test) undergraduate institutions have systematically higher risk-adjusted excess returns.

Moving on to firm performance and CEOs' education, Jalbert et al. (2002) investigate a sample of large US firms collected from the *Forbes 800 Compensation List* from 1987 to 1996. University quality is

measured by observing the effectiveness of the school in placing its graduates in the top management positions of large firms. Results show that CEOs who graduated from more prestigious universities lead to a higher return on assets (ROA). This evidence is limited to a subsample of graduate degrees, and there is no evidence for undergraduate students. Vice versa, graduating in reputable schools seems to result in a poorer Tobin's *Q*. In a subsequent study, Jalbert et al. (2010) repeat a similar analysis over the period from 1997 to 2006 and confirm the mixed evidence.

Gottesman and Morey (2006 and 2010) take into account NYSE firms and average SAT, LSAT (Law School Admission Test), and GMAT (Graduate Management Admission Test) scores of schools where CEOs graduated to measure university reputation. They too find no link between CEOs' education and accounting- and market-based performance measures.

Bhagat et al. (2010) analyze some additional education characteristics apart from university reputation, such as the attainment of an MBA and a law degree. They examine the largest 1500 US firms from 1992 to 2007 and use the *US News and World Report* 2008 ranking of national universities to assess university reputation. Most outcomes are not statistically significant for any performance measure. They only find two weakly significant results: firms led by CEOs with a law degree or an MBA degree from the top 20 business schools have, respectively, greater stock returns and a higher ROA and Tobin's *Q*. Lindorff and Prior Jonson (2013) do not find that an MBA degree is a performance-improving qualification in Australia, thereby backing the sharp criticism raised regarding the success and quality of Australian business education.

Although attending more prestigious universities is by no means a guarantee of success, the authors find that firms tend to hire CEOs with an educational background that is similar to that of previous executives. This means that the choice of the new top management team seems to be based on education characteristics, and to avoid significant disruptions between new and old CEOs in the level and quality of education. Elsaid (2014) provides further support for the

fact that a CEO succession that involves a significant change in educational characteristics is likely to result in a decline in firm performance.

Darmadi (2011), Ofe (2012) and Monastyrenko (2014) enrich the analysis of the link between the quality of education and firm performance by giving relevance to the field of study. Ofe (2012) and Monastyrenko (2014) find that graduates in engineering seem to be not significantly different from other graduates and the worst performers. On the contrary, graduates in law seem to be the best performers. Monastyrenko (2014) also finds that an MBA degree is related to improved performance, but the standing of the university is once again irrelevant. Darmadi (2011) unexpectedly shows a negative link between a degree in a financial field and Tobin's *Q*.

Zhao and Liao (2015) for China and Amran et al. (2014) for Malaysia fail to find a statistically significant link between the level of CEOs' education and firm performance.

However, a few studies find that graduating from better schools does have a positive effect on firm performance. Miller et al. (2015) collect 444 CEOs celebrated on the covers of three important US business magazines over the 1970-2008 period and find that graduating from an Ivy League School results in a higher Tobin's *Q*. The gap increases for undergraduate degrees.

Rakhmayil and Yuce (2008; 2013) not only include university reputation, measured by the *Financial Times 2009 World Ranking* of business schools, but also the attainment of an MBA degree. Their results are that 1) the higher the proportion of top managers in the management team with an MBA degree, the higher the Tobin's Q will be; 2) a higher number of graduates in the top management team from the top 20 schools is associated with improved performance.

The variety of results is also due to significant differences in the way the analysis is performed. In fact, although the samples are almost always composed of US firms, significant differences emerge with respect to how performance is measured and how universities are classified. In terms of performance variables, some studies adopt accounting returns while others use market-based indicators. Within

these two categories indicators tend to be quite comparable from one study to another, with the prevalence of ROA among accounting returns and Tobin's Q and market-to-book ratio among market-based variables. More issues emerge in terms of university rankings. Each study uses its own classification (e.g. *US News and World Report*, Ivy League Schools, average SAT, LSAT, and GMAT scores, and so on) that can result in significantly different standings that, in turn, make the comparison between the studies' results very difficult.

Another issue affecting the degree of comparability of reviewed studies is related to the effect of control variables; how these variables are included in regression models is, to a certain extent, arbitrary. Almost all works include controls for macroeconomic, industry and size effects but there could be a problem of omitted variables, potentially linked to firm performance. For example, CEO ownership and compensation are likely to be related to firm performance but are often omitted.

Finally, a prevalent econometric approach is OLS regressions (with some fixed effects) despite its weaknesses, which become evident when the link between CEOs' education and performance is affected by reverse causality (i.e. one cannot exclude that firm performance could attract CEOs with certain educational characteristics as well as firms with specific characteristics tend to hire managers with a specific educational background).

Our work contributes to the cited literature by examining, in the newly-explored and cross-country context of European firms, the potential influence on firm performance of additional international rankings of higher education that allow us to consistently compare universities worldwide.

2. Measuring university quality

Classifying universities according to their quality is a very hard task that implies considering a large number of factors. Before explaining the main characteristics of the rankings chosen in this

study, we would like to take a critical approach to these classifications. First of all, many rankings rely on questionnaires, interviews, and survey data to collect the opinions of professors, employers, and other experts, which are subject to individual assessment, therefore potentially creating biases and distortions. Second, quantitative measures may also be misleading since they do not necessarily represent what is thought. Third, given that each institution is generally involved in teaching, research, and other ancillary activities (e.g. accommodation services, internationalization, scholarships, etc.), the importance given to each factor may influence the ranking significantly. Fourth, unlike national rankings, international classifications also face the problem of comparing different university systems, each with their own peculiarities. Last but not least, most information needed to prepare the ranking is taken from the universities themselves, which may be incentivized to alter the data to rise in the standings. On this matter, several universities were found to falsify information used to construct the ranking in order to get to a better position, which means growth in applications and tuitions (Markus, 2013). Luca and Smith (2013) find that a one-rank improvement in the *US News and World Report*'s ranking leads to a 1-percentage-point increase in the number of applications to that college. Although we do not want to enter into a critical discussion on the reliability of university rankings (see for example Saisana et al., 2011; Dehon et al., 2009; Buela-Casal et al., 2007), it is important to bear in mind that these evaluation systems have limitations related to the framework they are based on.

Having said that, university rankings have become very popular tools for prospective students when choosing their school, for universities themselves, as a marketing lever to attract candidates in a global competitive environment, and finally for firms and institutions to get a first-hand view of an applicant's skills. The first university ranking dates back to 1983 when the US magazine *US News and World Report* started the annual publication of *America's Best Colleges*. Many other countries and institutions followed with their own classifications (Kehm and Stensaker, 2009). Before comparing

national rankings, however, we need to ask ourselves who prepares the ranking (private institutions, government-related institutions, professional entities, etc.), what the main audience is (students, universities, firms, etc.), what the purpose of the ranking is (marketing, helping students, etc.), and which indicators and methodologies are used.

Domestic rankings were followed by cross-country rankings created to satisfy the growing need to compare universities internationally as a result of increasing student mobility, which has made university competition global. This spurred the demand for internationally recognized criteria and guidelines for preparing and disseminating the rankings. The issue was formally discussed for the first time in the UNESCO-CEPES (European Centre for Higher Education) international meeting held in Warsaw in 2002 which established the International Ranking Expert Group that meets on average once a year to "strengthen [...] public awareness and understanding of [a] range of issues related to university rankings and academic excellence".

The first formalized international ranking was *The Academic Ranking of World Universities* published in 2003 by the Center for World-Class Universities, Graduate School of Education (formerly the Institute of Higher Education) of Shanghai Jiao Tong University, China, and updated on an annual basis. After that, several private and public entities engaged in producing international rankings and providing education-related services to students, universities and firms that made it a real business. Our study considers three different rankings that are widely analyzed, used and commented by researchers, newspapers, and magazines (e.g. Aguillo et al., 2010; Altbach, 2006) and have a long history and good reputation.

2.1. Webometrics Ranking of World Universities

This ranking is prepared by the Cybermetrics Lab, a research division of the Consejo Superior de Investigaciones Científicas (CSIC), the largest public research body in Spain, founded in 1939 and part of

the Ministry of Education. Its name comes from the newly introduced discipline called cybermetrics or webometrics, whose aim is to provide quantitative analyses of web contents related to the process of creating and communicating scientific knowledge. Webometrics uses link analysis for quality evaluation since it is a far more powerful tool than citation analysis or global surveys. In the first case, bibliometrics only counts formal recognition between peers whereas links include both bibliographic citations and third parties' involvement with university activities. Surveys are not a suitable tool for world rankings because no one has a deep (several semesters per institution), multi-institutional (several dozen), multidisciplinary (hard sciences, biomedicine, social sciences, technologies) experience in a representative sample (different continents) of universities worldwide. The creators of this ranking intend to promote the use of the web by universities, particularly open access documents, since they believe that it will be the key instrument for all university activities. The ranking is published since 2004 and revised semi-annually.

The ranking is essentially based on quantitative measures. Each indicator is log-normalized and weighted as follows:

– *openness* (weight: 10%): data from Google Scholar Citations' institutional profiles.

– *visibility* (50%): number of external networks originating backlinks to the institutions webpages. The maximum indicator value obtained from two independent information providers (Ahrefs and Majestic) is selected.

– *presence* (5%): number of web pages, including all the rich files like .pdf, .ps, .doc, .ppt generated by the research activity of the school found with Google.

– *excellence* (35%): Scimago data (top 10% most cited papers by discipline) for the five-year period 2011-2015.

2.2. QS World University Rankings

Since 2004, Quacquarelli Symonds (QS) has been publishing international rankings with the aim of helping candidates choose a university by providing them with independent and high-quality tools and information on the world of higher education. In 2003, the UK's ministry of finance highlighted the need to have an international ranking of universities to be able to assess the global position of the UK's higher education system. The idea was taken up by John O'Leary, the editor of *Times Higher Education*, who relied on QS as a data supplier and educational advisor. The partnership between *Times Higher Education* and QS ended in 2009 when both firms started to produce separate publications.

The ranking takes six performance indicators into account, which are related to four areas: research, teaching, employability, and internationalization. Four indicators out of six are based on quantitative data directly provided by universities, whereas two of them rely on questionnaires given to universities and employers. The first indicator is *academic reputation*; it is based on a questionnaire sent to a sample of scholars around the world, who are asked to give their opinion on which universities are considered the best in their own field of expertise. They cannot vote for their own institution and regional weightings are used to adjust differences in response rates. This indicator raised some criticism because scholars can only have a partial knowledge of the world's university activities and because it is given a high weighting when producing the measurement (40%). The second indicator is *employer reputation*. This is also based on a global survey, which this time asks employers to identify the universities they think produce the best graduates. Its purpose is to give students a better sense of how universities are viewed in the job market. More weight is given to votes for universities that come from employers based in other countries, making this indicator especially useful for prospective students that seek to identify institutions with a reputation that extends beyond their national borders (weight: 10%). Then we have four ratios based on hard data: the *student-to-faculty*

ratio measures the number of academic staff members employed in relation to the number of students enrolled and aims to identify the universities that are best equipped to provide small class sizes and a good level of individual supervision; the *international faculty ratio* measures how successful a university has been in attracting scholars from other nations and is based on the proportion of foreign faculty members at the institution; likewise, the *international student ratio* measures the ability of each university to attract foreign students. Each of these indicators contributes 5% to the overall ranking results; the *citations per faculty* aims to assess a university's research impact. It counts the number of times the work of a certain faculty member is cited by other research works. Generally, the more often a piece of research is cited, the more influential it is. Therefore, the more frequently cited research papers a university publishes, the stronger its research output is considered. Information on citations is collected by Scopus, the world's largest database of research abstracts and citations. The most recent five complete years of data are used and the total citation count is assessed in relation to the number of academic faculty members at the university, to avoid favoring larger institutions. Moreover, given that each research field has its own peculiarities in terms of research output, several refinements are introduced to the way this indicator is assessed to provide a more balanced reflection of research impact across different faculty areas. For example, humanities and social sciences are known to be less familiar with bibliometric indicators and a citation count may therefore underestimate the relevance of a certain work in relation to that of other scientific areas such as medicine, engineering, physics, etc.

2.3. Times Higher Education World University Rankings

Times Higher Education is a weekly magazine that publishes news and analyses on the world of higher education. It was originally a supplement to *The Times* and published international rankings elaborated by QS until 2009. Since then it has been publishing its own

ranking based on data supplied by Thomson Reuters and Elsevier. For a university to be included in this ranking, it has to offer undergraduate courses and has to have published more than 200 articles over the 2010-2014 period. Exceptions are made for disciplines with a low number of publications. This implies that teaching-intensive universities and universities offering only postgraduate courses such as business schools are excluded from the list.

Table 1 – *Times Higher Education's indicators and weighting*

Area	Performance indicator	Weighting	Total weighting
Teaching	Reputation survey	15%	30%
	Staff-to-student ratio	4.5%	
	Doctorate-to-bachelor's ratio	2.25%	
	Doctorate awarded-to-academic staff ratio	6%	
	Institutional ratio	2.25%	
Research	Reputation survey	18%	30%
	Research income	6%	
	Research productivity	6%	
Citations / research influence	Citation impact	30%	30%
International outlook	International-to-domestic-student ratio	2.5%	7.5%
	International-to-domestic-staff ratio	2.5%	
	International collaboration	2.5%	
Industry income	Research income from industry	2.5%	2.5%

The ranking methodology is based on 13 performance indicators related to universities' four missions: teaching, research, knowledge transfer, and internationalization. Table 1 shows a summary of these indicators. The ranking is biased towards research with a 60% weighting (research + citations). *Teaching* is measured by 5 variables: a *reputation survey*, in which experienced academics are asked to nominate no more than 10 universities that they believe are the best in terms of teaching. The responses are representative of the global academy's geographical and subject mix; *staff-to-student ratio*,

doctorate-to-bachelor's ratio and *doctorate awarded-to-academic staff ratio*. The first ratio gives an idea of how a school is able to provide small class sizes and efficient services, the second one measures a school's inclination to offer advanced teaching, and the third one is a measure of how the teachers are devoted and effective in developing the next generation of academics. Finally, the *institutional income* indicates an institution's general status and gives a broad sense of the infrastructure and facilities available to students and staff.

Research relies on 3 indicators: a *reputation survey* aimed to obtaining the academics' opinion on which universities excel in research; *research income* which measures the resources available to research and is normalized to take differences in staff size and the relative importance of each field in the school into account. For example, hard-science-oriented universities typically receive more research grants than those that focus their research in humanities; *research productivity* counts the number of papers published in the academic journals indexed by Elsevier's Scopus database per scholar, scaled for institutional size and normalized for subject.

The *citations* indicator examines research influence by capturing the number of times a university's published work is cited by scholars globally, compared to the number of citations a publication of a similar type and subject is expected to have. The data are drawn from the academic journals indexed by Elsevier's Scopus database and include all indexed journals published between 2010 and 2014. Only three types of publications are analyzed: journal articles, conference proceedings and reviews.

International outlook has three proxies: *international-to-domestic-student ratio* and *international-to-domestic-staff-ratio* try to measure a university's ability to attract students and staff from other countries; *international collaboration* calculates the proportion of a university's total research journal publications that have at least one international co-author and reward higher numbers.

The last indicator is the *industry income*. It measures a university's ability to provide the business sector with inventions, innovation, and consulting. How many funds an institution can earn

from businesses are a proxy for research quality and for aptitude in arranging agreements between the university and the business sector.

Each ranking shows several strengths and weaknesses. Webometrics is the only one that provides a specific standing for each institution, whereas QS and THE, under a certain position, only give the range the university is placed in. This means that universities that rank worse cannot be distinguished from similar ones in the same range. Webometrics does not employ surveys, thereby keeping the ranking away from the typical biases of questionnaires, also takes informal documents into account to measure the university's research activity, and unlike QS and THE, is produced by a government-related organization, which is normally less affected by external interferences. QS has been criticized for the disproportionate weighting assigned to surveys (50%) and the excessively small basis of respondents. THE can be appreciated for the significant weighting assigned to teaching (30%), the consideration given to PhD students, the importance of publishing with international co-authors, and the ability to interface with the business sector measured by funds collected and not by surveys. However, THE limits its analysis to a subsample of universities, and excludes those providing only graduate courses.

Another aspect that deserves to be discussed is that university rankings may differ according to the subject that is being studied: a university with an excellent faculty of physics could have a faculty of economics that is not as good. Consequently, using university-wide classifications could give rise to distortions. A possible way of dealing with the problem is to use faculty- or subject-wide classifications that would, however, create a problem of comparison, given that different rankings would coexist as if they were a unique, large classification.

3. Sample description

We started with all the firms listed in the British, French, Italian, Spanish, German, and Dutch stock markets with market capitalization of more than €1 billion as of 31 December 2015. The inclusion of large

firms only is due to the small amount of data on CEO education for small and medium-sized firms. Financial firms (i.e., banks, insurance firms, real estate companies, mutual funds, and holdings with a Standard Industrial Classification, SIC, code starting with 6) have been excluded. For each firm, we followed all the CEOs in charge from 2006 to 2015. This means that our analysis includes both CEOs that were at the head of their firm as of December 2015 and all the past CEOs that are no longer in charge but that were in charge at least until 2006. For example, a CEO appointed in 1990, still in office in 2006, and who resigned in 2012 is included; vice versa, a CEO appointed in 2000 who resigned in 2004 is not included. This selection was necessary, since the further we go back the more dramatically does the available data on CEO education decrease. The last filter we included is related to CEO tenure. It is reasonable to believe that the CEO's work can be seen in terms of firm performance only after a few years he or she has been in office. We assume that at least 3 years of work are required to be able to attribute a certain result to the CEO. As a consequence, we dropped all CEOs that held their position for less than 3 years.

The final sample consists of 612 CEOs who have worked in 434 firms distributed as follows: 195 in the UK, 146 in France, 121 in Germany, 56 in Italy, and 47 in the Netherlands and Spain. Table 2 provides the distribution of CEOs according to the two-digit SIC code and shows that our chosen CEOs lead firms that are engaged in the following sectors: services (99 observations), utilities (95), chemicals (59), retail trade (44), transportation equipment (39), industrial and commercial machinery and computer equipment (37), wholesale trade and construction (30), mining (27).

Table 3 shows the CEOs' countries of birth. As expected, most CEOs were born in the same country as the firm they work in: 121 out of 612 (19.77%) were born in a different country from that of their firm and of them, US CEOs are the most represented. This demonstrates that when a large firm in Europe decides to hire a CEO outside its own borders it relies on US CEOs, probably because of their experience and superior knowledge of economics, management, and financial matters.

Table 2 – *Sample distribution by industry*

Industry		SIC code	Observations (CEOs)
Agriculture, forestry, fishing		0	2
Mining		10, 12, 13, 14	27
Construction		15, 16, 17	30
Manufacturing	*Food and kindred products*	20	25
	Tobacco products	21	4
	Textile mill products	22	1
	Apparel and other finished products	23	6
	Lumber and wood products, except furniture	24	2
	Furniture and fixtures	25	1
	Paper and allied products	26	3
	Printing, publishing, and allied industries	27	5
	Chemicals and allied products	28	59
	Petroleum refining and related industries	29	9
	Rubber and miscellaneous plastics products	30	8
	Leather and leather products	31	3
	Stone, clay, glass, and concrete products	32	8
	Primary metal industries	33	12
	Fabricated metal products	34	6
	Industrial and commercial machinery	35	37
	Electronic and other electrical equipment	36	18
	Transportation equipment	37	39
	Measuring, analyzing, and controlling instruments	38	14
	Miscellaneous manufacturing industries	39	1
Transportation		40, 41, 42, 43, 44, 45, 46, 47, 48	24
Utilities		49	95
Wholesale trade		50, 51	30
Retail trade		52, 53, 54, 55, 56, 57, 58, 59	44
Other services		7, 8	99

Table 4 shows the country where the CEOs obtained their degree. Most CEOs graduated in the same country as the firm and in the same country of birth. However, a significant number of managers took their last qualification outside their own country (27.29%) and US universities are preferred among the foreign ones; this proves that top managers, when choosing to study abroad, select US schools that provide them with a large relationship network, advanced skills, and

many undergraduate and graduate programs, including prestigious MBAs. Only 38 CEOs do not have a degree.

Table 3 – *Distribution by CEO's country of birth*

	Firm's country						
Birth country	*France*	*Germany*	*Italy*	*Spain*	*Netherlands*	*UK*	*Total*
Australia						3	3
Austria		6	1				7
Belgium	2	1			1		4
Brazil	1					1	2
Chile						1	1
Denmark		1					1
France	125	1	2		2	6	136
Germany	3	97			1	1	102
Hungary						1	1
India				1		5	6
Ireland				1		9	10
Italy	2		51	4		1	58
Jordan						1	1
Lebanon						1	1
Mexico	1					2	3
Morocco	4						4
Netherlands	1	3			35	5	44
New Zealand		1					1
Pakistan						1	1
Palestine						1	1
Russia						1	1
South Africa						5	5
Spain	2	1		36		1	40
Sweden	1				1	1	3
Switzerland		1				1	2
Turkey		1					1
UK		1	1		3	122	127
USA		6	1		3	11	21
NA	*4*	*1*		*5*	*1*	*14*	*25*
Total	*146*	*121*	*56*	*47*	*47*	*195*	*612*

Table 4 – *Distribution by CEO's country of graduation*

	Firm's country						
Country of graduation	*France*	*Germany*	*Italy*	*Netherlands*	*Spain*	*UK*	*Total*
Algeria	1						1
Australia						4	4
Austria		5					5
Belgium	1	1					2
Brazil						1	1
Canada	1		1				2
China				1			1
France	101	2	2	3	2	7	117
India					1	3	4
Ireland					1	3	4
Germany	1	67				1	69
Italy	2		38				40
Mexico	1						1
Netherlands	1	2		28		3	34
South Africa		1				4	5
Spain	1	1			32		34
Sweden	1						1
Switzerland	2	4		1		2	9
UK	1	4	2	2		84	93
USA	18	15	5	7	7	38	90
No degree	*2*	*1*	*6*	*2*	*2*	*25*	*38*
NA	*12*	*18*	*2*	*3*	*2*	*20*	*57*
Total	*146*	*121*	*56*	*47*	*47*	*195*	*612*

4. Variable description and statistical methodology

The purpose of our analysis is to check whether firms led by CEOs who have graduated from highly-ranked schools perform better than firms managed by CEOs from lower-ranked universities. Our dependent variable is the firm performance measure calculated as a 3-year and 5-year relative change in ROA, returns on equity (ROE), market-to-book ratio, and stock returns following the appointment of a CEO. We assume that a 3- or 5-year period after the appointment is needed for the expected changes in performance to take place (Bertrand and Schoar, 2003).

Since changes in performance may depend on industry and/or market trends, each performance indicator has been normalized by subtracting its industry average according to the 2-digit SIC codes. All performance variables are collected from Datastream Thomson Reuters.

4.1 Independent variables

Our independent variables should measure the CEOs' education profile under three dimensions: level of education, quality of the university, and field of study. With reference to the level of education, we introduce a variable that takes on the following values: in the sample including CEOs who have not graduated, 0 for CEOs who have not attended university and 1 for CEOs with at least an undergraduate degree; and in the sample excluding CEOs who have not graduated, 0 for CEOs with an undergraduate degree and 1 for CEOs with a PhD, MBA, or other postgraduate degrees. Despite the fact that over the last decades there has been a homogenization of education systems across Europe, some peculiarities still need to be allowed for. The first one pertains to France's higher education system. France reacted to the Bologna process with a 3-level education system: the License (*baccalauréat* + 3 years of study corresponding to a first level degree), Master (*baccalauréat* + 5 years of study corresponding to a second level degree), and Doctorat (*baccalauréat* + 8 years of study corresponding to the PhD). Therefore, a French "Master" corresponds to an undergraduate degree. Moreover, many French CEOs graduated from institutions of higher education other than universities such as the *Grandes écoles* (GEC) and the *Grands établissements* (GET). GEC apply severe recruitment requirements and their programs last 5 years, whereas universities have to accept all applications by students that completed high school and have a *baccalauréat*. GET primarily focus on research. GEC require students to attend a 2-year *classes préparatoires* after the *baccalauréat* and pass a stringent admission test. We have therefore decided to consider them as undergraduate degrees with the exception of ENA, ENSAE, ENS, HEC and ISAE, which

distinguish themselves for their excellence and have therefore been considered graduate degrees. For example, ENA's purpose is to prepare prospective managers for the public administration.

A second peculiarity is related to British CEOs. Many of them hold certificates such as Certified Chartered Accountant, Certified Accountant, Certified Management Accountant, Fellow Chartered Accountant, etc., that generally qualify them for a professional career in business and allow them to enroll in professional associations. These qualifications do not require a previous degree and are granted after passing a set of exams in business management, finance, accounting, etc. and, sometimes, upon completing a training program in professional firms. Given that institutions issuing these certificates do not belong to the education system and are difficult to compare, we do not consider as graduate those who only hold one of these certificates.

With reference to the *quality* of universities, our variable of university quality expresses the ranking position of the university where the CEOs took their highest degree. We employ all the three rankings discussed above to check whether the results depend on the method for classifying universities. When THE and QS do not provide a specific position but only a range the university is included in, we use the midpoint of the range.

Finally, the third character considered is the field of study, which is measured by two dummy variables. One takes into account the fact that economics and business studies should train a CEO better, giving him or her a potentially better education on firm management issues. It therefore takes value 1 for CEOs who have graduated in economics, business, and management fields, and 0 otherwise. However, a CEO could have studied management and finance but then she/he could manage a firm (e.g. in the oil and gas sector) requiring engineering skills. We therefore consider the consistency between the field of study and the firm's industry. To this aim, a second dummy variable takes on value 1 if the field of study is consistent with the firm industry (e.g. a CEO with a degree in medicine who leads a pharmaceutical firm), and 0 otherwise.

Newspapers, magazines, and academics often invest much effort into investigating how an MBA helps students in having success in a managerial career. An MBA should provide students with the most advanced skills in all areas of firm management, such as organization behavior, finance, accounting, strategic management, marketing, etc., and the admission of candidates to an MBA is often based on highly selective professional and educational requirements. However, MBA programs are often accused of training bad managers because of their excessive attention to quantitative methods, a decision-making process essentially based on hard data, a disproportionate weight attributed to business case-study analysis, and the frequent use of GMAT scores in the selection process, which does not necessarily reflect the candidate's managerial and analytical abilities (Mintzberg, 2005). These issues are extensively discussed when analyzing whether the high cost of an MBA is paid back by the graduates' future compensation during their working life. We therefore include a variable taking on value 1 for the CEOs holding an MBA, and 0 otherwise.

Finally, we found a number of CEOs with more than one degree. Although it is hard to state that the more degrees one has, the more skilled he/she will be, the number of qualifications may be a proxy for a CEO's desire to study and develop a deep and diversified educational background. To allow for this, we consider the number of degrees held by a CEO. We also found that a few CEOs graduated in a country that was different from that of birth. Taking a degree abroad may indicate a culturally open-minded manager, able to adapt to various scenarios. This may represent a strong point in dynamic, global and rapidly evolving competitive environments. We therefore introduce a dummy variable taking on value 1 for CEOs that obtained at least one degree abroad, and 0 otherwise.

All information on CEO education is taken from Thomson Reuters Eikon, Lexis-Nexis, CEOs' CVs available on-line, and LinkedIn profiles.

4.2. Control variables

Since changes in firm performance do not only depend on a CEO's education, we introduce a set of control variables that may be linked to firm performance. Besides education, a CEO's skills are likely to be positively related to his/her past professional experience. We therefore include a variable that considers the number of years the CEO has spent in the same position in other firms before joining the firm that they manage in the period under investigation. Increasingly sophisticated and complex firms require CEOs to know a firm's value drivers very well. A CEO's previous education and experience may induce him/her to emphasize some business levers but ignore others, without an integrated vision of the firm. Some business magazines such as *CFO Magazine* argue that a CEO with previous experience as a CFO has the required skills and financial background to manage all business levers simultaneously and provide superior financial performance. These unique characteristics should be worth more in firms experiencing significant turnaround, such as distressed companies that have often hired CEOs who previously held the position of CFO. In order to capture this effect, we include a dummy variable taking on value 1 for the CEOs who in the past have been CFOs in the same or in another firm.

Additional CEO-specific variables included in the analysis are: the CEO's age at appointment, which may exert an ambiguous impact because if more experienced CEOs have more expertise than younger ones, the link between CEOs' age and performance should be positive, whereas if younger CEOs are more motivated and have new, inimitable and unknown skills, then we should expect a negative link; a dummy variable taking on value 1 when the CEO is also a founder of the firm, because extensive literature (e.g. Villalonga and Amit, 2006; Perez-Gonzalez, 2006) documents a 'founder effect' whereby founders-led firms perform significantly better than the others; a dummy variable taking on value 1 when the CEO's country of birth is the same as that of the firm, because foreign CEOs may be less concerned about domestic practices and issues, therefore bringing

into play new strategies and behaviors learned in other countries with more vigor, which should improve the decision-making process and firm performance. Domestic CEOs may have a better knowledge of the domestic context and this may help them elaborate better corporate strategies as a result of lower information asymmetries and tighter links with local politicians, entrepreneurs, unions, etc. However, these connections may also induce CEOs to assume suboptimal decisions at the expense of firm performance.

Table 5 – *Descriptive statistics*

	Mean	**Median**	**Q1**	**Q3**	**Min**	**Max**	**N**
			Dependent variables				
ΔMTB 3-years variation	0.079	-0.014	-0.304	0.372	-0.586	1.151	404
ΔMTB 5-years variation	0.142	-0.095	-0.384	0.466	-0.693	2.138	301
ΔROE 3-years variation	-0.129	-0.195	-0.730	0.360	-3.026	3.211	446
ΔROE 5-years variation	-0.000	-0.181	-0.699	0.497	-2.625	3.838	330
ΔROA 3-years variation	-0.006	-0.093	-0.542	0.321	-2.289	2.860	461
ΔROA 5-years variation	-0.002	-0.126	-0.519	0.531	-2.202	2.370	338
Stock returns: 3-years variation	0.339	0.233	-0.163	0.696	-0.549	1.913	422
Stock returns: 5-years variation	0.624	0.347	-0.074	1.079	-0.627	3.132	312
			Independent variables				
University ranking (WEBO)	1,433	326	100	1,435	1	17,515	505
University ranking (QS)	190	133	33	280	1	701	365
University ranking (THE)	166	106	31	225	2	700	339
Number of degrees	1.637	2	1	2	1	4	532
Age	48.48	49	44	53	23	71	519
Experience as CEO	1.769	0	0	2	0	21	529
Firm size	6.50	6.48	6.04	6.97	5.39	7.69	445
Debt ratio	40.29	40.80	26.23	55.46	3.72	78.07	473
CEO university education	47.5%						522
Economics or business	55.1%						519
Relevant field of study	61.4%						523
Education: MBA	22.3%						530
Education abroad	23.2%						508
Previously CFO	20.2%						529
Founder	11.7%						531
Born in the country	67.2%						516

Moving on to firm-specific variables, we include a set of variables to control for firm characteristics. The debt ratio affects a firm's risk-return profile and should therefore be controlled for. We define the corresponding variable as total debt / (total debt + market value of equity) in the year of appointment. We also control for firm size by including the log of market capitalization on the day of appointment. Table 5 shows descriptive statistics.

4.3. Econometric specification

The education-performance relation is tested on a cross-section of observations that may be dealt with by the OLS estimator with robust standard errors. In order to control for potential effects of macro and industry shocks, we include industry and time dummies (see e.g. Kaplan et al., 2012; Miller et al., 2015; Gottesman and Morey, 2006; 2010).

A main issue with OLS regressions common to all studies in this field is that firms with certain performance characteristics can decide to hire CEOs that satisfy certain requisites in terms of education. This would make the selection of education endogenous, therefore requiring instrumental variable regressions. Despite the fact that all studies agree on this point, the use of 2SLS or comparable estimators as a robustness check is uncommon, perhaps because finding variables that are related to education but not to performance is a very hard task. Endogeneity could make OLS estimations weaker if we find that poorly-performing firms tend to hire more educated managers in order to restore better performance. Otherwise, OLS regressions would give rise to a stronger relationship than it actually is the case.

We run OLS regressions on two samples: the first one excludes 38 observations of CEOs without a university degree, and the second one includes all observations but the variable measuring the ranking of the university) is dropped. This allows us to verify whether having any degree offers significant benefit.

5. Results

Tables 6 to 11 show the estimations of model (1) and are organized as follows: tables 6, 7, and 8 show the results when the ranking comes, respectively, from Webometrics (table 6), QS (table 7) and THE (table 8), and the dependent variable is the performance measure calculated over a 3-year period. Tables 9, 10, and 11 show results when the ranking is from Webometrics (table 9), QS (table 10) and THE (table 11) respectively, but the dependent variable is the performance measure calculated over a 5-year period. Tables 12 and 13 show regression results on the larger sample, including CEOs without a degree.

Referring to education variables, the main general result we find is that education does not seem to affect firm performance significantly and robustly regardless of the ranking and performance measure chosen. Graduating from highly ranked universities does not appear to offer any guarantee of managing firms successfully. However, some differences when moving from one ranking to another and from one performance measure to another can be found. Webometrics estimations show negative and non-significant relationships between university rankings and all performance measures. Results from QS and THE are more appealing and seem to provide the following evidence: while balance sheet ratios do not improve when CEOs who have graduated from highly ranked schools are appointed, both market-to-book ratio and stock returns significantly outperform those of firms managed by CEOs from lower-ranked universities over the 5 years that follow the start of the office. Investors seem to prefer CEOs from highly ranked schools even though firm fundamentals are not significantly affected by their work. The stock market is likely to value intangible benefits deriving from the CEOs coming from higher-ranked schools, such as a wider relationship network, a better reputation and the potential to accumulate tacit knowledge, but this does not materialize in better accounting returns immediately. With respect to professional service firms, Hitt *et al.* (2001, p. 14) state that "individuals graduating from

Table 6 – *Regression results, Webometrics ranking, 3-year change in performance*

	ΔMTB	**Stock returns**	**ΔROA**	**ΔROE**
Constant	1.0842	2.5470	-0.2394	-1.1077
	(0.3378)***	(0.4489)***	(0.8268)	(0.9367)
CEO university education	-0.1026	-0.1197	-0.2918	-0.1066
	(0.0714)	(0.1022)	(0.2029)	(0.2618)
University ranking	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Economics or business	0.0015	-0.0065	0.0718	0.1099
	(0.0322)	(0.0431)	(0.0714)	(0.0932)
Relevant field of study	-0.0129	-0.0151	-0.0089	0.0832
	(0.0366)	(0.0457)	(0.0796)	(0.1081)
Number of degrees	0.0543	0.0234	0.1211	0.0957
	(0.0479)	(0.0729)	(0.1438)	(0.1743)
Education: MBA	0.0086	0.1141	0.3755	0.0359
	(0.0744)	(0.0974)	(0.1928)*	(0.2420)
Education abroad	0.0809	0.1187	0.0096	-0.2151
	(0.0705)	(0.0854)	(0.1650)	(0.2206)
Born in the country	-0.0151	-0.0720	0.0116	0.1020
	(0.0520)	(0.0677)	(0.1207)	(0.1571)
Age	0.0051	0.0036	0.0133	0.0072
	(0.0037)	(0.0054)	(0.0097)	(0.0119)
Experience as CEO	0.0008	-0.0033	-0.0117	-0.0127
	(0.0071)	(0.0084)	(0.0140)	(0.0191)
Previously CFO	-0.1217	-0.0150	-0.0531	-0.1149
	(0.0574)**	(0.0781)	(0.1381)	(0.1668)
Founder	-0.1173	-0.0148	0.3376	0.4764
	(0.0789)	(0.1110)	(0.2043)*	(0.2501)*
Firm size	-0.1183	-0.2860	-0.1452	-0.0441
	(0.0402)***	(0.0524)***	(0.0892)	(0.1141)
Debt ratio	0.0010	0.0011	0.0065	0.0002
	(0.0013)	(0.0017)	(0.0031)**	(0.0039)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.3425	0.3268	0.2478	0.1578
Obs.	366	380	398	385

Table 7 – *Regression results, QS ranking, 3-year change in performance*

	ΔMTB	**Stock returns**	**ΔROA**	**ΔROE**
Constant	1.2136	2.6561	0.6315	-0.5196
	(0.3699)***	(0.5131)***	(0.9233)	(1.0857)
CEO university education	-0.0834	-0.0836	-0.4829	-0.2224
	(0.0964)	(0.1422)	(0.2737)*	(0.3581)
University ranking	-0.0001	-0.0002	0.0003	-0.0006
	(0.0002)	(0.0002)	(0.0004)	(0.0005)
Economics or business	-0.0123	-0.0388	-0.0207	0.0383
	(0.0417)	(0.0575)	(0.0894)	(0.1180)
Relevant field of study	-0.0401	-0.0620	-0.0036	0.0780
	(0.0441)	(0.0551)	(0.0982)	(0.1332)
Number of degrees	0.0256	-0.0014	0.2068	0.1564
	(0.0637)	(0.0968)	(0.1781)	(0.2328)
Education: MBA	0.1052	0.1433	0.4417	0.0304
	(0.0889)	(0.1210)	(0.2191)**	(0.2856)
Education abroad	0.0437	0.0390	0.0450	-0.2518
	(0.0884)	(0.1143)	(0.2095)	(0.2880)
Born in the country	-0.0177	-0.0654	-0.0537	0.0760
	(0.0605)	(0.0813)	(0.1416)	(0.1991)
Age	0.0043	0.0028	0.0147	0.0080
	(0.0044)	(0.0066)	(0.0109)	(0.0136)
Experience as CEO	0.0016	0.0063	-0.0150	-0.0148
	(0.0090)	(0.0109)	(0.0177)	(0.0244)
Previously CFO	-0.1459	-0.0205	-0.1870	-0.2466
	(0.0684)**	(0.0936)	(0.1525)	(0.1825)
Founder	-0.1162	-0.0484	0.2132	0.6052
	(0.1156)	(0.1209)	(0.2905)	(0.3505)*
Firm size	-0.1198	-0.2726	-0.2025	-0.0561
	(0.0502)**	(0.0632)***	(0.1109)*	(0.1485)
Debt ratio	0.0009	-0.0005	0.0028	-0.0028
	(0.0015)	(0.0021)	(0.0035)	(0.0046)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.3392	0.3130	0.2233	0.1395
Obs.	265	275	286	277

Table 8 – *Regression results, THE ranking, 3-year change in performance*

	ΔMTB	**Stock returns**	**ΔROA**	**ΔROE**
Constant	1.4977	2.6214	0.6811	-0.7835
	(0.3744)***	(0.5338)***	(1.0109)	(1.2283)
CEO university education	-0.0805	-0.0763	-0.5429	-0.2572
	(0.1054)	(0.1542)	(0.2851)*	(0.3846)
University ranking	-0.0002	-0.0001	-0.0000	-0.0002
	(0.0002)	(0.0003)	(0.0004)	(0.0006)
Economics or business	-0.0312	-0.0620	-0.0655	-0.0075
	(0.0471)	(0.0611)	(0.1111)	(0.1482)
Relevant field of study	-0.0448	-0.0603	0.0293	0.1157
	(0.0462)	(0.0574)	(0.1029)	(0.1411)
Number of degrees	0.0202	0.0080	0.2640	0.1984
	(0.0702)	(0.1069)	(0.2010)	(0.2629)
Education: MBA	0.1224	0.1549	0.4084	0.0567
	(0.0937)	(0.1231)	(0.2271)*	(0.2939)
Education abroad	0.0242	0.0047	-0.0479	-0.1730
	(0.0936)	(0.1232)	(0.2195)	(0.2999)
Born in the country	0.0035	-0.0462	0.0234	0.1676
	(0.0633)	(0.0873)	(0.1474)	(0.2077)
Age	0.0026	0.0036	0.0144	0.0081
	(0.0046)	(0.0070)	(0.0116)	(0.0149)
Experience as CEO	0.0037	0.0070	-0.0156	-0.0237
	(0.0115)	(0.0137)	(0.0217)	(0.0297)
Previously CFO	-0.1824	-0.0366	-0.2007	-0.2497
	(0.0715)**	(0.1011)	(0.1629)	(0.2026)
Founder	-0.2199	-0.0492	0.3622	0.5889
	(0.1430)	(0.1473)	(0.3464)	(0.4231)
Firm size	-0.1331	-0.2672	-0.1934	-0.0418
	(0.0515)**	(0.0658)***	(0.1151)*	(0.1531)
Debt ratio	0.0006	-0.0002	0.0016	-0.0026
	(0.0017)	(0.0023)	(0.0038)	(0.0051)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.3470	0.2926	0.2326	0.1557
Obs.	284	258	266	258

Table 9 – *Regression results, Webometrics ranking, 5-year change in performance*

	ΔMTB	**Stock returns**	**ΔROA**	**ΔROE**
Constant	2.0119	5.5985	1.6342	0.2740
	(0.6119)***	(0.7781)***	(0.9997)	(1.3872)
CEO university education	-0.0365	-0.1697	-0.0671	0.1592
	(0.1338)	(0.1678)	(0.2371)	(0.3454)
University ranking	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Economics or business	0.0238	-0.0063	-0.0739	-0.0682
	(0.0545)	(0.0691)	(0.0830)	(0.1252)
Relevant field of study	-0.0032	-0.0292	0.0819	0.1929
	(0.0583)	(0.0764)	(0.0914)	(0.1301)
Number of degrees	0.0670	0.0529	-0.0620	-0.0792
	(0.0816)	(0.1166)	(0.1501)	(0.2121)
Education: MBA	-0.0320	-0.0277	0.3403	0.0720
	(0.1368)	(0.1620)	(0.2124)	(0.2958)
Education abroad	0.1087	0.2402	0.0238	-0.1735
	(0.1070)	(0.1349)*	(0.1494)	(0.2245)
Born in the country	0.0727	-0.1101	-0.2091	-0.0958
	(0.0961)	(0.1233)	(0.1465)	(0.2107)
Age	-0.0041	-0.0198	0.0005	0.0054
	(0.0070)	(0.0089)**	(0.0121)	(0.0149)
Experience as CEO	-0.0055	-0.0055	-0.0126	-0.0160
	(0.0155)	(0.0202)	(0.0196)	(0.0277)
Previously CFO	-0.0696	-0.0529	-0.0834	0.0017
	(0.1003)	(0.1283)	(0.1441)	(0.2003)
Founder	-0.1256	-0.1291	0.6045	0.5691
	(0.1373)	(0.1834)	(0.2425)**	(0.2245)
Firm size	-0.1798	-0.4844	-0.1800	-0.1707
	(0.0687)***	(0.0876)***	(0.1039)*	(0.1492)
Debt ratio	0.0002	0.0012	0.0100	0.0093
	(0.0022)	(0.0028)	(0.0038)***	(0.0056)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.3901	0.3848	0.1570	0.0971
Obs.	277	285	296	288

Table 10 – *Regression results, QS ranking, 5-year change in performance*

	ΔMTB	**Stock returns**	**ΔROA**	**ΔROE**
Constant	2.1593	6.1598	2.6985	1.2441
	(0.6469)***	(0.7924)***	(1.1194)**	(1.5139)
CEO university education	0.0248	-0.0604	-0.0200	0.2455
	(0.1884)	(0.2312)	(0.3166)	(0.4493)
University ranking	-0.0006	-0.0007	0.0002	0.0006
	(0.0002)**	(0.0003)**	(0.0004)	(0.0005)
Economics or business	0.0285	-0.0561	-0.1808	-0.1333
	(0.0701)	(0.0846)	(0.0981)*	(0.1435)
Relevant field of study	-0.0632	-0.1070	0.1150	0.2195
	(0.0692)	(0.0876)	(0.1075)	(0.1582)
Number of degrees	0.0029	0.0164	-0.1179	-0.1821
	(0.1211)	(0.1591)	(0.1973)	(0.2842)
Education: MBA	0.0084	-0.0662	0.3965	0.2514
	(0.1670)	(0.1942)	(0.2387)*	(0.3565)
Education abroad	0.0143	0.0282	-0.0262	-0.4171
	(0.1410)	(0.1825)	(0.2030)	(0.3099)
Born in the country	0.1195	-0.0454	-0.3551	-0.1744
	(0.1171)	(0.1505)	(0.1845)*	(0.2746)
Age	-0.0102	-0.0281	-0.0050	-0.0076
	(0.0089)	(0.0109)**	(0.0148)	(0.0175)
Experience as CEO	0.0185	0.0232	-0.0104	-0.0010
	(0.0211)	(0.0307)	(0.0280)	(0.0424)
Previously CFO	-0.1302	-0.0634	-0.0960	0.0022
	(0.1133)	(0.1412)	(0.1659)	(0.2214)
Founder	0.0965	0.1224	0.9214	1.0510
	(0.2441)	(0.2588)	(0.3735)**	(0.5154)**
Firm size	-0.1090	-0.4315	-0.2104	-0.1339
	(0.0896)	(0.1055)***	(0.1316)	(0.1904)
Debt ratio	-0.0005	0.0018	0.0061	0.0049
	(0.0027)	(0.0034)	(0.0046)	(0.0072)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.4009	0.4146	0.2182	0.1502
Obs.	201	208	216	211

Table 11 – *Regression results, THE ranking, 5-year change in performance*

	ΔMTB	**Stock returns**	**ΔROA**	**ΔROE**
	coeff.	coeff.	coeff.	coeff.
Constant	2.1754	5.9543	2.4192	0.4956
	(0.6885)***	(0.8349)***	(1.2079)**	(1.6276)
CEO university education	0.0526	-0.0235	-0.0127	0.3075
	(0.1986)	(0.2459)	(0.3239)	(0.4587)
University ranking	-0.0006	-0.0010	0.0004	0.0000
	(0.0003)	(0.0004)**	(0.0005)	(0.0006)
Economics or business	0.0589	-0.0205	-0.2063	-0.1434
	(0.0790)	(0.0927)	(0.1236)*	(0.1814)
Relevant field of study	-0.1012	-0.1405	0.1707	0.3245
	(0.0730)	(0.0905)	(0.1187)	(0.1803)*
Number of degrees	0.0287	0.0378	-0.0977	-0.1990
	(0.1365)	(0.1724)	(0.2235)	(0.3206)
Education: MBA	-0.0601	-0.1312	0.3927	0.2115
	(0.1755)	(0.1977)	(0.2551)	(0.3811)
Education abroad	-0.0340	-0.0340	0.0591	-0.2839
	(0.1492)	(0.1967)	(0.2179)	(0.3183)
Born in the country	0.2070	0.0459	-0.3216	-0.1436
	(0.1236)*	(0.1546)	(0.1983)	(0.2889)
Age	-0.0116	-0.0273	-0.0025	-0.0067
	(0.0093)	(0.0113)**	(0.0152)	(0.0191)
Experience as CEO	0.0244	0.0274	-0.0293	-0.0183
	(0.0220)	(0.0315)	(0.0285)	(0.0427)
Previously CFO	-0.1635	-0.0935	-0.0633	0.0209
	(0.1247)	(0.1584)	(0.1838)	(0.2481)
Founder	-0.0187	0.0817	1.0471	1.1711
	(0.2984)	(0.2932)	(0.4061)**	(0.5947)*
Firm size	-0.1040	-0.4212	-0.2367	-0.1353
	(0.0922)	(0.1082)***	(0.1382)*	(0.2014)
Debt ratio	-0.0020	-0.0023	0.0095	0.0095
	(0.0031)	(0.0039)	(0.0049)*	(0.0078)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.4079	0.4199	0.2211	0.1546
Obs.	188	195	200	196

the top institutions often develop and maintain elite social networks that can be valuable as a source of clients" or, referred more in general to top managers, CEOs graduating from highly ranked universities have a source of better investment and financing opportunities potentially originating from business and relationship networks that were created during the years at university. The fact that this evidence only emerges in QS and THE but not in Webometrics is likely to be related to the significant differences in the way Webometrics and the other two rankings are constructed, which are reflected in the classification. For instance, the University of Wisconsin Madison is 8th in Webometrics, 50th in THE and 54th in QS (2015-2016 edition) and many others tend to share a similar position in QS and THE, but not in Webometrics. The way the ranking is designed and its interpretation is therefore a critical step that should be well understood in order to avoid a blind allegiance to a raw figure, with all its practical implications.

The impact of having a more advanced education is almost never statistically significant: having a PhD, an MBA or another graduate degree does not seem to result in better managerial abilities, or at least these supposedly improved skills do not translate into a higher performance. This result holds for any performance measure and ranking.

We have assumed that graduating in economics and business fields or in a field consistent with that of the firm should be beneficial in managing a firm. This assumption is not confirmed. In fact, the variables denoting the economics and business fields or the correspondence between the field of study and that of operations of the firm are almost never statistically significant and the sign of coefficients often changes across models. This could mean that the importance of having deep knowledge of the market the firm is operating in and a general knowledge of management tools is overrated. The results seem to indicate that personal skills learned by studying or working, whatever the field, can be transferred to any type of business without knowing the peculiarities of the business itself,

knowledge of which can be acquired later and not necessarily as formal knowledge.

However, both the above variables take the field of study into account, no matter the level and type of qualification. This point is important since there are graduate specialization programs such as MBAs that are specifically designed to satisfy the highest needs in the managerial field. We find that the variable denoting the possession of an MBA is often positive and statistically significant. In detail, getting an MBA results in a higher 5- and 3-year change in ROA. This evidence should be treated with caution since it is not confirmed with all performance measures and models, but it indicates that an MBA is likely to help future managers learn the managerial tools required to move a firm's levers successfully. Given that ROA is the performance variable that captures a firm's operating performance, MBA graduates, as a result of their business knowledge, could pay more attention to core performance metrics than to overall firm performance indicators.

Finally, looking at the remaining two education variables, it emerges that a larger number of qualifications or a degree abroad do not seem to be a source of better firm performance.

Moving on to control variables, we find that stock returns over a 5-year period after appointment are significantly higher for CEOs who are appointed at an early age. This is not surprising, since talent and abilities tend to be more valued at an early stage in one's career. When people get old, their skills become known to the market, causing the probability of rent appropriation to increase. In addition, for younger CEOs, fewer years generally elapse between graduation and the acquisition of a position as CEO; this should increase the value of all the things learned by studying as opposed to the experience that comes into play at a later point in a CEO's career. The fact that CEO experience does not seem to be particularly relevant also emerges from the variable measuring CEO's previous experience, which reveals that the number of years spent in the position of CEO before joining the firm is never statistically significant.

Having previously been a CFO does not contribute to a significant improvement in performance; the performance drops significantly if

measured in terms of a 3-year change in the market-to-book ratio. This does not confirm our assumption that those who had previously been CFOs have superior financial skills, which are particularly helpful in environments as complex and dynamic as the current ones, especially in firms that are facing reorganization or other exceptional circumstances.

Table 12 – *Graduate CEOs vs. non-graduate CEOs, 3-year change in performance*

	ΔMTB	**ΔROA**	**ΔROE**	**Stock returns**
Constant	1.0821	-0.2735	-0.1011	2.3650
	(0.3124)***	(0.7372)	(0.8652)	(0.4100)***
CEO university education	-0.0078	0.0289	-0.0345	-0.0104
	(0.0475)	(0.1191)	(0.1477)	(0.0586)
Age	0.0032	0.0103	0.0090	0.0016
	(0.0036)	(0.0100)	(0.0119)	(0.0052)
Experience as CEO	0.0018	-0.0096	-0.0160	-0.0021
	(0.0068)	(0.0142)	(0.0188)	(0.0082)
Previously CFO	-0.1300	-0.0070	-0.1498	-0.0312
	(0.0576)**	(0.1411)	(0.1664)	(0.0748)
Founder	-0.1106	0.3183	0.3691	-0.0016
	(0.0793)	(0.1933)	(0.2457)	(0.1145)
Born in the country	0.0069	0.0288	0.0570	-0.0689
	(0.0500)	(0.1161)	(0.1475)	(0.0640)
Firm size	-0.1094	-0.1371	-0.1100	-0.2636
	(0.0391)***	(0.0874)	(0.1117)	(0.0510)***
Debt ratio	0.0003	0.0068	0.0004	0.0008
	(0.0013)	(0.0032)**	(0.0038)	(0.0016)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.3247	0.1514	0.1044	0.3388
Obs.	381	414	401	395

Table 13 – *Graduate CEOs vs. non-graduate CEOs, 5-year change in performance*

	ΔMTB	**ΔROA**	**ΔROE**	**Stock returns**
Constant	2,1741	1,5513	1,1934	5,4323
	(0,5358)***	(0,8344)*	(1,2462)	(0,6855)***
CEO university education	0,0335	0,0375	0,0779	-0,0947
	(0,0809)	(0,1362)	(0,1900)	(0,1030)
Age	-0,0060	-0,0025	0,0078	-0,0206
	(0,0067)	(0,0120)	(0,0148)	(0,0089)**
Experience as CEO	-0,0046	-0,0094	-0,0145	-0,0032
	(0,0149)	(0,0197)	(0,0269)	(0,0192)
Previously CFO	-0,0716	-0,0700	-0,0771	-0,0694
	(0,0951)	(0,1432)	(0,1959)	(0,1219)
Founder	-0,1533	0,5578	0,5076	-0,1448
	(0,1391)	(0,2297)**	(0,3231)	(0,1913)
Born in the country	0,0647	-0,1554	-0,1211	-0,1245
	(0,0872)	(0,1374)	(0,1959)	(0,1175)
Firm size	-0,1771	-0,1880	-0,2557	-0,4683
	(0,0665)***	(0,1030)*	(0,1472)*	(0,0854)***
Debt ratio	0,0002	0,0088	0,0067	0,0009
	(0,0021)	(0,0037)**	(0,0054)	(0,0027)
Industry dummies	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
R^2	0.3540	0.1473	0.1038	0.3855
Obs.	286	306	298	294

Appointing a CEO who was born abroad does not seem to lead to significant changes in performance, therefore it does not support the theory that foreign CEOs are more effective in putting the strategies required to vary the firm's course into effect. In line with past evidence, the effect of the founder working as CEO is positive. We find that after the appointment of a CEO that is also the firm's founder, there is a larger change in ROA and ROE. However, it should be said that the same result does not hold for market-based performance measures. As expected, smaller firms yield the highest changes in performance, regardless of the performance measure chosen. Finally, we also find that firms with a higher debt ratio tend to perform better

in terms of ROA in the 3 and 5 years following the new appointment. This may be due to the debt's pressure and monitoring effect on the newly appointed CEO.

Finally, we compare graduate CEOs with those without a degree and find that having a degree does not seem to have a positive effect on firm performance.

6. Discussion and conclusion

In this research, we aim to analyze the potential impact of CEO education on firm performance in a sample of European listed firms. The topic has recently raised the attention of academic establishments, journalists, and public institutions in Europe because of the growing importance and resonance of international rankings. Empirical studies on this issue in Europe have been extremely limited so far due to the unavailability and unreliability of data.

The main evidence that emerges from our study is that graduating from highly ranked universities and having more qualifications does not guarantee that a CEO is able to improve firm performance significantly. However, when we focus on 5-year changes in market-based performance indicators we find significantly higher improvements for firms led by a CEO who has graduated from top universities. This could imply that investors, institutional ones above all, are taking the educational profile of CEOs into account as a way of reducing information asymmetries about a CEO's quality and inferring positive information on a CEO's superior abilities and relationship networks. This result should however be taken with caution, since it is not confirmed over the 3-year period and, more importantly, accounting returns do not seem to provide the same answer.

Several implications may be drawn from this study. First of all, our basic assumption is that the higher the ranking, the better the institution and the more skilled the student will be according to the following line of reasoning:

ranking → institution quality → student skills → management abilities → firm performance

This chain can be broken in several points. First, the ranking may be a biased representation of university quality, something that is hard to evaluate using quantitative and synthetic measures; second, assuming the validity of the first connection, a higher (lower) quality of university does not necessarily imply better (worse) students; finally, an excellent student from an excellent university may not be an excellent manager or, at least, might excel only in a few functional areas. A disruption in the above path is sufficient to make the relationship between CEO education and firm performance no longer significant. Finding the break, if any, and its position goes beyond the scope of this research, but it is important to highlight that the different proportions between universities that have good rankings and the number of good CEOs they produce is outstanding, therefore we are not surprised by the fact that we cannot find robust and significant relationships. Past research has given a wide mix of results, with a prevalence of studies that do not find any significant evidence, and that support our results.

We have, however, found some noteworthy results. Relevant managerial abilities are confirmedly acquired in graduate degrees such as MBAs, which appear to provide a superior qualification in management. This question is controversial since the MBA has been criticized from several perspectives (Mintzberg, 2005) and extant empirical studies support neither theoretical criticism nor sponsors of this form of education.

The appointment of younger CEOs seems to be a source of better stock market returns. Higher motivation, resources and talent, typical of younger people, may offset their lack of experience, of which impact is not significant. We indeed find that past experience as a CFO or CEO does not help improve firm performance. CFOs are likely to be the managers with the strongest orientation towards value. They are prepared to know the contribution of each firm area to creating or destroying value very well and operate consequently to maximize it.

Their competences gain the highest value when they are provided to firms requiring extraordinary interventions, which need managers with highly technical and financial skills. Our sample is, for the most part, composed of going-concern businesses in which those abilities are valued less; this could explain the lack of statistically significant results. Likewise, experience abroad in terms of country of birth or graduation does not seem to be a source of distinctive qualities that improve firm performance.

REFERENCES

Aguillo I.F., Bar-Ilan, J., Levene, M., Ortega, J.L. (2010), "Comparing University Rankings", *Scientometrics*, vol. 85 n. 1, pp. 243-256.

Altbach P.G. (2006), "The Dilemmas of Ranking", *International Higher Education*, vol. 42, pp. 2-3.

Amran N.A., Md Yusof M.A., Ishak R., Aripin N. (2014), "Do Characteristics of CEO and Chairman Influence Government-Linked Companies Performance?", *Procedia – Social and Behavioral Sciences*, vol. 109, pp. 799-803.

Barney J.B. (1991), "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, vol. 17 n. 1, pp. 99-120.

Barney J.B., Arikan A.M. (2001), "The Resource-Based View: Origins and Implications", in Hitt M.A., Freeman R.E., Harrison J.S. (eds.), *The Blackwell Handbook of Strategic Management*, pp. 124-188, Oxford (UK): Blackwell.

Bertrand M., Schoar A. (2003), "Managing with Style: The Effect of Managers on Firm Policies", *Quarterly Journal of Economics*, vol. 118 n. 4, pp. 1169-1208.

Bhagat S., Bolton B.J., Subramanian A. (2010), "CEO Education, CEO Turnover, and Firm Performance", *SSRN Working Paper*, August 3, available at: http://ssrn.com/abstract=1670219.

Bishop J. (1994), "The Impact of Previous Training on Productivity and Wages", in Lynch L. (ed.), *Training and the Private Sector*, pp. 161-200, Chicago: University of Chicago Press.

Buela-Casal G., Gutiérrez-Martínez O., Bermúdez-Sánchez M.P., Vadillo-Muñoz O. (2007), "Comparative Study of International Academic Rankings of Universities", *Scientometrics*, vol. 71 n. 3, pp. 349-365.

Chevalier J., Ellison G. (1999), "Are Some Mutual Funds Managers Better than Others? Cross-Sectional Patterns in Behavior and Performance", *Journal of Finance*, vol. 54 n. 3, pp. 875-899.

Crossland C., Zyung J., Hiller N.J. Hambrick D.C. (2014), "CEO Career Variety: Effects on Firm-Level Strategic and Social Novelty", *Academy of Management Journal*, vol. 57 n. 3, pp. 652-674.

Darmadi S. (2011), "Board Members' Education and Firm Performance: Evidence from a Developing Economy", *International Journal of Commerce and Management*, vol. 23 n. 2, pp. 113-135.

Dehon C., McCathie A., Verardi V. (2010), "Uncovering Excellence in Academic Rankings: A Closer Look at the Shanghai Ranking", *Scientometrics*, vol. 83 n. 2, pp. 515-524.

Dill D.D., Soo M. (2005), "Academic Quality, League Tables, and Public Policy: A Cross-National Analysis of University Ranking Systems", *Higher Education*, vol. 49 n. 4, pp. 495-533.

Elsaid E. (2014), "Examining the Effect of Change in CEO Gender, Functional and Educational Background on Firm Performance and Risk", *Journal of Applied Business Research*, vol. 30 n. 6, pp. 1605-1614.

Gottesman A.A., Morey M.R. (2006), "Does a Better Education Make for Better Managers? An Empirical Examination of CEO Educational Quality and Firm Performance", *SSRN Working Paper*, April 21, available at: http://ssrn.com /abstract=564443.

Gottesman A.A., Morey M.R. (2010), "CEO Educational Background and Firm Financial Performance", *Journal of Applied Finance*, vol. 20 n. 2, pp. 70-82.

Hambrick D., Mason P. (1984), "Upper Echelons: The Organization as a Reflection of Its Top Managers", *Academy of Management Review*, vol. 9 n. 2, pp. 193-206.

Hitt M.A., Bierman L., Shimizu K., Kochhar R. (2001), "Direct and Moderating Effects of Human Capital on Strategy and Performance in Professional Service Firms: A Resource-Based Perspective", *Academy of Management Journal*, vol. 44 n. 1, pp. 13-28.

Jalbert T., Furumo K., Jalbert M. (2010), "Does Educational Background Affect CEO Compensation and Firm Performance?", *Journal of Applied Business Research*, vol. 27 n.1, pp. 15-40.

Jalbert T., Rao R., Jalbert M. (2002), "Does School Matter? An Empirical Analysis of CEO Education, Compensation, and Firm Performance", *International Business & Economics Research Journal*, vol. 1 n. 1, pp. 83-98.

Kaplan S.N., Klebanov M.M., Sorensen M. (2012), "Which CEO Characteristics and Abilities Matter?", *Journal of Finance*, vol. 67 n. 3, pp. 973-1007.

Kehm B.M., Stensaker B. (eds.) (2009), *University Rankings, Diversity, and the New Landscape of Higher Education*, Rotterdam: Sense Publishers.

Lindorff M., Prior Jonson E.P. (2013), "CEO Business Education and Firm Financial Performance: A Case for Humility Rather than Hubris", *Education + Training*, vol. 55 n. 4/5, pp. 461-477.

Luca M., Smith J. (2013), "Salience in Quality Disclosure: Evidence from the US News College Rankings", *Journal of Economics & Management Strategy*, vol. 22 n.1, pp. 58-77.

Markus J. (2013), "Caught Cheating: Colleges Falsify Admissions Data for Higher Rankings", *NBCnews.com*, 20 March, available at http://investigations.nbcnews.com/_news/2013/03/20/17376664-caught-cheating-colleges-falsify-admissions-data-for-higher-rankings.

Merisotis J.P. (2002), "Summary Report of the Invitational Roundtable on Statistical Indicators for the Quality Assessment of Higher/Tertiary Education Institutions:

Ranking and League Table Methodologies", *Higher Education in Europe*, vol. 27 n. 4, pp. 475-480.
Miller D., Xu X., Mehrotra V. (2015), "When is Human Capital a Valuable Resource? The Performance Effects of Ivy League Selection among Celebrated CEOs", *Strategic Management Journal*, vol. 36 n. 6, pp. 930-944.
Mintzberg H. (2005), *Managers Not MBAs: A Hard Look at the Soft Practice of Managing and Management Development*, San Francisco: Berrett-Koehler.
Monastyrenko, E. (2014), "Opening the Black Box of Firm Performance: The Role of CEO's Education", *PhD thesis*, Paris: Université Panthéon-Sorbonne, UFR d'Économie, available at http://dumas.ccsd.cnrs.fr/dumas-01103161 /document.
OECD (2000), *Education at a Glance 2000: OECD Indicators*, Paris: Organization for Economic Co-operation and Development, available at: http://dx.doi.org/10.1787/eag-2000-en.
OECD (2016), *Education at a Glance 2016: OECD Indicators*, Paris: Organization for Economic Co-operation and Development, available at: http://dx.doi.org/10.187/eag-2016-en.
Ofe H.A. (2012), "Chief Executive Officer's (CEO's) Educational Background and Firm Performance: An Empirical Study on Manufacturing and IT Listed Firms in the Stockholm Stock Exchange", *Master's thesis*, Umeå: Umeå School of Business and Economics, available at: http://www.diva-portal.org/smash/get /diva2:511679/FULLTEXT01.pdf.
Penrose E.T. (1959), *The Theory of the Growth of the Firm*, New York: John Wiley and Sons.
Perez-Gonzalez F. (2006), "Inherited Control and Firm Performance", *American Economic Review*, vol. 96 n. 5, pp. 1559-1588.
Petruzzellis L., D'Uggento A.M., Romanazzi S. (2006), "Student Satisfaction and Quality of Service in Italian Universities", *Managing Service Quality*, vol. 16 n. 4, pp. 349-364.
Rakhmayil S., Yuce A. (2008), "Effects of Manager Qualification on Firm Value", *Journal of Business & Economics Research*, vol. 6 n. 7, pp. 129-138.
Rakhmayil S., Yuce A. (2013), "Executive Qualification and Firm Value", *Journal of Applied Business and Economics*, vol. 14 n. 5, pp. 52-70.
Saisana M., d'Hombres B., Saltelli A. (2011), "Rickety Numbers: Volatility of University Rankings and Policy Implications", *Research Policy*, vol. 40 n.1, pp. 165-177.
Spence M. (1973), "Job Market Signaling", *Quarterly Journal of Economics*, vol. 87 n. 3, pp. 335-374.
Villalonga B., Amit, R. (2006), "How do Family Ownership, Control and Management Affect Firm Value?, *Journal of Financial Economics*, vol. 80 n. 2, pp. 385-417.
Weiss A. (1995). "Human Capital vs. Signaling Explanations of Wages", *Journal of Economic Perspectives*, vol. 9 n. 4, pp. 133-154.
Zhao C.Y., Liao M.Z. (2015), "Study on Relationship between Officers' Education Background and Performance of Listed Companies on Growth Enterprise Board", *Open Journal of Social Sciences*, vol. 3, pp. 95-100.