Does the CEO elite education affect firm hedging policies?

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Abstract

This paper studies the relationship between CEO elite education and firm hedging decisions. It uses the particular specificities of the French post-secondary educational institutions to examine the effect of CEO educational background on the use of foreign currency derivatives. The results show a positive and significant relationship between education quality and derivatives use. Neither the level nor the type of education has any significant effect. The results also show that the use of derivatives enhances firm performance only when CEOs are from elite institutions. These results are robust to a battery of tests that involve alternative estimation techniques, the use of different subsamples, additional control variables, and control for endogeneity and selection bias.

Keywords**:** CEO elite education; *Grandes écoles*; Derivatives use; Firm value

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1. Introduction

The view that corporate hedging, particularly through the use of derivatives, can affect firm performance is widely shared by investors and corporate managers alike and is supported by extensive academic literature (e.g. Smith and Stulz, 1985; Mayers and Smith, 1987; Froot et *al.*, 1993; Stultz, 1996; Clark and Mefteh, 2010).[4] There is also a large body of research showing that CEO education is a significant determinant of corporate risk-taking.[5] For instance, Beber and Fabbri (2012) show that a CEO with an MBA education level is more inclined to adopt a speculative behavior. Finkelstein and Hambrick (1996), and Barker and Mueller (2002) find that CEOs with technical degrees are engaged in more research and development (R&D) activities while CEOs with educational backgrounds in business or law tend to be more risk-averse with regard to R&D. However, up to now, to the best of our knowledge, the effect of CEO education on derivatives use has received no attention. Given the relationship between CEO education and corporate risk-taking and the role of derivatives use in corporate risk management, this is an important gap in the literature.

The current paper aims to fill this gap by studying the effect of CEO education on the use of foreign currency (FC) derivatives and the relationship between FC use and firm performance. We analyze a range of CEO educational characteristics in France to get a more complete and nuanced appreciation of the impact of education on corporate risk management.

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[4] The positive theories of firm risk management in the presence of capital market imperfections argue that shareholder value can be increased through an overall reduction in exposure, which leads to a reduction of external claims on the cash stream flowing from the firm's assets.

[5] Several studies, such as Grable and Joo (2004), Hallahan et *al.* (2004), Yao et *al.* (2004) and Fan and Xiao (2006), report a positive relationship between education and financial risk tolerance.

The major innovation of the paper is that we break education down into three components – the level (undergraduate, masters, PhD), the type (engineering, business, other) and the quality (top, middle and low ranked institutions). We then empirically evaluate the effect of each component or combination of components on foreign currency derivatives use and on the relationship between derivatives use and firm performance. Our objective is to provide a complete understanding of the relationship between the educational training and the risk-taking behavior of CEOs reflected in their use of derivatives and the effect of this use on firm performance. The quality of educational training can signal acquired knowledge as well as intellectual and analytical ability and personality penchants. Besides addressing the gap in the academic research, such an understanding is of relevance to the renewed interest by regulators on how derivatives are related to risk mitigation and performance.

This study focuses on foreign currency (FC) derivatives using a sample drawn from the largest 250 French firms (CAC all Tradable, former SBF250) observed over the period 2004–2012. The French educational system is particularly well suited to our study since it offers clear-cut distinctions arising from the strong involvement of the state in the creation, support and control of French post-secondary educational institutions. These institutions can generally be divided into two main groups – the universities and the "*Grandes écoles*". The university system is similar to that in many other European countries. It focuses on scholarly pursuits, is generally accessible to anyone with a baccalaureate diploma and offers degrees at the undergraduate, master's and PhD level. The "Grandes ecoles" are rooted in the last quarter of the 18th century when French royalty initiated the creation of institutions that would train agents qualified to lead the Army, civil engineering projects and agricultural development (Green, 2013). Their training is focused on practical matters and decision-making aimed at producing individuals endowed with strong scientific competence and capable of synthesizing large quantities of information (Thoenig, 1973) as opposed to the intellectual and theoretical pursuits associated with the universities

The empirical analysis begins by testing the impact of education type, level and quality on derivatives use. The results provide evidence for a significant relationship between education quality and derivatives use. More specifically, they show that "elite" education (ENA, HEC and *Polytechnique)* has a positive and strongly significant impact on derivatives use. However, it does not show any significant effect for education type or level. The empirical analysis also assesses the contribution of each individual "elite" school category to derivatives use. It shows a positive and significant effect for each of three elite institutions standing alone. Additional post-estimation tests reject the hypothesis that the values of the individual coefficients are equal, providing evidence that within the universe of the elite institutions the type of training does affect derivatives use. *ENA*, the political training institution, has the highest coefficient, *HEC*, the business training institution, has the second highest coefficient and *Polytechnique*, engineering training, has the lowest.

As a robustness test, in a second step we use factor analysis to extract the two factors that reflect our hypothesized underlying fundamental construct of CEO educational attainment. The first factor reflects education level whereas the second one, composed mainly of "elite institutions" and other non-elite " *Grandes écoles* ", reflects education quality. We then use these two factors as explanatory variables and re-test the impact of education on derivatives use. The results confirm the previous findings.

We show that only education quality, reflected in factor 2, is positive and statistically significant in affecting derivatives use.

In the third step we look at how derivatives use affects firm performance. On the one hand, the use of derivatives can increase firm performance by reducing risk. According to the positive theory of risk management at the firm level in the presence of capital market imperfections, shareholder value can be increased by reducing risk. The argument is that risk reduction leads to a reduction of external claims on the cash stream flowing from the firm's assets, such as taxes, bankruptcy costs (both direct and indirect), and/or agency costs to align managerial interests with the interests of capital suppliers.[6] On the other hand, derivatives use could also decrease firm value. First of all, the conception and implementation of a FC hedging strategy with derivatives requires a commitment of financial, physical and human resources that can represent significant costs for the firm. Thus, to increase firm performance the gains from derivatives use must be larger than the costs of implementing the strategy. Second, the arguments for increased firm value are based on the assumption that derivatives are used for hedging purposes. If this is not the case and they are used for speculation, derivatives use could increase risk and decrease firm value.

We test the effect of derivatives use on firm performance and find that, overall, the use of derivatives does increase firm performance, consistent with Allayannis and Weston (2001), Carter et al. (2006) and Bartram et al. (2011), among others. However, when we break down the sample according to education quality, derivatives use is positive and significant only for firms with CEOs coming from the elite schools. It is

[6] See, Aretz and Bartram (2011), for a comprehensive survey and analysis.

negative but not always significant for non-elite CEOs. To confirm this result, we use factor 2, the factor representing education quality. It is composed of a positive loading on the elite variable and a negative loading on the non-elite (other schools) variable. We proceed by breaking the sample down according to whether this factor is positive or negative. The results consistently show that derivatives use has a positive and significant effect on firm value when factor 2 corresponds to CEOs from elite schools. The relationship is, however, negative but not always statistically significant when factor 2 corresponds to CEOs from other schools. To control for the ongoing nature of a strategic derivatives program and the potential problem of endogeneity, we rerun all the regressions using a dynamic GMM estimator and find that the results do not qualitatively change.

Our major finding is that only education quality, reflected in three elite institutions – *Polytechnique* (engineering), *ENA* (political science) and *HEC* (management) - has a significant effect on derivatives use or firm performance. The effects are positive and the results are robust to a battery of tests that include, among others, alternative estimation techniques, use of different subsamples, additional control variables, and control for endogeneity.

The reminder of the paper is organized as follows. Section 2 reviews the literature on CEO education and risk management and presents the institutional background of the French educational system. Section 3 describes the data, details the methodology, and defines the variables used in the empirical analysis. Section 4 discusses the main empirical results. Section 5 presents the analysis of derivatives use on firm value. Section 6 summarizes the main findings and concludes.

2. Related literature

2.1. CEO education and risk management decisions

Several studies, such as Grable and Joo (2004), Hallahan et al. (2004), Yao et al. (2004) and Fan and Xiao (2006), report a positive relationship between education and the willingness to take risk. Education is thought to increase a person's capacity to evaluate risks inherent to the investment process and therefore endow them with a higher financial risk tolerance. Besides the relationship between education and risk tolerance in general, education can also influence CEO risk management decision making. To understand this impact of CEO education on risk management decisions, it is important to take into account three components of education: its level, its type and its quality. Kimberly and Evansiko (1981), Bantel and Jackson (1989), Hitt and Tyler (1991), Thomas et. al. (1991), Wiersema and Bantel (1992), and Wally and Baum (1994) have found that more educated CEOs are better able to process information and are more receptive to change than CEOs with lower educational attainment.

The level of education can be a reflection of cognitive ability (Hambrick and Mason, 1984), knowledge, skills and openness to change (Datta and Rajagopalan, 1998; Wiersema and Bantel, 1992). Many papers in the management literature have postulated that managers with higher educational attainment will have better cognitive abilities, training or social ties that may improve firm performance (Chevalier and Ellison, 1999, Beber and Fabbri, 2012, Miller et al., 2015).

The type of education received can signal a personality penchant, such as quantitative versus verbal or practical versus theoretical. Kiesler and Sproull (1982) explain that background characteristics and experiences reflect a CEO's underlying psychological orientation and knowledge base. A quantitative personality, for example, may find it easier than a verbal personality to understand a complicated derivative instrument and when and how to use it. In addition to signaling personality penchants, the type of education can also impact managers' use of derivatives and appetite for risk-taking because it affects the ability to recognize risky situations and the usefulness of risk reducing techniques. For instance, it is likely that a CEO with an MBA degree has studied financial risk and the derivative instruments that can be used to hedge it. Beber and Fabbri (2012) find that in forex markets, CEOs with MBAs are engaged in speculation because management education breeds overconfidence and greater tolerance to risk. In addition, the educational background could matter for risk management because it provides the manager with better information. For example, MBA degree holders could have an information advantage relative to the market that allows them to forecast future exchange rate movements more accurately.

Furthermore, the quality of education can matter to risk management decisions. In fact, besides the benefits associated with superior lecturers and course content, the quality of educational training could also reflect innate ability (Herrmann and Datta, 2005) as, for example, when the best institutions base their entry criteria on competitive exams. In a similar vein, we could envision that CEO graduates from well ranked business schools are more likely to be overconfident and thus more risk tolerant, possibly because the MBA is simply perceived as the best degree in general management. Consistent with this idea, other papers document that managers holding an MBA degree follow more aggressive strategies (Bertrand and Schoar, 2003).

2.2.The Institutional Background : French educational system

The distinguishing feature of the French system resides mainly in what is known as the "*Grandes écoles*". The "*Grandes écoles*" go back to the 18th century when French royalty created institutions to train highly-skilled and qualified citizens to lead the Army, civil engineering projects and agricultural development (Green, 2013). This approach was widely adopted over the years to train professionals who are able to reinforce the state's authority and capacity to control and rule the country. It was also linked to mistrust towards the universities that were considered as either excessively oriented towards scholarly teaching, under religious influence, or too independent to produce highly-skilled and competent military and civil servants (Van Zanten and Maxwell, 2015).

The "*Grandes écoles*" feature a process of selection by merit through very competitive examinations, called "*Concours*", for a small number of annual places. Their training is focused on decision-making and practical matters to produce individuals endowed with strong scientific competence and capable of synthesizing large quantities of information (Thoenig, 1973) as opposed to the intellectual and theoretical pursuits associated with the universities. The "*Grandes écoles*" themselves can be divided into two main groups. The first group is composed of the very elite schools, namely, *École Nationale d'Administration* (*ENA*), *École Polytechnique* (*Polytechnique*) and *École des Hautes Études Commerciales* (*HEC*). These three elite "*Grandes écoles*" are richly endowed with generous amounts of human and financial resources and alone account for 46% of French managers in firms listed in the CAC40 equity index (Dudouet and Joly, 2010).[7] The second group is comprised of the other institutions that are less prestigious and less competitive but still based on the basic model of the "*Grandes écoles*".

This post-secondary organization provides us with some interesting distinctions. The first one refers to student quality that contrasts the "*Grandes écoles*" based on a very selective merit system for a small number of places with that of the university that is accessible to anyone with a baccalaureate diploma.[8] The second distinction is one of training quality that contrasts the "*Grandes écoles*" with the university and the elite "*Grandes écoles*" with the other "*Grandes écoles*". The third distinction is one of type that contrasts the non-utilitarian university culture traditionally oriented towards teaching, scholarship and research with the utilitarian culture of the "*Grandes écoles*" oriented towards practical matters and decision-making. The last distinction is one of level that contrasts the undergraduate, masters, "*Grandes écoles*" and PhD levels. Thus, the French post-secondary education model allows us to extend our understanding of the mechanisms that shape derivatives use and their effect on firm performance and will, we hope, inspire further work drawing on a similar framework in other national contexts.

3. Data and methodology

[7] According to an estimate made by "Droit d'inventaire" diffused on "France 3" Television on September 17th, 2008, the French government spends on average twice as much per "*Grandes écoles*" student as it does for a university student in the same type of training.

[8] Frey and Detterman (2004) explain that CEOs from schools that require higher mean entrance exam scores are more intelligent and display greater managerial ability as they can process more information. Chevalier and Ellison (1999) find that fund managers generate higher returns when they are graduated from universities with tougher entry requirements.

The initial sample starts with the largest 250 French firms (CAC all Tradable, former SBF250) observed over the period 2004–2012. Financial firms are excluded because it is difficult to distinguish between their hedging and their trading activities. We also exclude firms that are not exposed to exchange risk as stated in their financial reports, firms that do not disclose anything on their hedging strategies, and firms with missing accounting and financial data. Data on firm hedging policies were collected manually from the annual reports. Stock market and financial data were extracted from the *Datastream* and *Thomson One Banker* databases, respectively. Data on CEO educational backgrounds are from the Corporate Governance Database of IODS (Insead OEE Data Service) or collected manually. Our final sample consists of 121 unique firms, making an unbalanced sample of 1,089 firm-year observations.

The following baseline model estimates a regression with derivatives use as the dependent variable and CEO education proxies as variables of interest. It also includes a set of control variables deemed to explain FC derivatives.

Derivatives use = f (CEO education, Control variables, Year dummies, Firm fixed effects)

(1)

The proxy for derivatives use, noted *Derivatives*, is the notional amount of foreign currency derivatives scaled by the book value of total assets. To proxy for CEO education we gather information that reflects the type, level and quality of the CEO's educational background. For the type of training we distinguish among three categories, namely, *Engineering*, *Management*, and Other. This distinction is based on descriptive statistics that show that "*Engineering*" and "*Management*" categories account for over 78% of the total sample. For the level of education we distinguish among undergraduate, masters, PhD, and Schools. For education quality we make several distinctions. First, we distinguish between university and Schools. Second, we separate the elite schools from non-elite schools. Third, we break the elite schools into groups by distinguishing between *ENA*, *Polytechnique* and *HEC*. Panel A of Table 1 describes the foregoing education variables.

Panel B of Table 1 presents the frequency distribution of the education variables. Interestingly, 57.48% (626 out of 1089) of the sample CEOs had management training and 20.56% (224 out of 1089) were engineers. Overall, 25.34% (276 out of 1089) of CEOs graduated from the University, 69.80% (760 out of 1089) come from the Schools and only 4.86% have no higher education degree. Of the CEOs graduated from the university 61.95% (171 out of 276) hold an undergraduate degree, 19.57% hold a Master degree and 18.48% hold a PhD. Of the CEOs graduated from the Schools, 42.1% come from the elite Schools of *Polytechnique*, *ENA* or *HEC*. Of the Elite CEOs, *Polytechnique* represents 50.2%, followed by *ENA* (26.56%) and *HEC* (23.43%).

[Insert Table 1 about here]

Our model includes a range of control variables deemed to affect derivatives use (e.g. Geczy et al. 1997, Allayannis and Ofek, 2001 and Graham and Rogers, 2002; among others). They are divided into two groups.

The first group refers to common firm characteristics such as size, growth opportunities, liquidity, leverage and substitutes for hedging. Firm size can affect derivatives use in several ways. First, the cost of setting up and managing a derivatives program may be unaffordable for small firms (Smith and Stulz, 1985). On the other hand, small firms often experience relatively high bankruptcy costs and thereby could use derivatives to hedge financial risk as a means of reducing these costs (Smith and Stulz, 1985; Mayers and Smith, 1987 and Stulz, 1996). To account for this we use the natural logarithm of the firm's total assets (*Size*).

Growth opportunities can also affect hedging decisions in the sense that investment and financing plans can be affected by unfavorable cash-flow fluctuations that force the firm to give up positive NPV projects or to resort to costly external financing (see, Froot et al., 1993). Hedging can offset this risk. We proxy for growth opportunities using the ratio of total capital expenditure to total assets (*Capex Ratio*).

We use the quick ratio (*Quick Ratio*) to control for the liquidity effect on the use of derivatives. This ratio is traditionally used to measure firm short-term solvency. It is measured as the ratio of cash accounts and marketable securities to short-term liabilities and is expected to be negatively related to the use of derivatives (Nance et *al.,* 1993; Géczy et *al.,* 1997 et Graham and Rogers, 2002). Dividend policy may also require the need for hedging in the short term to ensure the availability of funds (Nance et *al*, 1993). Thus, we include the dividend yield ratio (*Dividend Ratio*) measured as dividend divided by share price at year-end. In the longer term, hedging company cash flows can reduce the risk of bankruptcy caused by high levels of long term debt (Berkman and Bradbury, 1996 and Haushalter, 2000). To account for this we use the ratio of long-term debt to total assets (*Leverage*).

The second group refers to personal characteristics of the CEO that might affect risk aversion and derivatives use. There is evidence that older CEOs are more risk averse than younger CEOs because the costs of failure and the difficulty of getting rehired increase with age, especially as retirement age approaches (Beber and Fabbri, 2012). Thus, older executives would be more inclined to use derivatives to minimize random fluctuations in firm performance. To account for this we include the age of the CEO in years (*CEO_Age*) as a control variable. There is also evidence that the number of years that the CEO has held the position affects risk aversion and derivatives use. May (1995) considers that tenure length is a proxy of undiversified human capital. Mian (1996) echoes this and suggests that it is an indicator of firm specific managerial competence that has little or no value outside the firm. Thus, since hedging reduces the manager's human capital risk, firms where managers feature a long tenure period are more inclined to use derivatives. Gibbons and Murphy (1992), however, argue that managers with long tenure as CEO in the firm have a well-developed reputation and do not need to signal the quality of their management through hedging activities. To account for the effect of tenure we include the number of years that the CEO has held the position (*CEO_Tenure*) as a control variable, but have no prior as to its sign. The descriptive statistics of derivatives use and the control variables are displayed in Table 2.[9]

The average notional value of the portfolio of derivatives is 11.52% of total assets. Some firms in the sample do not use foreign currency derivatives. On average, the CEO is 55 years old and has been the CEO for more than 10 years. The sample includes large and small firms with an average *Size* of 21.22 (natural logarithm of total assets measured in millions). The average *Capex Ratio* of 0.0489 and that of the *Quick Ratio* is 1.017 whereas that of the *Dividend Ratio* is 2.16%.

[9] The appendix presents the pairwise correlation matrix. We note that *Derivatives* is negatively correlated to *University* and positively related to *School*. However, when schools are divided on two components '*Elite* and *School_non_elite*, the relation between *Derivatives* and *School_non_elite* becomes negative.

[Insert Table 2 about here]

4. Empirical results

4.1 CEO education and FC derivatives use

We start by testing for the effect of type, level and quality of training education on derivatives use (*Derivatives*). We run panel regressions with firm and year fixed effects. The firm fixed effect is designed to control for the unobservable firm characteristics influencing the level of derivatives use so that the CEO effect can be separated from firm characteristics.[10] The year fixed effects are included to control for unobserved year-specific effects.

[Insert Table 3 about here]

The results reported in Panel A (Table 3) test for the type of education training. They show that there is no significant relationship between the type of education and derivatives use.[11] None of the three variables- *Engineering*, *Management* and Other - are significant at any conventional level. Interestingly, however, the other CEO characteristics, *CEO_Age* and *CEO_Tenure*, are highly significant, suggesting that derivatives use increases with CEO age and decreases with CEO tenure. Older CEOs are more likely to use more foreign currency derivatives. This result is consistent with Beber and Fabbri (2012) and Bertrand and Schoar (2003), who show that older managers take less risk in corporate investment decisions and financial policies. However, long-tenured CEOs seem to use less derivatives since they are highly-

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[10] As a robustness test we also use propensity score matching to control for unobserved heterogeneity bias. See, section 3.4.2.

[11] Mandal and Doukas (2018) find similar results for their US sample.

confident about their way of managing the firm. Firm size, the quick ratio and leverage have a significant, negative effect on derivatives use.

The results in Panel B of Table 3 on education training level provide weak evidence that the level of education does affect derivatives use. When university levels stand alone, PhD has a weak, negative correlation with derivatives use. However, when combined with "*School*", its significance falls below the conventional 10% level, but *School* is positive and weakly significant. All the other significant control variables from Table 3- *CEO_Age*, *CEO_Tenure*, *Size*, *Quick Ratio* and *Dividend Ratio*– keep the same signs and remain significant.

Panel C (Table 3) distinguishes between the non-selective, non-utilitarian quality of university training traditionally oriented towards teaching, scholarship and research with the selective, utilitarian quality of the "*Grandes écoles*" oriented towards practical problems and decision-making. We find that University training education has no significant effect on derivatives use. "*Grandes écoles*" training, on the other hand, has a weakly significant, positive effect on derivatives use. This is consistent with the results of Panel B (Table 3) where we compared the effect of different training levels. All the other significant control variables from Panels A and B - *CEO_Age*, *CEO_Tenure* , *Size*, *Quick Ratio* and *Dividend Ratio*– keep the same signs and remain statistically significant.

To pursue the role that the "*Grandes écoles*" seem to play in derivatives use based on the results of Panels B and C of Table 3, we distinguish between the quality of the elite trio of *Polytechnique*, *ENA* and *HEC* (the variable, *Elite*) and the quality of all the other "*Grandes écoles*" (the variable *School_non_elite*). The results in Panel A (Table 4) provide some interesting results. They show a divergence between the elite trio and the other "*Grandes écoles*". Standing alone in column 1 "*Elite*" is a highly significant, positive determinant of derivatives use. In column 2 "*School_non_elite*" is negative and significant. When tested together, "*Elite*" remains positive and highly significant, while "*School_non_elite*" changes sign and loses its significance. We interpret this as evidence that only "elite" education has a significant effect on derivatives use.

[Insert Table 4 about here]

We perform two robustness tests to support the evidence that only "elite" education has a significant effect on derivatives use. First, we include university training (*University*). The results of column 4 (Table 4; Panel A) show that "*University*" is not significant and that its inclusion does not change the results in column 3 in any meaningful manner. Second, to make our results comparable to prior studies, we also include CEOs with an MBA degree (*MBA*). The results in column 5 (Table 4; Panel A) show that the variable *MBA* is not statistically significant and its inclusion leaves the preceding results substantially unchanged.[12]

As a further robustness test, we breakdown the variable "*Elite*" into its component parts (*Polytechnique*, *ENA*, *HEC*) to see if there is one particular school that is driving the results. Table 4 (Panel B) shows that the coefficients of all three schools are positive and significant at the 1% level. From this we can say that there is not one particular school that is driving the results. However, the coefficients differ considerably in magnitude. *ENA* has the highest coefficient and *HEC* has the lowest.

[12] This finding is similar to Mandal and Doukas (2018).

Contrary to results in Table 3 (Panel A), this is evidence that the type of training does affect derivatives use, but this is only true for Elite education.

4.2 Education indexes: Factor Analysis

As a further robustness check, we use factor analysis (FA) to construct a set of factors that act as barometers of educational attainment. In this context, FA acts as an exploratory technique that first establishes the dimensionality of the education construct, and then extracts the structure and composition of its dimensions. We then use these factors and their individual components to test the robustness of the foregoing results.

Before undertaking the factor analysis, we perform a number of preliminary tests to verify that our data is suitable for FA. To this end, we begin by using the Kaiser-Meyer-Olkin (KMO) measure to identify problematic variables and consider them for elimination.[13] Applying this iterative process to the education variables reported in Table 1, we eliminate any variables with a KMO below 0.6. The final sample includes five variables: *Undergraduate*, *Master*, *MBA*, *Elite* and *School_non_elite*. The overall KMO for these variables is 0.81 with a relatively high Cronbach alpha equal to 0.8,[14] which indicates that this data set is suitable for FA.

[Insert Table 5 about here]

[13] The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. Small KMO values (less than 0.5) suggest that FA should not be applied whereas KMO values larger than 0.8 indicate that the sample is especially well suited for the methodology.

[14] Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability.

Table 5 presents the outcomes of the resulting FA. Based on the Kaiser Criterion, we find two factors that capture 71.40% of the variance.[15] The first factor, representing 40.72% of the variation, is a combination of four key variables: *Undergraduate* degree, Masters degree, *Elite*, *School_non_elite*. These variables capture the education level. Hereafter, this factor is titled "*Education_level* ". The next factor loads significantly with *Elite* and *School_other_elite*. We interpret this factor as measuring the "*Education_quality*". It is interesting to note that, as in Table 4, this variable loads positively with "*Elite*" and negatively with *School_non_elite*. Following Tetlock (2007), Kaplan et al. (2012) and King et al. (2016), we use these factor loadings to estimate individual factor scores for each factor to obtain two new variables: "*Education_level*" and "*Education_quality*". These variables are then used to re-estimate the relationship between CEO education and derivatives use.

[Insert Table 6 about here]

The results in Table 6 show that *Education_level* is positive but not significant, which is consistent with the results for the effect of the level of education on derivatives (see, Table 3). *Education_quality*, which is driven positively by "*Elite*" and negatively by "*School_non_elite*", is positive and statistically significant. This result is consistent with that for the effect of education quality on derivatives use (see, Table 4) and underlines the importance of the "*Grandes écoles*" that is emerging from the study so far.

[15] The Kaiser Criterion suggests using only factors with an eigenvalue greater than 1.

4.3 Robustness checks

4.3.1 Industry fixed effects models

Firms in the same industry are likely to have similar constraints (e.g., investment, and technology, etc.) leading to similar financing requirements and potentially similar risk-taking profiles. Thus, derivatives use might vary systematically across industries together with the type of CEOs employed by firms in these industries. The firms in our sample belong to 11 industries following the classification of Campbell (1996). All the models in tables 3, 4 and 6 were re-run with industry fixed effects replacing firm fixed effects. The results not reported here but available on request are qualitatively similar to our main results. Only elite education has a significant positive effect on derivatives use.

4.3.2 Propensity score matched samples

This section addresses the situation where it is firm characteristics rather than CEO characteristics that determine firm derivatives use. For instance, firms with certain observable or unobservable characteristics, e.g., sophisticated, complex, belonging to certain industries, etc., may prefer to use more derivatives. To this end, we employ a propensity score matching procedure (Rosenbaum and Rubin, 1983). Propensity score matching allows us to identify a sample of firms that are managed by high *Education_quality* CEOs but reflect no observable differences in characteristics with respect to the firms run by CEOs with lower *Education_quality*. Thus, each pair of matched firms is virtually indistinguishable from the other except for one key characteristic, namely *Education_quality*. Matching on observable firm and CEO characteristics mitigates concerns related to non-random selection.

We begin by estimating a logit model in which the binary dependent variable is equal to 1 if the variable *Education_quality* is positive, and 0 otherwise. We include *Size*, *Capex Ratio*, *Quick Ratio*, *Leverage*, *Dividend Ratio* and *Derivatives* in the logit equation. This step allows us to determine a propensity score for each firm that represents a predicted probability that a firm with given characteristics is run by a CEO with high education quality. To ensure that the firms in the control sample are sufficiently similar to the firms run by CEOs with high *Education_quality*, we require that the maximum difference between the propensity score of the firm run by the high quality educated CEO and that of its matching peer does not exceed 0.1% in absolute value. Finally, we compare the level of derivatives use (*Derivatives*) between the two matched samples. The average of *Derivatives* of firms run by CEOs with high *Education_quality* is 0.1773 compared with 0.0982 for similar firms run by CEOs with lower Education quality. The difference is 0.0791 and statistically significant at the 1% level.[16] More importantly, this result suggests that the education related differences in derivatives use are not due to observable differences in firm characteristics and remain consistent with our previous findings.

4.3.3 Endogenous firm-CEO match

The direction of causality between CEO education and derivatives use is unclear *ex-ante*. It is possible that the matching of a CEO to a particular firm is not the result of random assignment and CEOs and firms select one another, leading to strong relationships between firm and CEO characteristics (Allgood and Farrell, 2003; Li and Ueda, 2006).

[16] The results are not reported but available from the authors upon request.

In our case, rather than CEO appointments affecting derivatives use, derivatives use may affect appointment decisions. For instance, CEOs with high education quality may prefer to be at the helm of firms using derivatives because they are more comfortable with this kind of financial instrument. Therefore, reverse causality could explain the relationship between CEO education and derivatives use. To account for endogenous firm-CEO matching, we use two approaches. The first is a two-step approach similar to King et al. (2016). It accounts for the possibility that better-educated CEOs are attracted by firms that use more derivatives. [17] We create a dummy variable, denoted as Top_Deriv_Use, that equals 1 if the firm is ranked in the top 25% percentile by *Derivatives* and 0 otherwise and use the following specification

$$Top\_Deriv\_Use_{i,t} = \beta_0 + \beta_1\, Elite_{i,t} + \beta_2 School\_non\_elite_{i,t} + \beta_2 University_{i,t} + \varepsilon_{i,t}$$

This step allows us to use estimated probabilities that a CEO selects into a firm that has a high level of derivatives use. In step two, we use the estimated probabilities that capture the likelihood of a CEO being selected into a firm with high levels of derivatives use as probability weights and repeat our main analysis. The results reported in Table 7, reinforce our main findings; only "*Elite*" education has a positive and statistically significant effect on FC derivatives use and the *Education_quality* variable is positive and statistically significant. The effect of other non-elite schools remains negative as in Table 4.

[Insert Table 7 about here]

[17] The two-equation Heckman selection approach cannot be applied here because one does not really know or have data on CEO selection criteria.

The second approach addresses the potential endogeneity problem using the approach of Michaely et al. (2016). It restricts the sample to firms that experienced changes in CEOs with different educational backgrounds. By doing so, it avoids the overlap between CEO characteristics and firm characteristics and controls for unobserved firm characteristics that influence firm hedging policies. We end up with a sample of 42 firms and 378 firm-year observations; 122 with *Elite* equals 1, 135 with *School_non_elite* equals 1, and 120 with *University* equals 1. We have one case where CEO has no degree in higher education. The results reported in Table 8, confirm our main findings that elite education has a positive and significant effect on FC derivatives use and the *Education_quality* variable is positive and significant. As in Tables 4 and 7 the effect of other non-elite schools remains negative.

[Insert Table 8 about here]

5. Does derivatives use increase firm value?

5.1. The main analysis

Having established the strong positive relationship between elite education and the use of derivatives, we turn to the question of how the use of derivatives affects firm value.

The proxy for firm value using the natural logarithm of Tobin's Q (*LnTobinQ*) where Tobin's Q is defined as the market capitalization of equity plus the book value of debt divided by the book value of total assets. To examine the effect of derivatives use on firm value, we control for other known drivers of value (e.g. Allayannis and Weston, 2001). These factors are firm size, investment opportunities, liquidity, leverage, profitability and the ability to access to financial markets.

The proxy for firm size is the natural logarithm of total assets (*Size*). A number of studies, such as Nance et al. (1993), Mian (1996) and Géczy et al. (1997), have found that because of the high start-up costs necessary to develop a hedging program, large firms are more likely than small firms to use derivatives. There is, however, some ambiguity as to how size affects firm value (e.g. Allayannis and Weston, 2001). Consequently, we have no prior on the sign.

For investment opportunities we use the *Capex Ratio*, defined as the ratio of capital expenditures to sales. As Froot et al. (1993) and Géczy et al. (1997) have argued, firms that hedge are more likely to have more investment opportunities. Allayannis and Weston (2001) find weak evidence of a positive relation between the *Capex Ratio* and firm value. Thus, we expect a positive relationship between the *Capex Ratio* and Tobin's Q.

The Quick Ratio (*Quick Ratio*), defined as the ratio of cash accounts and marketable securities to short term liabilities, proxies for liquidity. Based on the free cash flow argument of Jensen (1986) that firms with excess free cash flow are more likely to invest in projects with negative NPV, firms that are cash constrained may have higher Tobin's Qs because they are more likely to invest in predominantly positive NPV projects. From this we expect a negative relationship between the *Quick Ratio* and Tobin's Q.

Following Allayannis and Weston (2001) and Jin and Jorion (2006), we use the dividend yield (*Dividend Ratio*) as the proxy for access to financial markets. One argument is that limited access to financial markets would have a positive effect on Q ratios because only those projects with the highest NPVs could be undertaken (Lang and Stulz, 1994; Allayannis and Weston, 2001; Jin and Jorion, 2006). Given this interpretation, the expected coefficient would be negative. Another argument, however, says that dividends can be viewed as a positive signal from management, which should imply a positive coefficient (e.g., Fazzari et al., 1988). Thus, we have no prior expectation on the sign of the relationship between the *Dividend Ratio* and Tobin's Q.

The variable, *Leverage*, defined above as the ratio of long-term debt to total assets, proxies for the measure of the firm's capital structure. Other things being equal, higher leverage reflects a higher probability of financial distress and a negative effect on firm value. The tax shield on the other hand reflects a positive effect (see, for instance, Haushalter, 2000; and Graham and Rogers, 2002). Thus, we have no a priori on the sign of the relationship between *Leverage* and Tobin's Q.

As defined above, the proxy for profitability is return on assets (*ROA*), the ratio of earnings before interest and taxes to total assets. Based on the argument that the market is likely to reward more profitable firms with higher values, we expect *ROA* to be positively related to Tobin's Q.

We first examine the value of the use of derivatives unconditionally without taking into account differences in CEO education. We then estimate the regression for the sample of firms with CEOs graduated from the French elite schools (*Elite*=1) and for the other firms with *Elite*=0. We use three estimation techniques for these tests: pooled OLS with clustered errors at the firm level, the fixed effect specification to account for unobserved firm heterogeneity and dynamic panel model methodology to control for the potential endogeneity of derivatives use. The preferred estimator for this is the dynamic Generalised Method of Moments (GMM) system estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) because (a) the panel consists of a small number of time periods (small *T*) and a large number of firms (large *N*); (b) the dependent variable, *LnTobinQ*, is dynamic in the sense that a firm performance is likely to depend on past realizations and experience time clustering[18]; c) the GMM system explicitly allows for heteroscedasticity and autocorrelation within firms. These dynamic panel data estimations are characterized by two sources of persistence over time, namely, autocorrelation due to the presence of a lagged-dependent variable among the regressors and individual effects characterizing the heterogeneity among the individuals (Baltagi, 2010).

The GMM approach of Arrelano and Bover (1995) and Blundell and Bond (1998) allows us to treat all the explanatory variables as endogenous (except year dummies) and orthogonally uses their past values as their respective instruments. The consistency of the GMM estimates is subject to an optimal choice of instruments and the absence of higher-order serial correlation in the idiosyncratic error term. The results of the GMM system of tests reported in Table 9 support the consistency of the estimates. The Hansen J-statistic is not significant, indicating that the instruments used in the GMM estimation are valid. As expected, the *AR(1)* and *AR(2)* tests confirm the existence of serial correlation of order one, but not of order two. Also, the dynamic nature of firm performance is confirmed. Specifically, the estimated coefficient of the previous year's performance ($LnTobinQ_{t-1}$) is positive and statistically significant.

[18] Moreover, Bond (2002, p.1) argues that "*even when coefficients on lagged dependent variables are not of direct interest, allowing for dynamics in the underlying process may be crucial for recovering consistent estimates of other parameters*."

Table 9 reports the results for the three specifications. In all three specifications derivatives use has a positive effect on firm value (Specifications on all firms). These results are consistent with Allayannis and Weston (2001), Carter et al. (2006) and Clark and Mefteh (2010), among others. However, when the sample is broken down into elite and non-elite groups, the importance of elite training becomes obvious. Derivatives use in firms with an elite educated CEO (*Elite*=1) has a positive, highly significant effect on firm value in all three specifications. However, the results are different when the CEO is not elite educated (*Elite* = 0). In the pooled specification (Panel A) derivatives use has a highly significant negative effect on firm value. In the fixed effect specification (Panel B) derivatives use has a negative, non-significant effect and in the dynamic GMM specification (Panel C) the effect is positive but not significant.

[Insert Table 9 about here]

5.2 Robustness tests

Thus far, our results show that when the CEO is graduated from an elite school, FC derivatives are used effectively resulting in an increase in firm value. To check the robustness of these results, we re-run our regressions using the variable *Education_quality* calculated using the factor analysis to construct two sub samples. Recall that this variable loads significantly with the variables *Elite* (positively) and *School_other_elite* (negatively). From this we construct two sub-samples: A sub-sample of firm values for firms with negative values for *Education_quality* and another sub-sample of firm values for firms with positive values for *Education_quality*. The results are reported in Table 10. They are broadly similar to those of Table 9. For firms with positive (negative) values of *Education_quality* derivatives use is positive (negative) and statistically significant (not significant). These results reinforce our earlier results and provide more reinforcing evidence that elite education is driving the profitable use of FC derivatives.

[Insert Table 10 about here]

6. Summary and conclusions

In this paper we take advantage of the clear-cut distinctions of the French educational system to empirically evaluate the effect of the level, type and quality of educational training on firm derivatives use and the effect of the latter on firm value. Our main finding is that elite institutions including, *Polytechnique*, *ENA* and *HEC* are the only aspect of the French educational system with any significant influence on derivatives use and firm performance. More specifically, we find that "elite" education reflected in these three institutions, together and standing alone, has a positive, strongly significant impact on derivatives use. We also find that across these three institutions, the type of training affects derivatives use. *ENA*, the political educational school, has the largest effect, *HEC*, the business school, has the second largest and *Polytechnique*, the engineering school, has the lowest. Outside of these three institutions, we find no significant relationship between the type of training and derivatives use and between the level of education and derivatives use. These results are robust to a battery of tests that includes alternative estimation techniques, use of different subsamples, additional control variables, and control for endogeneity.

The role the elite institutions is clearer when we assess the effect of derivatives use on firm performance. We find that for whole sample the use of derivatives does increase firm performance. However, when we break down the sample according to education quality, derivatives use is positive and significant only for firms with CEOs coming from the three elite schools. It is negative but not always significant for non-elite CEOs.

Overall, we can attribute the foregoing results to three factors acting together. The first one refers to the attractiveness of the elite institutions and the very selective merit system that ensures an exceptionally high level of students. The second one is the utilitarian culture of the "*Grandes écoles*" oriented towards practical matters and decision-making that are so important for effective risk management. The third factor refers to the amount and quality of the financial and human resources employed in the elite training.

Appendix. Pairwise correlation matrix of variables.

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
(1) Derivatives	1.0000											
(2) Management	0.0577	1.0000										
(3) Engineering	0.0122	**-0.0484***	1.0000									
(4) Other_high_education	-0.1001	**-0.0527***	**-0.3091***	1.0000								
(5) Undergraduate	-0.0504	**0.1318***	**-0.3081***	**0.1326***	1.0000							
(6) Master	-0.0593	-0.0346	**-0.0737***	**0.0987***	**-0.1033***	1.0000						
(7) Phd	-0.0181	-0.0344	**-0.0656***	**0.1617***	**-0.1493***	**-0.0754***	1.0000					
(8) University	**-0.0680****	**0.0613***	**-0.3559***	**0.2629***	**0.0697***	**0.2920***	**0.1694***	1.0000				
(9) School	**0.1071****	0.0369	**0.0409***	**-0.0445***	**-0.0650***	**-0.3472***	**-0.1255***	**-0.0885***	1.0000			
(10) Elite	**0.2337*****	-0.0587	**0.3424***	**-0.2653***	**-0.2751***	**-0.1470***	**-0.1515***	**-0.3750***	**0.4235***	1.0000		
(11) School_non_elite	**-0.1165***	**0.0889***	**0.0655***	**-0.1706***	**-0.3533***	**-0.1884**	0.0231	**-0.3807***	**0.5428***	-0.3310	1.0000	
(12) MBA	**0.0892**	**0.2322***	**-0.1839***	**-0.1225***	**-0.1221***	**0.1904***	0.0212	-0.0315	0.0585	-0.1738	**0.2158***	1.0000
(13) Polytechnique	**0.1465*****	**-0.3829***	**0.0475***	**-0.1539***	**-0.1877***	**-0.0948***	-0.0586	**-0.2418***	**0.2731****	0.6448	**-0.3424***	**-0.1121***
(14) ENA	**0.1862*****	**0.1860***	**0.1286***	**-0.1312***	**-0.1125***	**-0.0660***	**-0.0954***	**-0.1684***	**0.1902****	0.4492	**-0.2385***	**-0.0781***
(15) HEC	**0.0190****	**0.2339***	**-0.1852***	**-0.1234***	**-0.1134***	**-0.0621***	**-0.0898***	**-0.1585***	**0.1789***	0.4225	**-0.2244***	**-0.0734***
(16) *CEO_Age*	**0.1232****	**0.0944***	**0.0695***	**-0.1886***	**-0.1584***	0.0535	**0.0802***	-0.0100	0.0192	0.1178	**-0.0917***	**0.0682***
(17) CEO_Tenure	**-0.1272****	**-0.0878***	**-0.1311***	**0.1888***	-0.0007	**-0.1078***	**0.1935***	**0.0764***	**-0.2096***	-0.2511	0.0388	-0.0344
(18) Size	**0.0929***	0.0025	**0.2226***	**-0.1797***	-0.0427	-0.0161	-0.1644	**-0.1208***	0.1507	0.3242	**-0.1596***	**-0.0724***
(19) Capex Ratio	-0.0037	-0.0035	-0.0422	**0.0839***	**-0.0604***	-0.0100	-0.0258	**-0.0705***	0.0518	-0.0452	**0.0903***	0.0781
(20) Quick Ratio	-0.0126	-0.0426	-0.0585	0.0567	-0.0162	0.1303	**0.0972***	**0.0791***	-0.0455	-0.2029	**0.1459***	0.0421
(21) Leverage	**-0.0673***	0.0167	-0.0004	0.0313	0.0505	-0.0463	-0.0332	**-0.0878***	0.0365	0.0489	-0.0112	**0.0650***
(22) Dividend Ratio	**-0.0731***	0.0399	0.0816	-0.1023	**-0.1251***	0.0484	**-0.1127***	**-0.0895***	**0.0877***	0.1201	-0.0290	0.0504

Continued

	(13)	*(14)*	*(15)*	(16)	*(17)*	*(18)*	*(19)*	*(20)*	*(21)*	*(22)*
(13) Polytechnique	1.0000									
(14) ENA	**-0.1200***	1.0000								
(15) HEC	**-0.1129***	**-0.0786***	1.0000							
(16) CEO_Age	**0.0757***	**0.1362***	-0.0381	1.0000						
(17) CEO_Tenure	**-0.1745***	**-0.1637***	-0.0343	**0.2406****	1.0000					
(18) Size	**0.2211***	**0.2891***	-0.0311	**0.2235****	**-0.3318***	1.0000				
(19) Capex Ratio	-0.0467	0.0112	-0.0277	**0.0645*****	-0.0361	0.0187	1.0000			
(20) Quick Ratio	**-0.1687***	**-0.1170***	-0.0053	**-0.1548*****	**0.1543****	**-0.0403****	-0.0856	1.0000		
(21) Leverage	0.0380	**0.0888***	-0.0588	**0.0670****	-0.0493	**0.2539***	0.1415	**-0.2352****	1.0000	
(22) Dividend Ratio	0.0315	**0.0900***	**0.0774**	**0.1859****	-0.0804	**0.2805*****	0.0940	**-0.0608****	0.0225	1.0000

This appendix shows Pearson pairs-wise sample correlations. Coefficients in bold are significant at the 5% level or better. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *Management* is a dummy variable that takes the value of 1 if the CEO has training in management and 0 otherwise. *Engineering* is a dummy variable that takes the value of 1 if the CEO is an Engineer but doesn't hold an *MBA* and 0 otherwise. *Other_high_education* is a dummy variable that takes the value of 1 if the CEO has higher education training in a subject other than management or engineering and 0 otherwise. *Undergraduate* is a dummy variable that takes the value of 1 if the CEO holds only an undergraduate degree (i.e., DEUG or "licence", a two or three year university undergraduate degree, respectively) and 0 otherwise. *Master* is a dummy variable that takes the value of 1 if the CEO holds only a "Master" degree and 0 otherwise. *Phd* is a dummy variable that takes the value of 1 if the CEO holds a Phd degree and 0 otherwise.. *University* is a dummy variable that takes the value of 1 if the CEO is graduated from the university and 0 otherwise. *School* is a dummy variable that takes the value of 1 if the CEO is graduated from a School and 0 otherwise. *Elite* is a dummy variable that takes the value of 1 if the CEO is graduated from one of the French elite schools (*ENA*, *Polytechnique* and *HEC*), and 0 otherwise. *School_non_elite* is a dummy variable that takes the value of 1 if the CEO is graduated from a School other than *ENA*, *Polytechnique* or *HEC* and 0 otherwise. *MBA* is a dummy variable that takes the value of 1 if the CEO holds an *MBA* and 0 otherwise. *Polytechnique* is a dummy variable that takes the value of 1 if the CEO is graduated from *Polytechnique* and 0 otherwise. *ENA* is a dummy variable that takes the value of 1 if the CEO is graduated from *ENA* and 0 otherwise. *HEC* is a dummy variable that takes the value of 1 if the CEO is graduated from HEC and 0 otherwise. *CEO_Age* is the CEO's age in years *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets. *Capex Ratio* is the ratio of total capital expenditure to total assets (millions). *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio* is the dividend per share divided by the share price.
***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

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Table 1. CEO elite education variables

Panel A. Education variables

This table presents the variables used to describe CEO elite Education background. Three categories of variables are presented, namely, education type, education level, and education quality.

No higher education	*No_degree*	A dummy A dummy variable that takes the value of 1 if the CEO has no higher education degree and 0 otherwise.
Education type	*Engineering*	A dummy variable that takes the value of 1 if the CEO is an Engineer without an MBA, and 0 otherwise.
	Management	A dummy variable that takes the value of 1 if the CEO has received management training, and 0 otherwise.
	Other_high_education	A dummy variable that takes the value of 1 if the CEO has higher education training in a subject other than management and engineering and 0 otherwise.
Education level	*Undergraduate*	ummy variable that takes the value of 1 if the CEO holds only an undergraduate degree (i.e., DEUG or "licence", a two or three year university undergraduate degree, respectively), and 0 otherwise.
	Master	A dummy variable that takes the value of 1 if the CEO holds only a "Master" degree and 0 otherwise.
	Phd	A dummy variable that takes the value of 1 if the CEO holds a Phd degree and 0 otherwise.
	School	A dummy variable that takes the value of 1 if the CEO is graduated from a-School and 0 otherwise.
Education quality	*University*	A dummy variable that takes the value of 1 if the CEO is graduated from the university and 0 otherwise.
	School	A dummy variable that takes the value of 1 if the CEO is graduated from a School and 0 otherwise
	Elite	A dummy variable that takes the value of 1 if the CEO is graduated from one of the French elite schools (*ENA*, Polytechnique and HEC), and 0 otherwise
	School_non_elite	A dummy variable that takes the value of 1 if the CEO is graduated from a non-elite School (other than *ENA*, Polytechnique and HEC), and 0 otherwise.
	HEC	A dummy variable that takes the value of 1 if the CEO is graduated from HEC, and 0 otherwise.
	Polytechnique	A dummy variable that takes the value of 1 if the CEO is graduated from *Polytechnique* and 0 otherwise.
	ENA	A dummy variable that takes the value of 1 if the CEO is graduated from the *ENA*, and 0 otherwise.
	MBA	A dummy variable that takes the value of 1 if the CEO holds an MBA degree, and 0 otherwise.

Panel B. The frequency distribution of the education variables

This panel shows the frequency distribution of the education variables. The sample consists of French listed firms observed over 2004–2012 with a total of 1089 firm/year observations. 4.86% (53 out of 1089) of firms are headed by CEOs with no degree in higher education.

	Number of observations with variable equals to		Number of observations
Variables	**0**	**1**	
No_degree	1036	53	
Engineering	865	224	
Management	463	626	
Other_high_education	903	186	
Total			**1089**
No_degree	1036	53	
University	813	276	
School	329	760	
Total			**1089**
University components			
Undergraduate	918	171	
Master	1035	54	
Phd	1038	51	
Total			**276**
School components			
School_non_elite	649	440	
Elite	769	320	
Total			**760**
***Elite* Components**			
Polytechnique	929	160	
ENA	1 004	85	
HEC	1 014	75	
Total			**320**
MBA	1 015	74	

Table 2. Descriptive statistics for derivatives use and control variables.

This table presents summary statistics of the dependent variable and the control variables in the model (1). *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *CEO_Age* is the CEO's age in years *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets measured in millions. *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price.

	Minimum	First quartile	Mean	Media	Third quartile	Maximum	Standard deviation
Dependant variable							
Derivatives	0.0000	0.0000	0.1152	0.0999	0.8225	1.0000	0.2211
Control variable							
CEO_Age (years)	35.0000	49.0000	55.1008	54.0000	60.0000	79.0000	7.5409
CEO_Tenure (years)	0.0000	3.0000	10.2635	8.0000	17.0000	47.0000	9.8784
Size	15.6763	18.9511	21.2216	20.3925	22.2508	26.1974	2.3140
Capex Ratio	0.0011	0.0335	0.0489	0.0578	0.4410	0.4686	0.0474
Quick Ratio	0.2375	0.7031	1.0171	0.8993	1.1638	3.7579	0.5114
Leverage	0.0000	0.0615	0.1652	0.1580	0.2626	0.5828	0.1246
Dividend Ratio	0.0000	0.0000	0.0216	0.0668	0.0999	0.1241	0.0198

Table 3. CEO education and derivatives use

This table reports the results of regressing *Derivatives* on CEO education variables, CEO characteristics and firm characteristics. The sample consists of large non-financial firms observed in the period 2004 to 2012 with a total of 1,089 firm/year observations. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *Engineering* is a dummy variable that takes the value of 1 if the CEO is an Engineer but doesn't hold an MBA and 0 otherwise. *Management* is a dummy variable that takes the value of 1 if the CEO has training in management and 0 otherwise. *Other_high_education* is a dummy variable that takes the value of 1 if the CEO has higher education training in a subject other than management or engineering and 0 otherwise. *Undergraduate* is a dummy variable that takes the value of 1 if the CEO holds only an undergraduate degree (i.e., DEUG or "licence", a two or three year university undergraduate degree, respectively), and 0 otherwise. A dummy variable that takes the value of 1 if the CEO holds only a "Master" degree and 0 otherwise. *Phd* is a dummy variable that takes the value of 1 if the CEO holds a Phd degree and 0 otherwise. *School* is a dummy variable that takes the value of 1 if the CEO is graduated from a School and 0 otherwise. *University* is a dummy variable that takes the value of 1 if the CEO is graduated from the university and 0 otherwise. *CEO_Age* is the CEO's age in years, *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets (millions). *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price. All continuous variables are winsorized at the 1st and 99th percentiles. The model includes year fixed effects and firm fixed effects. *P-values* are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

Variables	**Panel A. Education type**	**Panel B. Education level**		**Panel C. Education quality**		
Engineering	0.0112					
	(0.7660)					
Management	0.0055					
	(0.8880)					
Other_high_education	–0.0840					
	(0.1011)					
Undergraduate		0.0424	0.0294			
		(0.5731)	(0.696)			
Master		0.0126	–0.0355			
		(0.6420)	(0.4161)			
Phd		–0.114*	–0.0508			
		(0.0742)	(0.5101)			
School			0.0657*		0.0494 *	0.0604**
			(0.0611)		(0.0590)	(0.0407)
University				–0 .0454*		–0 .0119

				(0.0883)		(0.8720)
CEO_Age	0.0037**	0.0458***	0.0450***	0.0043***	0.0041***	0.0041***
	(0.0172)	(0.0035)	(0.0042)	(0.0053)	(0.0071)	(0.0077)
CEO_Tenure	–0.0035***	–0.0359***	–0.0359***	–0.0039***	–0.0037***	–0.0036***
	(0.0050)	(0.0052)	(0.0050)	(0.0016)	(0.0033)	(0.0048)
Size	–0.0204***	–0.0200***	–0.0197***	–0.0191***	–0.0192***	–0.0193***
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)
Capex Ratio	0.0012	0.00145	0.00136	0.0013	0.0014	0.0014
	(0.569)	(0.492)	(0.518)	(0.525)	(0.520)	(0.518)
Quick Ratio	–0.0335**	–0.0339**	–0.0345**	–0.0353**	–0.0348**	–0.0347**
	(0.0298)	(0.0286)	(0.0259)	(0.0225)	(0.0242)	(0.0249)
Leverage	–0.0559	–0.0630	–0.0704	–0.0664	–0.0655	–0.0649
	(0.3621)	(0.3050)	(0.2531)	(0.2792)	(0.2852)	(0.2901)
Dividend Ratio	–0.0107***	–0.0103**	–0.0105**	–0.0105**	–0.0104**	–0.0104**
	(0.0098)	(0.0130)	(0.0115)	(0.0115)	(0.0120)	(0.0124)
Constant	0.382***	0.272*	0.274*	0.332***	0.293**	0.284**
	(0.0049)	(0.0564)	(0.0536)	(0.0095)	(0.0213)	(0.0451)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1089	1089	1089	1089	1089	1089
R-squared	0.110	0.0746	0.0736	0.0700	0.0710	0.0714

Table 4. Quality of training: Elite schools versus non-elite schools

This table reports the results of regressing *Derivatives* on CEO education variables, CEO characteristics and firm characteristics. The sample consists of large non-financial firms observed in the period 2004 to 2012 with a total of 1,089 firm/year observations. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *Elite* is a dummy variable that takes the value of 1 if the CEO is graduated from one of the French prestigious schools *ENA*, Polytechnique or HEC and 0 otherwise. *School_non_elite* is a dummy variable that takes the value of 1 if the CEO is graduated from a School other than *ENA*, Polytechnique or HEC and 0 otherwise. *University* is a dummy variable that takes the value of 1 if the CEO is graduated from the university and 0 otherwise. *MBA* is a dummy variable that takes the value of 1 if the CEO holds an MBA and 0 otherwise. *Polytechnique* is a dummy variable that takes the value of 1 if the CEO is graduated from *Polytechnique* and 0 otherwise. *ENA* is a dummy variable that takes the value of 1 if the CEO is graduated from *ENA* and 0 otherwise. *HEC* is a dummy variable that takes the value of 1 if the CEO is graduated from HEC and 0 otherwise. *CEO_Age* is the CEO's age in years *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets (millions). *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price. All continuous variables are winsorized at the 1st and 99th percentiles. The models include year fixed effects and firm fixed effects. *P-values* are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

Variables	Panel A. Quality of Training: Elite Schools versus Non-Elite Schools					Panel B. *Polytechnique* vs *ENA* versus *HEC*
Elite	0.107***		0.115***	0.120*	0.117*	
	(0.0000)		(0.000182)	(0.0948)	(0.0904)	
School_non_elite		–0.0470**	0.0118	0.0176	0.0082	
		(0.0362)	(0.6651)	(0.8041)	(0.9091)	
University				0.0062	0.0089	
				(0.9313)	(0.9015)	
MBA					0.0678	
					(0.3950)	
Polytechnique						0.1292***
						(0.0003)
ENA						0.1391***
						(0.0005)
HEC						0.0681***

						(0.0012)
School_non_elite						0.0104
						(0.704)
CEO_Age	0.0034**	0.0043***	0.0034**	0.0034**	0.0036**	0.00318**
	(0.0233)	(0.0048)	(0.0251)	(0.0269)	(0.0193)	(0.0375)
CEO_Tenure	–0.0036***	–0.0041***	–0.0035***	–0.0035***	–0.0033***	–0.0032***
	(0.0027)	(0.0006)	(0.0036)	(0.0051)	(0.0079)	(0.0086)
Size	–0.0207***	–0.0192***	–0.0208***	–0.0209***	–0.0203***	–0.0214***
	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Capex Ratio	0.0018	0.0018	0.0017	0.0017	0.0015	0.00170
	(0.391)	(0.3892)	(0.4061)	(0.4061)	(0.4802)	(0.4192)
Quick Ratio	–0.0347**	–0.0347**	–0.0347**	–0.0347**	–0.0354**	–0.0351**
	(0.0236)	(0.0248)	(0.0236)	(0.0241)	(0.0212)	(0.0221)
Leverage	–0.0696	–0.0641	–0.0697	–0.0693	–0.0754	–0.0686
	(0.2532)	(0.2951)	(0.2523)	(0.2564)	(0.2164)	(0.2631)
Dividend Yield	–0.0108***	–0.0102**	–0.0109***	–0.0108***	–0.0108***	–0.0107***
	(0.0083)	(0.0134)	(0.0082)	(0.0084)	(0.0085)	(0.0091)
Constant	0.365***	0.342***	0.361***	0.358**	0.330**	0.380***
	(0.0038)	(0.0078)	(0.0046)	(0.0113)	(0.0202)	(0.0022)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1089	1089	1089	1089	1089	1089
R-squared	0.0714	0.0666	0.0698	0.0701	0.0755	0.0704

Table 5. Factor Analysis

This table presents factor loadings of the first two factors based on five education characteristics for 1089 firm-year observations in our sample from 2004 to 2012. Factor loadings are calculated using a normalised orthogonal varimax rotation. Undergraduate is a dummy variable that takes the value of 1 if the CEO holds at least a DEUG and at best a "licence" (a two or three-year university undergraduate degree) from the university and 0 otherwise. Master is a dummy variable that takes the value of 1 if the CEO holds at least a "Masters" from the university but not a Phd and 0 otherwise. *MBA* is a dummy variable that takes the value of 1 if the CEO holds an *MBA* and 0 otherwise. Elite is a dummy variable that takes the value of 1 if the CEO is graduated from one of the French prestigious schools *ENA*, *Polytechnique* or *HEC* and 0 otherwise. School_non_elite is a dummy variable that takes the value of 1 if the CEO is graduated from a School other than *ENA*, *Polytechnique* or *HEC* and 0 otherwise. Factor loadings with absolute value less than 0.5 are blank (as in King et al. (2016)). The factors have been sorted by the percentage of variance explained.

Variables	Factor 1	Factor 2
Undergraduate	–0.8846	
Master	0.9068	
MBA		
PhD		
Elite		0.9026
School_non_elite		–0.8415
Eigenvalue	2.0357	1.5345
% Variance explained	0.4072	0.3069
Cumulative % variance explained	0.4072	0.7140

Table 6. The Effect of Education Level and Quality on Derivatives Use

This table reports the results of regressing *Derivatives* on CEO education level and quality, CEO characteristics and firm characteristics. The sample consists of large non-financial firms observed in the period 2004 to 2012 with a total of 1,089 firm/year observations. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *Education_level* represents the first factor scores and *Education_quality* the second factor scores obtained from the factor analysis. *CEO_Age* is the CEO's age in years *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets. *Capex Ratio* is the ratio of total capital expenditure to total assets (millions). *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio* is the dividend per share divided by the share price. All continuous variables are winsorized at the 1st and 99th percentiles. The model includes year fixed effects and firm fixed effects. *P-values* are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

Variables	(1)
Education_level	0.0171
	(0.1992)
Education_quality	0.0423***
	(0.0001)
CEO_Age	0.0035**
	(0.0209)
CEO_Tenure	–0.0037***
	(0.0020)
Size	–0.0209***
	(0.0000)
Capex Ratio	0.0017
	(0.4010)
Quick Ratio	–0.0349**
	(0.0230)
Leverage	–0.0665
	(0.2752)
Dividend Ratio	–0.0108***
	(0.0085)
Constant	0.396***
	(0.0020)
Firm fixed effects	Yes
Year fixed effects	Yes
Observations	1089
R-squared	0.0499

Table 7. Robustness checks: endogenous firm-CEO matching (A two-step approach)

This table shows the impact of the CEO education variables on the derivatives use (*Derivatives*) whilst controlling for potential CEO-firm endogenous selection bias. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. . *Elite* is a dummy variable that takes the value of 1 if the CEO is graduated from one of the French prestigious schools ENA, *Polytechnique* or HEC and 0 otherwise. *School_non_elite* is a dummy variable that takes the value of 1 if the CEO is graduated from a School other than ENA, *Polytechnique* or *HEC* and 0 otherwise. *University* is a dummy variable that takes the value of 1 if the CEO is graduated from the university and 0 otherwise. *Education_level* represents the first factor scores and *Education_quality* the second factor scores obtained from the factor analysis. *CEO_Age* is the CEO's age in years *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets. *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price. We include in the regressions, eight individual dummy variables which equal either one or zero for each year from 2005 to 2012, with 2004 being the excluded year. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

Variables	Equation1	Equation2	Equation3	Equation4	Equation5
Elite	0.0946***			0.0610*	
	(0.0044)			(0.0747)	
School_non_elite		–0.0587**		–0.0348	
		(0.0236)		(0.2803)	
University			–0.0447	–0.0320	
			(0.1112)	(0.3144)	
Education_level					0.0102
					(0.1351)
Education_quality					0.0395***
					(0.0000)
CEO_Age	0.0058**	0.0062**	0.0066**	0.00579***	0.0057***
	(0.0276)	(0.0200)	(0.0122)	(0.0000)	(0.0000)
CEO_Tenure	–0.0044**	–0.0051**	–0.0052**	–0.0044***	–0.0044***
	(0.0294)	(0.0110)	(0.0121)	(0.0000)	(0.0000)
Size	0.0014	0.0037	0.0051	0.0014	0.0016
	(0.8671)	(0.6452)	(0.5203)	(0.7921)	(0.7513)
Capex Ratio	0.0014	0.0015	0.0004	0.0014	0.0015
	(0.7922)	(0.7832)	(0.9914)	(0.5945)	(0.5754)
Quick Ratio	0.0196	0.0135	0.0093	0.0198	0.0186
	(0.5520)	(0.6801)	(0.7781)	(0.2970)	(0.3270)
Leverage	–0.268**	–0.273***	–0.286***	–0.268***	–0.262***
	(0.0119)	(0.00910)	(0.00723)	(0.0000)	(0.0000)
Dividend Ratio	–0.0203**	–0.0191**	–0.0195**	–0.0203***	–0.0204***
	(0.0127)	(0.0171)	(0.0134)	(0.0000)	(0.0000)
Constant	–0.1690	–0.1701	–0.2193	–0.1356	–0.1392
	(0.3602)	(0.3454)	(0.2333)	(0.2616)	(0.2501)
Year effect	Yes	Yes	Yes	Yes	Yes
Observations	1,089	1,089	1,089	1,089	1,089
R–squared	0.135	0.116	0.109	0.136	0.132

Table 8. Robustness checks: endogenous firm-CEO matching (test on sample of firms that changed CEO with different educational background)

This table shows the impact of the CEO education variables on the derivatives use (*Derivatives*). The sample is restricted to firms that changed CEO with different educational background. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. . *Elite* is a dummy variable that takes the value of 1 if the CEO is graduated from one of the French prestigious schools ENA, *Polytechnique* or *HEC* and 0 otherwise. *School_non_elite* is a dummy variable that takes the value of 1 if the CEO is graduated from a School other than ENA, *Polytechnique* or *HEC* and 0 otherwise. *University* is a dummy variable that takes the value of 1 if the CEO is graduated from the university and 0 otherwise. *Education_level* represents the first factor scores and *Education_quality* the second factor scores obtained from the factor analysis. *CEO_Age* is the CEO's age in years *CEO_Tenure* is the number of years that the CEO has been the CEO. *Size* is the natural logarithm of the firm's total assets. *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price. We include in the regressions, eight individual dummy variables which equal either one or zero for each year from 2005 to 2012, with 2004 being the excluded year. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively. The sample is restricted to firms that changed CEO with different educational backgrounds

Variables	Equation1	Equation2	Equation3	Equation4	Equation5
Elite	0.0868***			0.106***	
	(0.0073)			(0.0052)	
School_non_elite		–0.0055**		0.0379	
		(0.027)		(0.818)	
University			–0.0791	–0.0244	
			(0.848)	(0.882)	
Education_level					0.0276**
					(0.0295)
Education_quality					0.0290**
					(0.0431)
CEO_Age	0.00758*	–0.0011*	0.0001*	90.0001*	–0.0059*
	(0.0709)	(0.0601)	(0.0972)	(0.0965)	(0.0773)
CEO_Tenure	–0.0032*	0.0096	0.0164	0.0085*	0.0049*
	(0.0855)	(0.594)	(0.358)	(0.0634)	(0.0782)
Size	–0.0276***	–0.0283***	–0.0334***	–0.0301***	–0.0296***
	(0.0067)	(0.0068)	(0.0015)	(0.0034)	(0.0042)
Capex Ratio	0.0050*	0.0047*	0.0041	0.0044	0.0045
	(0.0690)	(0.0910)	(0.1430)	(0.1101)	(0.1063)
Quick Ratio	0.0873***	0.0917***	0.0949***	0.0920***	0.0908***
	(0.0094)	(0.0069)	(0.0044)	(0.0064)	(0.0072)
Leverage	–0.0889	–0.0620	–0.0717	–0.0953	–0.0852
	(0.3951)	(0.5505)	(0.4922)	(0.3632)	(0.4144)
Dividend Ratio	–0.0147**	–0.0137*	–0.0144**	–0.0151**	–0.0147**
	(0.0364)	(0.0531)	(0.0404)	(0.0309)	(0.0364)
Constant	0.6563***	0.6748***	0.8744***	0.7311**	0.7233***
	(0.0081)	(0.0075)	(0.0008)	(0.0168)	(0.0037)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	378	378	378	378	378

Table 9. Firm value, Derivatives use and CEO Education.

This table reports the results of regressing *LnTobinQ* on *Derivatives* and control variables. The tests are run for the entire sample, for the sub-sample with CEO graduated from schools other than elite and for the sub-sample of firms with CEO graduated from Elite Schools. We used three specifications: pooled OLS with clustered errors at the firm level, panel fixed effect specification and the dynamic Generalised Method of Moments (GMM) system estimator. *LnTobinQ* is the natural logarithm of Tobin's Q. Tobin's Q is equal to the market capitalization plus the book value of debt divided by the book value of total assets. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *Size* is the natural logarithm of the firm's total assets. *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price. *ROA* is the earnings before interest and taxes on the book value of assets. We include in the regressions, eight individual dummy variables which equal either one or zero for each year from 2005 to 2012, with 2004 being the excluded year. ELITE is a dummy variable that takes the value of 1 if the CEO is graduated from one of the French prestigious schools ENA, *Polytechnique* or *HEC* and 0 otherwise. All continuous variables are winsorized at the 1st and 99th percentiles. All the specifications include year dummies. AR(1) and AR(2) are tests for first-order and second-order serial correlation in residuals. The Hansen test of exogeneity of the instruments subset tests the null hypothesis of exogenous instruments. Standard errors are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

	All firms			*Elite*=0			*Elite*=1		
Variables	*Pooled OLS with clustered errors*	*Fixed Effect Specification*	*Dynamic Panel Model*	*Pooled OLS with clustered errors*	*Fixed Effect Specification*	*Dynamic Panel Model*	*Pooled OLS with clustered errors*	*Fixed Effect Specification*	*Dynamic Panel Model*
Derivatives	0.0536***	0.0158***	0.00213***	–0.0188***	–0.0999	–0.0005	0.0745***	0.0257***	0.0018***
	(0.0000)	(0.0000)	(0.0001)	(0.0003)	(0.2706)	(0.9715)	(0.0000)	(0.0000)	(0.0000)
Size	–0.0358**	–0.0610***	–0.0731**	–0.0261	–0.0897***	–0.122**	–0.0451	0.0462*	0.0270
	(0.0282)	(0.0000)	(0.0369)	(0.154)	(0.0000)	(0.0128)	(0.118)	(0.0579)	(0.383)
Capex Ratio	0.0132***	0.00473	0.00139	0.0132**	0.0053	0.0084**	0.0152	–0.0058	–0.0308***
	(0.0088)	(0.1566)	(0.7707)	(0.0158)	(0.1411)	(0.0208)	(0.2068)	(0.6002)	(0.0087)
Quick Ratio	0.455***	0.235***	0.250***	0.441***	0.220***	0.188**	0.447***	0.297***	0.167*
	(0.0000)	(0.0000)	(0.0043)	(0.0000)	(0.0000)	(0.0223)	(0.0006)	(0.0014)	(0.0717)
Leverage	0.1430	0.2080*	0.1519	–0.0910	–0.0263	–0.2475	0.4425	0.4715**	0.5465*
	(0.505)	(0.0871)	(0.612)	(0.691)	(0.865)	(0.462)	(0.235)	(0.0109)	(0.0954)
Dividend Ratio	–0.0114	–0.0331***	–0.0462***	–0.0304	–0.0303***	–0.0544***	0.0298	–0.0390***	–0.0699***
	(0.489)	(0.0000)	(0.0008)	(0.134)	(0.0037)	(0.0006)	(0.179)	(0.0026)	(0.0000)

ROA	0.029	0.0184***	0.0091	0.0255	0.0087***	–0.0007	0.0457	0.0366	0.0430***
	(0.6504)	(0.0000)	(0.1309)	(0.0941)	(0.0000)	(0.8921)	(0.7007)	(0.1734)	(0.0000)
L.*LnTobinQ*			1.475*			0.233***			0.0785**
			(0.0556)			(0.0006)			(0.0183)
Firm fixed effects	No	Yes	No	No	Yes	No	No	Yes	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.4588	0.8144***	1.1626***	0.3800	1.4873***	2.6522**	–0.0404	–1.2726**	–1.0941**
	(0.1972)	(0.00418)	(0.0005)	(0.3470)	(0.0000)	(0.0114)	(0.947)	(0.0171)	(0.0140)
Observations	1089	1089	968	769	769	582	320	320	219
R—squared	0.432	0.516		0.440	0.520		0.414	0.592	
Hansen J–stat (chi–square, pvalue)			174.12 (*p*=0.6450)			143.25 (p=0.4333)			152.466 (p=0.3990)
Arellano–Bond AR(1) (z, p–value)			–4.7612 (p=0.0000)			–4.2441 (p=0.0000)			–3.8392 (p=0.0001)
Arellano–Bond AR(2) (z, p–value)			0.5066 (p=0.6124)			0.4728 (p=0.6364)			–0.14 (p=0.8999)

Table 10. Firm value, Derivatives use and CEO Education using factor scores.

This table reports the results of regressing *LnTobinQ* on *Derivatives* and control variables. The tests are run for the sub-sample of firms with *Education_quality* factor score negative and for the sub-sample of firms with *Education_quality* factor score positive. We used three specifications: pooled OLS with clustered errors at the firm level, panel fixed effect specification and the dynamic Generalised Method of Moments (GMM) system estimator. *LnTobinQ* is the natural logarithm of Tobin's Q. Tobin's Q is equal to the market capitalization plus the book value of debt divided by the book value of total assets. *Derivatives* is defined as the notional amount of foreign currency derivatives divided by total assets. *Size* is the natural logarithm of the firm's total assets. *Capex Ratio* is the ratio of total capital expenditure to total assets. *Quick Ratio* is the ratio of cash accounts and marketable securities to short-term liabilities. *Leverage* is the ratio of long-term debt to total assets. *Dividend Ratio*is the dividend per share divided by the share price. *ROA* is the earnings before interest and taxes on the book value of assets. We include in the regressions, eight individual dummy variables which equal either one or zero for each year from 2005 to 2012, with 2004 being the excluded year. *Education_quality* is the second factor scores obtained from the factor analysis. All continuous variables are winsorized at the 1st and 99th percentiles. All the specifications include year dummies. AR(1) and AR(2) are tests for first-order and second-order serial correlation in residuals. The Hansen test of exogeneity of the instruments subset tests the null hypothesis of exogenous instruments. P-values are in parentheses. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

Variables	*Education_quality* factor scores < 0			*Education_quality* factor scores > 0		
	Pooled OLS with clustered errors	*Fixed Effect Specification*	*Dynamic Panel Model*	*Pooled OLS with clustered errors*	*Fixed Effect Specification*	*Dynamic Panel Model*
Derivatives	–0.0185	–0.0101	–0.0026	0.0001*	0.0015***	0.0015***
	(0.1011)	(0.2751)	(0.8452)	(0.0947)	(0.0000)	(0.0000)
Size	–0.0390***	–0.0869***	–0.115**	–0.0207**	0.0018	–0.0004
	(0.0000)	(0.0000)	(0.0209)	(0.0342)	(0.9214)	(0.9819)
Capex Ratio	0.0112***	0.00481	0.00829**	–0.0088	–0.0148*	–0.0356***
	(0.0006)	(0.1902)	(0.0263)	(0.1801)	(0.0842)	(0.0026)
Quick Ratio	0.399***	0.220***	0.198**	0.319***	0.243***	0.213*
	(0.0000)	(0.0000)	(0.0219)	(0.0000)	(0.0001)	(0.0626)
Leverage	0.1162	0.0464	–0.193	0.5432***	0.5492***	0.5311*
	(0.4040)	(0.7711)	(0.5840)	(0.0005)	(0.0005)	(0.0853)
Dividend Ratio	–0.0357***	–0.0292***	–0.0552***	–0.0202*	–0.0708***	–0.0731***
	(0.0000)	(0.0071)	(0.0009)	(0.0648)	(0.0000)	(0.0000)
ROA	0.0241***	0.0072**	0.0002	0.0503***	0.0410***	0.0474***
	(0.0000)	(0.0105)	(0.9581)	(0.0000)	(0.0000)	(0.0000)
L.*LnTobinQ*			0.231***			0.0416
			(0.0006)			(0.3115)
Firm fixed effects	No	Yes	No	No	Yes	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1091*	1.3642***	2.4866**	–0.352*	–0.5937*	–0.4444*
	(0.0562)	(0.0000)	(0.0199)	(0.0636)	(0.0691)	(0.0553)
Observations	715	715	539	374	374	262
R–squared	0.491	0.528		0.567	0.678	
Hansen J–stat (chi–square, pvalue)			139.83 (p=0.396)			164.79 (p=0.401)

Arellano–Bond AR(1) (z, p–value)	–4.1513 (p=0.0000)	–4.129 (p=0.0000)
Arellano–Bond AR(2) (z, p–value)	0.51677 (p= 0.6053)	–1,24 (p=0.22)