

Does Age Matters?

Empirical Evidence of CEO and Firm Match

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Abstract

A disproportionately high percentage of start-up firms hire younger executives when compared with established firms. Young firms led by younger CEOs exhibit higher growth rates in their sales and assets than similar firms led by senior CEOs. Further, young firms led by younger CEOs also have higher capital expenditures and invest more in R&D activities. These facts are consistent with the argument that younger CEOs can facilitate the development and growth of young start-ups, as they are more high-tech oriented, have higher risk tolerance, and are better at working in decentralized organizations.

I. Introduction

Young start-ups differ from established firms in a number of aspects. First, young firms are more likely to fail than established firms (Haltiwanger, Jarmin & Miranda, 2012). But once young firms survive, they exhibit higher growth rates than established firms. Second, young firms are likely to face financial constraints and higher costs when accessing external financing (Hadlock and Pierce, 2010, Peterson and Rajan, 1994). However, young firms account for a disproportionately large share of innovations (Christiansen, 1997). Third, young firms are much smaller and have flatter hierarchy than established firms (Rajan and Zingales, 2001). Last, young firms employ larger proportion of younger people in their workforce (Ouimet and Zarutskie, 2013). What will these differences impose on the desiring characteristics of management? If start-up firms and established firms have different preferences for CEOs, these differences are likely to show up in the age of their CEOs, because age is a natural variable that represents the biological and psychological differences among different age groups. In this paper, I focus on a special subset of firms, start-ups, to examine whether CEO age matters.

Using data from Compustat and ExecuComp from 1992 to 2012¹, I find that young firms are more likely to be led by young CEOs. In firms aged from 1-5 years, 23.96% of their CEOs are under the age 45, and only 12.07% of their CEOs are over 60. In contrast, for established firms which have been public listed for 20 years or more, only 6.82% have CEOs aged 45 or younger, but 22.95% of these firms have CEOs aged over 60, and 28.29% have CEOs aged between 56 to 60. This pattern exists even after I control for industry heterogeneity, and year fixed effect. In addition, young CEOs working in young firms on average earn higher total compensations than young CEOs working elsewhere and senior CEOs working in start-ups. Is this pattern simply

¹ I will expand the data later to cover more firms, which will be more representative of the universe of young firms

attributable to labor market dynamics (i.e. young people are more likely to start new firms than senior people)? Or young CEOs may be a better match to young firms (i.e. young CEOs have some specific feature that young firms prefer)?

Based on existing research from psychology and management, I propose several reasons regarding why young CEOs could be beneficial to start-up firms. First, young CEOs on average completed their educations more recently than their senior peers and are likely to possess new technical skills. Second, young CEOs are usually quicker learners compared with their senior peers. They keep close track of recent technology development, have more active mind and are better adapted to new environment. Third, young CEOs tend to have higher risk tolerance than senior CEOs, thus more likely to invest in riskier projects, such as R&D. The fore-mentioned characteristics are quite desirable for start-up companies since innovations, development of new products and/or establishment of new methods of production are critical to the prosperity of young firm. Last, young firms usually have flat hierarchies, decentralized structures and younger workforce (Rajan and Zingales, 2001, Ouimet and Zarutskie, 2013). Young CEOs are not only close in age and share lots of ‘common language’ with their fellow employees, but also more likely to favor flat hierarchy than senior people. These can facilitate efficient communication between the management team and workforce, smooth the transfer of ‘soft information’ within a firm, both of which are critical for the realization of innovative ideas.

However, when compared with senior CEOs, young CEOs lack for experiences and social network. They are more prone to hang on to underperforming projects (Graham, Harvey, and Puri, 2013) and likely to undertake bolder and more visible investments (Li, Low, and Makhija, 2014, Yim, 2013), which might result in inefficient internal capital allocations. Young firms facing severer competition can afford less inefficiency and may need to be equipped with senior

CEOs, who are more experienced, have better judgment and more social network. If young CEOs can't provide benefits for start-ups, the observed CEO age pattern in start-ups is simply the consequence of labor market joint dynamics.

I find that young firms led by young CEOs experience overall higher asset and sales growth than start-ups led by senior CEOs after controlling for past firm performances, size, market to book, industry heterogeneity and year fixed effect. In addition, young firms led by young CEOs have higher growth in capital expenditure and R&D investment than otherwise similar young firms led by senior CEOs. These results are consistent with that young CEOs have more technical skill, higher risk tolerance, and are better at communicating with their workforce. The evidence is against the network and experiences mechanisms. In addition, I find that young CEOs working in young firms have higher total compensation, controlling for variables that are known to be related with executive compensation. This result implies that young CEOs might have certain desiring characteristic that start-up firms prefer.

As robustness checks, I examine whether the positive relationship between firm age and CEO age is mainly driven by hi-tech industries. It might be the case that young CEOs are only preferable for hi-tech firms that are characterized by a high rate of innovation and growth. However, the relationship between CEO age and firm age exists for both the hi-tech industries (which include pharmaceutical, electronics, tele-communications and computers) and the non-hi-tech industries. Furthermore, regardless of whether a firm is in the hi-tech industries, young firms led by young CEOs always have higher sales and assets growth, higher capital expenditure growth and R&D growth. All these results support the notion that young CEOs are preferable to young firms.

The remainder of this paper is arranged as follows. Section II reviews relevant literature, and motivates the present study. Section III describe the underlying mechanisms and develops related hypotheses. Section IV describes the data and variables used. Section V provides empirical evidence regarding the relationship between CEO age and firm age. Section VI considers the possible mechanisms. Section VII is the robustness test. Section VIII concludes, and discusses future works.

II. Literature Review

The literature has generally showed that young firms differ from mature firms in a variety of ways. First, young firms are very likely to fail. For example, Haltiwanger, Jarmin and Miranda (2012) find that young firms have higher exit rate. But once they survive, they have higher growth rate controlling for size. Second, young firms are more likely to face financial constraints. Hadlock and Pierce (2010) find that firm age has strong predictive power for the possibility that a firm get into financial distress. Peterson and Rajan (1994) find young firms usually have concentrated lender, suggesting that it is difficult for young firms to access external capital, and the cost is relatively higher than for established firms. This makes young firms more vulnerable to market shocks and economic downturns (Haltiwanger, Jarmin& Miranda, 2012). Third, Rajan and Zingales (2001) document that young firm tends to have flatter organizational hierarchy than mature firms, and firms with flat hierarchy have distinctive cultures and more innovations than firms with a steep hierarchy. Consistent with the evidence, Christiansen (1997) show that young firms often accounts for a disproportionately large share of innovations, partly due to their flat organizational structures. Last, Ouimet and Zarutskie (2013) report a positive relationship between firm age and their employee age, even after controlling for the joint dynamic between employees and firms (i.e. young people consist of a large proportion of people looking for jobs

when young start-ups hire). They suggest this is consistent with that young people have features that young firms value.

According to CEO-firm match theory (job match theory), productivity of CEOs with similar ability differs across different firms. Allgood and Farrell (2003) provide direct evidence regarding the prevalence of job-match heterogeneity. They suggest that more research need to be done to understand what determine the success and failure of a CEO-firm match. The current study tries to answer the question do young firms differ from mature firms in their desiring CEO characteristics, and attempt to specify one potential channel of firm-CEO match by proposing that young CEOs better match young firms.

Why can age provide useful information? Firms usually apply some psychological evaluation during their recruiting process. It is very likely that CEO candidates or incumbent CEOs may 'cast' themselves into certain profiles in interview or surveys, resulting in misleading assessments of their psychological traits. However, psychological studies already pointed out that age difference causes profound differences in many aspects of cognition and emotion and young people generally show some common behavioral patterns that senior people would not. More importantly, contemporaneous psychological literature has established the relationship between age and certain behavior traits. For example, young adult are faster learner and have much better memory than their senior peers. They have higher risk tolerance than senior people (Gardner and Steinberg, 2005). Thus, age can provide some easily accessible information regarding the personal traits of potential CEO candidates.

In addition, previous studies focus on CEO characteristics usually use various tests or survey to quantify certain skills or behavioral traits, such as overconfidence, optimism, and risk aversion.

These psychological traits are quite useful and relevant. However, accurate assessment of these psychological traits is very time consuming and difficult to be applied to a large sample in real world. It is unclear whether firms apply those assessments during their selection of management team. In contrast, age is available to public. It is a natural variable that cannot be falsified, and has little measurement errors. It is possible that board members use ages of their potential CEO candidates to infer their matching quality with the firm based on some commonly-held beliefs regarding how young people behave. However, as far as I know, there is no studies examine whether firms actually take age into account when they make relevant decisions, and whether the beliefs on which they base their decisions actually work in their favor. The current study will shed more lights on this question. Despite the features of age mentioned above, from a statistical perspective, age is an exact number with equivalent interval of units which is more desirable in statistical analysis than other psychological measurements.

Starting from Bertrand and Shoar (2003), growing literature begins to pay attention to heterogeneity of managers and how such heterogeneity affects their decisions and behavior, eventually the performance of firms. Among these studies, there are two streams of literature studying specifically how CEOs' age affects their decisions. One stream of literature focuses on how personal and psychometric characteristics of managers vary over time as they age. For example, Graham, Harvey and Puri (2013) document that young CEOs are more tolerant to risk, more over-confident, more optimistic than their senior peers, but at the same time they also exhibit more aversion to sure loss (high loss aversion).

The other stream of literature focuses on the differences in career concerns between young and old CEOs. Gibbons and Murphy (1992) points out that career concerns are stronger when managers are further away from retirement. To the extent that career concerns are greater for

young CEOs, reputation cost of young CEOs are also high and thus affect their behavior. Li, Low and Makhjia (2014) document that young CEOs are more likely to make bolder and riskier investments. In addition, the literature regarding executive compensation also documents the downward rigidity of CEO compensation. Thus, being in the early stage of career also generates financial incentives for young CEOs. Yim (2013) points out that young CEOs have stronger financial incentives to increase their compensation earlier in their career in order to have a longer horizon to reap the benefit. Consequently, young CEOs engage in more merger and acquisition activities. But she only found weak evidence that these mergers and acquisitions are value-destroying.

However, it is not clear how young CEOs can affect the overall performances of young firms. On one hand, young CEOs have some desiring characteristics that start-up firms may prefer, such as higher risk tolerance, more advanced technical skills. On the other hand, their relative higher career concern and reputation cost may bias their decisions regarding internal capital allocation and investment. Thus whether start-up firms led by young CEOs actually have better performances is an important empirical question to board members, investors and venture capitalists.

The present study adds new knowledge to the literature on how executives' personal characteristics affect firm performances. Evidence in this field is mixed. For example, Hirshleifer, Low, and Toeh (2012), show that overconfident CEOs are better at exploiting innovative growth opportunities, though such effect only exists in innovative industries. Malmendier and Tate (2005) and Malmendier, Tate and Yan (2010) show that CEOs' personal characteristics and earlier life experiences affect firms' investment and financing activities. Overconfident CEOs have higher investment sensitivity to cash flows, are debt conservative and less likely to issue

equity. They further document that CEOs who have grown up during the Depression have less belief in external capital market, and that CEOs with military experiences are more debt aggressive. Graham, Harvey, and Puri (2013) report that management optimism and managerial risk-aversion are also correlated with corporate financial policies. Ling, Simsek, Lubatkin, and Veiga (2008) find small firms with transformational CEOs are likely to have higher sales growth than similar firms with non-transformational CEOs. In contrast, Fee, Hadlock and Pierce (2011) don't find evidence of CEO managerial style using a sample of exogenous CEO turnover (such as death, health issue, and natural retirement). With a sample of Swedish firms, Becker (2006) fails to reliably establish the relationship between firm size, CEO age and compensation level. One possible reason for the mixed evidence may be the lack of control for firm characteristics when examining the effect of CEO personal characteristics. While some personal characteristics have universal impacts for all companies, other characteristics may have differential influences on different types of firms.

The present study contributes to the literature on firm-CEO match by demonstrating the strong positive relationship between firm age and CEO age, and that young firms led by young CEOs have better operating performances than young firms led by senior CEOs. It also expands the literature regarding executive compensation by showing that the matches between firm age and CEO age have additional explanatory power for CEO compensation. In addition, present results suggest that it is helpful to control for the characteristics of firms when investigating the effect of CEOs' personal characteristics on firm performances.

III. Mechanisms and Hypotheses Development

A. Risk tolerance

Psychological studies show that young people tend to have higher risk tolerance than senior people (Gardner and Steinberg (2005)). This effect amplifies in the following two channels. First, young CEOs can have higher risk tolerance towards their own career path. Thus they are more likely to accept job offers from start-up companies than senior people. Second, young CEOs with higher risk tolerance are more likely to invest in riskier projects and invest more in R&D, which are beneficial to the development and survival of young firms.

Hypothesis I (H1): young firms led by young CEOs have higher investment in R&D than young firms led by senior CEOs.

B. Skills

Young CEOs usually completed their educations more recently than their senior peers. Thus, compared with senior CEOs, they have better understanding of new technologies and possess more advanced technical skills. For example, young CEOs who attended his college in the late 1990s generally have better computer skills than senior CEOs who attended their college in the late 1980s or even early 1990s, when computers are still rare. Additionally, young CEOs are more likely to be quick learner who keep close track of new technology development. Furthermore, young people also have more active mind and are better adapted to new environment than senior people. Consequently, young firms led by young CEOs are more likely to have innovations and new methods of production.

Hypothesis II (H2): young firms led by young CEOs have more innovations and more citation for their innovations than young firms led by senior CEOs.

C. Flat Hierarchy / Decentralized Structure

Studies of organizational structure show that young firms usually have flatter hierarchy than established firms (e.g. Rajan and Zingales, 2001). In young firms, CEOs need to communicate more with their employee directly due to the decentralized structure. Young CEOs usually prefer flat hierarchy structure, which may stimulate the communications with employees. In contrast, senior CEOs usually possess a traditional view and emphasize the commanding hierarchy. Thus they are less likely to fit into firms with flat hierarchies as well as young CEOs.

Moreover, young employees compose a larger part of the workforce of young firms than the workforce of established firms (Ouimet and Zarutskie (2013)). Since young CEOs are closer in age to young employees, they share more ‘common language’ with young employees. Thus, they can communicate better and more efficiently with young employees than senior CEOs. Efficiency in communication and harmonious working relation can improve the productivity of the workforce. Stein (2002) documents that decentralized organizational structure are better for the transfer of ‘soft’ information such as innovative ideas. Thus I expect young firms led by young CEOs have more efficient communications, smoother transfer of ‘soft’ information (such as innovative ideas), and can realize these ideas into productivity in a faster manner.

Hypothesis III (H3): young firms with young CEOs have higher sales growth, and asset growth than their peers lead by senior CEOs.

D. Career Concern

At the early stage of their career, young CEOs have higher career concerns, and thus have higher reputation cost, which may bias their decisions. Boot (1992) and Graham, Harvey and Puri (2013) provide evidence that young CEOs are more prone to hang on to underperforming

projects, and more aversive to sure loss. Since the admission of previous wrong decisions may taint their reputation, they are reluctant to admit their mistakes or reverse their decisions. In addition, career concern for young CEOs may distort their decision regarding internal capital allocation. Weisbach (1995) find empirical evidence consistent with escalation of commitment. He documents that managers are likely to channel excessive capital to the projects they initiated, and are less likely to cease investing in projects they initiated than projects they inherited from their predecessors. Greater career concerns also make young CEOs prefer activities that are more visible (Li, Low, and Makhija, 2014, Yim, 2013).

Hypothesis IV (H4): young firms with young leaders are more likely to involve in bold but less efficient activities, such as value-destroying acquisitions than young firms led by senior CEOs.

E. Joint Dynamic

Young firms are likely to have young CEOs (newly prompted and not) by nature of being new. For example, a five year old firm can only hire CEOs that changed their position during the past five years (shorter tenure), or have to prompt new CEOs inside or outside their firms. Young people are more likely to be mobile in the early years of their career. Since relatively young people consist of the majority part for CEO candidates due to their higher mobility, they will be more likely to be hired by young firms than senior peers.

Moreover, Senior CEOs, who have worked many years on executive positions, on average have greater reputation than young ones. Board members and shareholders are likely to have better evaluations for their strength and weakness. Thus, it is relatively easy for board members to pick a suitable senior CEO for their firms. In contrast, it is hard to have clear assessment for

young CEOs who have just begun to build their reputation. In other words, it is hard to find a young manager suitable for the firm. This implies if the fact that young firms have disproportionately higher number of young CEOs is simply contributable to the joint dynamics in the labor market, then young CEOs hired by young firms should exhibit higher turnovers. But if in contrast, young CEOs work better for young firms, then these CEOs are also likely to be retained in the firms for a long time, and these managers are likely to receive high compensations for their preferable features.

Hypothesis V (H5): young CEOs hired by young firms exhibit higher turnover than senior peers working in similar firms.

Hypothesis VI (H6): young CEOs working in young firms receive lower compensation.

F. Experiences/Network

Intuitively, young CEOs lack experiences compared with senior CEOs. Senior CEOs who have fight through numerous situations may have better judgments. Young firms facing severer competition than established firms may need to be equipped with senior CEOs who are more experienced. Moreover, senior CEOs are likely to have more social network with related institutions and peoples (e.g. banks, skilled individuals), which might be beneficial for young firms when they need to acquire external capital and valued technique specialists. If this is the case, I expect that young firms lead by senior CEOs have better outcomes (higher growth rate, and lower failure rate) than their peers with relatively young and inexperienced CEOs.

Hypothesis VII (H7): young firms with young CEOs will have lower growth rate (sales growth, and asset growth) than their peers led by senior CEOs.

To sum up, if young CEOs are beneficial to young firms due to their technical skills, high risk tolerance, and better communication with employees as mentioned above, young firms led by young CEOs should have better outcomes than young firms led by senior CEOs, and young CEOs in young firms have lower turnover and higher compensation than senior CEOs. But if young firms hire more young CEOs simply due to joint dynamics, young firms with young CEOs should have poor performances, and young CEOs should have higher turnover and lower compensation than senior CEOs.

IV. Data

I obtained data from Compustat and ExecuComp database. The sample only includes firms that are present in the intersection of both databases. The sample period starts from 1992, when the ExecuComp begins its coverage. CEO age, tenure, and compensation information are obtained from ExecuComp, while the accounting data for measuring firm performance comes from Compustat.

Table I reports the summary of descriptive statistics for all variables for different firm age groups respectively, and for the entire sample (the last column). As the table shows, young firms are much smaller, have lower sales and leverage, but at the same time have higher growth opportunities, measured by Tobin's Q. Young firms exhibit a much higher growth rate in sales and asset. Their R&D investment scaled by sales is larger than the oldest firms, but smaller than the medium-aged firms. Despite the limited capital young firms have and the difficulties young firms face when accessing external capital, they exhibit a higher growth rate in their R&D investments than old firms. These results are consistent with fore-mentioned results that young firms have a higher growth rate in sales than old firms and accounts for a disproportionate share of innovations.

Table II documents the correlation among variables that are used for regression analysis. The largest correlations are among asset, sales, and market capitalization, ranging from 0.6641 to 0.7285. Firm age is significantly correlated with CEO compensation, asset, sales, and market capitalization. Interestingly, CEO age has a significant positive correlation with firm age, with a correlation coefficient of 0.1948. At the same time CEO age is also related to asset, sales, and market capitalization. This is consistent with results in table I where young firms are very likely to have younger CEOs. Meanwhile, young firms are small, and have fewer assets, sales, and relatively lower market capitalization. In general, there is little concern for multi-collinearity. In the following section, I will examine the positive correlation between firm age and CEO age in more detail.

V. Empirical Results Regarding CEO age and Firm Age

In this section, the positive correlation between firm age and CEO age is examined in greater details. Though ExecuComp database is dominated by S&P 1500 firms, among them, some are still quite young firms that below the age of five since their IPO.² After examining the relationship between CEO age and firm age, I test my proposed hypotheses regarding CEO compensation, firm growth, R&D expenditures and capital expenditures.

Table III documents the percentage of CEOs in a given age group as a function of the firm age group. I have 34745 firm year observations with non-missing CEO age. The top panel of table III shows that CEO on average aged 54 (median 54) for the entire sample. Only 10% of CEOs aged younger than 45 while 25% percent of CEOs is older than 59. I consider the following CEO age groups: 45 or younger, between 46 and 50, between 51 and 55, between 56

²It is still unknown whether this under-estimate the effect. I am working on expanding my sample.

and 60, and 60 or older. In the following regression analysis, I define young CEO as CEOs who aged 45 or younger. But the results hold if I change to the alternative benchmark of 50 years old.

In the bottom panel of Table III, rows correspond to age category for CEOs, while the column corresponds to firm age categories. The very last column reports the CEO age distribution for the full sample. The result indicates that younger firms have a larger proportion of young CEOs. Specifically, 23.96% of CEOs that work in firms aged 1 to 5 year are 45 or younger, 22.14% are between 46 and 50 year old. These two categories account for almost half of the CEOs that work in young firms. The percentage of CEOs 45 or younger decline monotonically as firm age increases. For firms that are 20 or older, only 6.82% of the CEOs are 45 or younger. CEOs aged between 56 and 60 accounts for 28.29% for firms aged 20 year older. The pattern is similar for CEOs aged between 46 and 50, who are concentrated in firms younger than 10 year old. The distribution of CEOs aged between 51 and 55 are quite stable across all firm age categories. And the proportion of CEOs aged 56 or older increase as the firm age increase.

Table IV examines whether the correlation between firm age and CEO age (shown in table III) is still robust after controlling for industry heterogeneity and year fixed effect. Table IV reports the results of cross sectional OLS regression of CEO age on firm age, firm age decile, and young firm dummy (firm aged between 1 and 5) respectively. We can see that after controlling for industry and year effect, CEOs working for young firms aged between 1 and 5, are almost 3 years younger than CEOs working elsewhere.

VI. Hypotheses Test

i. CEO compensation and CEO age

If young CEOs are more desirable to young firms, young CEOs working for young firms should receive higher compensation than young CEOs working elsewhere and senior CEOs working in young firms. The relationship between firm age, CEO age, and CEO compensation is reported in table V. Specifically, table V documents the results of OLS regression of CEO compensation on firm age, young CEO dummy variable (CEO aged between 1 and 5), and the interaction term of young firm and young CEO, controlling for other previous document variables that affect CEO compensation, including tenure, sales, market-to-book, asset, lagged and current stock return and ROAs.

Column 1 documents the results without controlling for young CEO working in young firms. We can see that young CEOs on average earn a higher compensation than their senior peers. However, after controlling for the interaction effect of young CEO and young firm, industry heterogeneity and year fixed effect, CEO age alone has no significant explanatory power for their compensation. Loading on firm age is negative and significant all the time, suggesting that young firms on average tend to have higher CEO compensation, implying that young firms need to reward their CEO more to compensate for their higher career risk. Most importantly, the positive and significant interaction term of young CEO and young firm indicate that young CEOs working in young firms earn higher compensation than their senior peers in young firms too. Thus young CEOs working in young firms earn a significantly higher compensation than both young CEOs elsewhere and senior CEOs in young firms. Particularly, young CEOs working in young firms earn on average 1.87 million more than senior CEOs working in similar young firms after controlling for firm size, and tenure. This result is economically significant given some of these young firms are much smaller than mature firms. Thus hypothesis VI (H6) is rejected

Indicating that young firms hire more young CEOs are not simply due to labor market dynamics, and young CEOs have some preferable features that young firms desire.

ii. Investment Growth and CEO age

This part examines hypothesis I, which are related to the growth rate of R&D investments and capital expenditures respectively. Table VI documents results of the cross sectional OLS regression of firm R&D growth and capital expenditure growth on firm age, young CEO dummy, and the interaction term between young firm and young CEO, controlling for lagged dependent variables, asset, market-to-book, industry heterogeneity and year fixed effect.

Young CEOs on average invest more in R&D. But most of such increase in investment of R&D is captured by young CEOs working in young firms. Young firms led by young CEOs have a 44.05% higher R&D growth than similar firms led by senior CEOs, and 40.73% higher capital expenditure growth. Young CEOs alone don't have explanatory power for capital expenditure growth, and only have a marginal significant explanatory power for R&D increase. The higher investments on R&D are likely to be resulted from the higher risk tolerance of young CEOs. And consistently, both young and mature firms led by young CEOs have slightly higher R&D growth than all the other firms led by senior CEOs. But the magnitude of the effect of young CEO alone (3.62%), is much smaller than the magnitude of the additional effect of young CEOs in young firms. To summarize, results here support the hypothesis I, suggesting that technical skills help to explain the positive relationship between CEO age and firm age.

iii. Firm growth and CEO age

The third hypothesis (H3) predicts that young firms with young CEOs will have higher growth rate if the skill, incentive, and communication mechanism works. Table VII presents the

asset, sales, capital expenditure growth and Tobin's Q for the two extreme firm age (young firm aged between 1 and 5, mature firms aged over 20) categories by CEO age. Each row corresponds to CEO age categories. Both mean growth rate and median growth rate are reported to make sure the results are not driven by outliers. T-statistics for the difference of mean, and Wilcoxon p-value for the difference of median growth rate between firms with CEOs aged 45 or younger and firms with CEOs aged over 60 for each firm age group are reported at the bottom row for each panel. Interesting results emerge from table VII. Results in Table VII indicate that average sales growth for firms with young CEOs and senior CEOs differ significantly by 46.18% for firms aged between 1 and 5. But this difference between different CEO age group disappears for established mature firms that aged over 20. The sales growth rate for firms led by young CEO is also significantly higher than firms with senior CEOs for the entire sample. This is driven by the stronger effect in young firms. Results for asset growth and capital expenditure growth resemble the result for sales growth. Average sales growth in young firms led by young CEOs are 68.3% higher than young firms led by senior CEOs, and capital expenditure growth are 61.57% higher. When it comes to Tobin's Q, which acts as a proxy for growth opportunities, young firms led by young CEOs have significantly higher Tobin's Q (1.98) than similar firms led by senior CEOs. But this young CEO effect disappears in mature firms aged over 20. Results here suggest that young firms led by young CEOs produce much better firms operating outcome than young firms led by senior CEOs. But mature firms led by young CEOs and senior CEOs don't differ much in all these measurement. This indicates that young CEOs are specifically desirable to young firms.

Table VIII shows whether the relationship among firm growth, CEO age and firm age sustain after controlling for other related variables. Specifically, table VIII documents the results of cross sectional OLS regression of sales growth and asset growth on firm age, young CEO

dummy, and the interaction term of young firm and young CEO, controlling for lagged dependent variable, asset, growth opportunities (market-to-book), industry heterogeneity and year fixed effect. Consistent with fore-mentioned results, young firms on average still have higher asset and sales growth rates after controlling for lagged dependent variable. While the young CEO dummy is significantly positive without the interaction term, it becomes insignificant after controlling for the young firm young CEO interaction. This indicate that although young CEOs do play an important role in improving firm growth, this positive effect only exist in young firms. After controlling for industry and year fixed effect, young firms led by young CEOs on average have 33.66% higher sales growth and 58.31% higher asset growth than similar firms led by senior CEOs. Combining the results in table VII and table VIII, the evidence supports the third hypothesis. These results imply that the skills, risk tolerance and communication mechanism of young CEOs are desirable to young firms.

VII. Robustness Test

It might be argued that young CEOs may be only preferable for young firms characterized by high growth rate and innovation. To test this assertion, in this section, I run the regression analysis included in table V (for CEO total compensation), table VI (for investment rate), and table VIII (for sales growth) separately for high-tech industries and non-high-tech industries. I define industries using Fama French 49 industry. Firms operating in Fama French 13 (pharmaceutical), 22 (tele-communications), 32 (electronics), 35 and 36 (computers software and hardware) are categorized as high-tech industries. Table IX, X, and XI documents the results for these additional OLS regression analysis. Generally speaking, the results are similar cross high-

tech and non-high-tech industries. This implies that young CEOs are desirable to young firms irrespective of industries.

VIII. Conclusion

The present study provides evidence that young firms are more likely to hire young CEOs than established firms. Further detailed analysis reveals that young CEOs, especially those in young firms, are likely to invest more in R&D and capital expenditure than senior CEOs. In addition, young firms led by young CEOs have much higher asset and sales growth rates than similar firms led by senior CEOs. Further, young CEOs in young firms received higher compensation than young CEOs in other firms and senior CEOs in young firms. These results indicate that young CEOs possess certain characteristics that are specifically valuable and desirable for young firms compared with their senior peers. Possibly mechanisms include that young CEOs have more advanced technical skills, are more tolerant to risk, and communicate better in a flat hierarchy with young employees than senior CEOs.

IX. Future Work

I am currently working on extracting data from the ThomasonOne database in order to expand my sample. It will take some time to update the results because manual collection of data is time consuming. Additionally, I will examine H2 by using the NBER dataset and H5 by adding turnover data. Also, risk tolerance mechanism predicts that firm performance will be more volatile. I should include the examination of volatility in my study.

I may need to take more controlling variables into account and examine whether my results are attributable to other endogeneity issue. I wish I can get my suggestion on how to further develop this paper.

Reference

Allgood, Sam, and Kathleen A. Farrell, 2003, The Match between CEO and Firm, *Journal of Business* 76(2):317-341

Becker, Bo, 2006, Wealth and Executive Compensation, *the Journal of Finance* 61(1): 379-397

Bertrand, Marianne, and Antoinette Schoar, 2003, Managing With Style: The Effect of Managers on Firm Policies, *the Quarterly Journal of Economics* 118(4):1169-1208

Christensen, Clayton M., 1997, *Innovator's Dilemma*, Harvard Business School Press

Cronqvist, Henrik, Anil K. Makhija, and Scott E. Yonker, Behavioral Consistency in Corporate Finance: CEO Personal and Corporate Leverage, *Journal of Financial Economics* 103: 20-40

Fee, C. Edward, Charles J. Hadlock, and Joshua R. Pierce, 2011, Managers Who Lack Style: Evidence from Exogenous CEO Changes, *working paper*

Gardner, Margo, and Laurence Steinberg, 2005, Peer Influence on Risk Taking, Risk Preference, and Risky Decision Making in Adolescence and Adulthood: An Experimental Study, *Developmental Psychology* 41(4): 625-635

Gibbons, Robert, and Kevin J. Murphy, 1992, Optimal Incentive Contracts in the Presence of Career Concerns: Theory and Evidence, *working paper*

Graham, John R., Campbell R. Harvey, and Manju Puri, 2013, Managerial Attitudes and Corporate Actions, *Journal of Financial Economics* 109: 103-121

Haltiwanger, J., R. Jarmin, and J. Miranda, 2010, "Who Creates Jobs? Small vs. Large vs. Young", *working paper*

Hadlock, C. and J. Pierce, 2010, New Evidence on Measuring Financial Constraints: Moving Beyond the K-Z Index, *Review of Financial Studies*, 23:1909-1940

Hirshleifer, David, Angie Low, and Siew Hong Toeh, 2012, Are Overconfident CEOs Better Innovators? *the Journal of Finance* 67(4): 1457-1498

Li, Xiaoyang, Angie Low, and Anil K. Makhija, 2014, Career Concerns and the Busy Life of the Young CEO, *working paper*

Ling, Yan, Zeki Simsek, Michael H. Lubatkin, and John F. Veiga, 2008, The Impact of Transformational CEOs on the Performance of Small-to-Medium-Sized Firms: Does Organizational Context Matter? *Journal of Applied Psychology* 93(4): 923-934

Malmendier, Ulrike, and Geoffrey Tate, 2005, CEO Overconfidence and Corporate Investment, *the Journal of Finance* 60(6): 2661-2700

Malmendier, Ulrike, Geoffrey Tate, and Jon Yan, 2011, Overconfidence and Early-Life Experiences: The Effect of Managerial Traits on Corporate Financial Policies, *the Journal of Finance* 66(5): 1687–1733

Ouimet, Paige, and Rebecca Zarutskie, 2013, Who Works For Startups? The Relation between Firm Age, Employee Age, And Growth, *working paper*

Petersen, M. and R. Rajan, 1994, The Benefits of Lending Relationships: Evidence from Small Business Data, *Journal of Finance*, 49:3-37.

Rajan, R. and L. Zingales, 2001, The Firm as a Dedicated Hierarchy: A Theory of the Origins and Growth of Firms, *Quarterly Journal of Economics*, 116:805-851

Ryan, Harley E., Jr., and Lingling Wang, 2012, CEO Mobility and the CEO-Firm Match: Evidence from CEO Employment History, *working paper*

Stein, Jeremy C., 2002, Information Production and Capital Allocation: Decentralized versus Hierarchical Firms, *the Journal of Finance* 57(5): 1891-1921

Weisbach, Michael S., 1995, CEO Turnover and the Firm's Investment Decisions, *Journal of Financial Economics* 37(2): 159-188

Yim, Soojin, 2013, The acquisitiveness of youth: CEO age and acquisition behavior, *Journal of Financial Economics* 108: 250-273

Table I: Summary Statistics

This table reports the mean of key variables for the sample of firms included in the regressions. Sample firms are at the intersection of Compustat database and ExecuComp database from year 1992 to 2012. Mean values are reported by firm age groups and for the entire sample in the last column. Firm Age is calculated as the number of years since the firm first appeared in Compustat with non-missing price. Total asset, sales and market capitalization are reported in millions. Leverage is defined as the total debt divided by total asset. Tobin's Q is calculated as market value of equity plus total debt divided by total assets. ROA is defined as net income divided by total assets.

	Firm Age					
	1-5 Years	6-10 Years	11-15 Years	16-20 Years	>20 Years	All Years
observations	3320	5205	5284	4062	16966	34837
Firm Age	3.46	8.05	12.95	17.83	34.17	22.22
Asset	5490.67	5850.95	7505.40	9198.05	20321.59	13504.41
Sale	1767.65	1663.95	2236.19	3028.74	7652.15	4881.74
Market Capitalization	3093.51	2743.37	3883.06	5049.73	8903.97	6242.84
Leverage	0.51	0.52	0.53	0.55	0.63	0.58
Tobin's Q	2.86	2.02	1.92	1.81	1.39	1.75
ROA	0.01	0.01	0.02	0.03	0.04	0.03
CEO tenure	5.92	7.21	8.05	8.47	8.08	7.75
Sales Growth	0.45	0.19	0.16	0.14	0.08	0.29
Asset Growth	0.53	0.20	0.15	0.13	0.09	0.06
R&D intensity	0.25	0.28	0.45	0.47	0.09	0.24
R&D Growth	0.46	0.22	0.19	0.18	0.10	0.18
M/B	5.99	5.58	3.41	3.06	3.11	3.80

Table II: Correlations among Key Variables

This table reports the correlation coefficient of key variables used in the following regression. Age is defined as the CEO's age at certain year. Firm Age, is defined as the number of years since firm appeared in Compustat with non-missing year-end price. Tenure is defined as the years since the person first became a CEO. Total compensation is measured as the same of CEO's salary, bonus, other compensation, stock grants and option rewards. Total assets, sales and market capitalizations are in millions. Return is measured annually. ROA is defined as net income divided by total asset. Market-to-book ratio is the market value of firm's equity divided by its book value of equity. Coefficients in bold letters represent significant level at 1%.

Variable	AGE	Firm Age	tenure	Total Compensation	Asset	Sale	Market Capitalization	Return	ROA	Market/Book
AGE	1	0.1948	0.3944	0.0073	0.0318	0.0484	0.0309	-0.0047	0.0167	-0.0170
Firm Age		1	-0.0141	0.0797	0.1039	0.2332	0.1694	0.0005	0.0301	-0.0190
tenure			1	0.0007	-0.0222	-0.0427	-0.0213	-0.0105	0.0082	-0.0088
Total Compensation				1	0.1566	0.2205	0.2865	0.0069	0.0141	0.0107
Asset					1	0.7285	0.6641	-0.0017	0.0076	-0.0028
Sale						1	0.6774	-0.0004	0.0150	-0.0003
Market Capitalization							1	-0.0031	0.0305	0.0115
Return								1	0.0609	-0.0003
ROA									1	0.0004
Observations	35175	34837	35273	35002	35049	30222	29856	34328	30219	29032

Table III: The Relation between CEO age and Firm Age

This table documents the percentage of CEOs in a given age group (row) by firm age group (column) for all firms in the interaction of ExecuComp and Compustat database between year 1992 and 2012.

# of observations		35273 (missing value=528)					
# of CEO		6662					
	mean	p10	p25	p50	p75	p90	std.deviation
CEO age	54.32	45	49	54	59	63	7.58
		Firm Age					
		1-5 Years	6-10 Years	11-15 Years	16-20 Years	>20 Years	all years
% of CEO aged	≤ 45 years	23.96%	18.95%	14.29%	10.78%	6.82%	11.86%
	46-50 years	22.14%	23.14%	20.75%	17.86%	15.22%	18.21%
	51-55 years	24.50%	26.40%	26.88%	25.68%	26.73%	26.37%
	56-60 years	17.33%	18.01%	21.27%	24.38%	28.29%	14.19%
	> 60 years	12.07%	13.50%	16.81%	21.29%	22.95%	19.38%

Table IV: The Relation between Firm Age and CEO age: Regression Analysis

This table reports the results of OLS regression with CEO age as the dependent variable. Sample is constructed as the interaction of ExecuComp and Compustat database from year 1992 to year 2012. CEO age is defined as the age of the CEO in year t; firm year is defined as the number of years since first appearance on Compustat with non-missing price information. Firm age deciles are constructed using the cut-point of 1-5 years, 6-10 years, 11-15 years, 16 -20 years, and > 20 years. Young Firm (1-5 years) is equal to one if firm age is less or equal to 5 years and 0 otherwise. T-statistics are reported below.

<i>Dependent</i>									
<i>Variable</i>	CEO age								
Firm Age	0.110			0.111			0.095		
	37.03			36.95			28.60		
Firm Age		1.154			1.149			0.992	
decile		41.38			40.90			33.39	
Young Firm			-3.342			-3.404			-2.880
(1-5 years)			-24.32			-24.59			-20.85
Industry									
fixed effect	no	no	no	no	no	no	yes	yes	yes
Year fixed									
effects	no	no	no	yes	yes	yes	yes	yes	yes
N	34745	34745	34745	34745	34745	34745	34745	34745	34745
R-square	0.0379	0.0470	0.0165	0.0414	0.0495	0.0206	0.0647	0.0725	0.0543

Table V:CEO Total Compensation by CEO Age and Firm Age

This table documents the results of cross sectional regression of CEO total compensation on firm age and CEO age dummy variable controlling for lagged sales, asset, market to book, current and lagged return and ROA. Total compensation is defined as the sum of salary, bonus, total value of restricted stock granted, total value of stock options granted, and all other payments. Young CEO equals to 1 if CEO age is less than or equal to 45, otherwise 0. Firm age is defined as the number of years since first appearance on Compustat with non-missing price information. Young firm equals to 1 if firm belongs to the bottom decile of firm age (firm age within 1-5 years). Tenure is measured since person first became a CEO. Return is measured at annual basis. ROA is measured as net income divided by total assets.

<i>Dependent Variable</i>	Total Compensation			
Young CEO	1.1234	0.9522	0.7706	0.2868
	6.45	5.15	4.18	1.53
log(1+Firm Age)	-1.1762	-1.1199	-1.1439	-0.4418
	-12.77	-11.87	-12.14	-4.40
Young Firm *		1.2366	1.3699	1.8718
Young CEO		2.75	3.06	4.23
log(1+Tenure)	0.4705	0.4665	0.3968	0.3022
	6.05	6.00	5.11	3.92
log(Sale_t-1)	0.0575	0.0578	0.0648	0.0947
	0.79	0.70	0.79	0.92
Market/Book t-1	0.0036	0.0037	0.0034	0.0028
	2.77	2.78	2.57	2.20
log(Asset_t-1)	2.0878	2.0844	2.0386	2.1061
	25.39	25.35	24.83	20.64
Return	0.0120	0.0120	0.0118	0.0101
	2.28	2.27	2.26	1.96
Return_t-1	-0.0008	-0.0008	-0.0009	-0.0012
	-0.57	-0.58	-0.65	-0.92
ROA	0.3778	0.3965	0.6105	0.8301
	1.27	1.33	2.05	2.82
ROA_t-1	0.8273	0.8527	0.7541	0.9131
	2.25	2.32	2.05	2.51
Industry fixed effect	no	no	no	yes
Year fixed effect	no	no	yes	yes
N	28050	28050	28050	28050
R-square	0.1083	0.1088	0.1198	0.1460

Table VI: Firm Investment by CEO Age and Firm Age: Regression Analysis

This table documents the results of cross sectional regression of investment growth on young CEO dummy, firm age and the interaction term controlling for past growth, asset, and market to book. Young CEO equals to 1 if CEO age is less than or equal to 45, otherwise 0. Firm age is defined as the number of years since first appearance on Compustat with non-missing price information. Young firm equals to 1 if firm belongs to the bottom decile of firm age (where firm age is within 1-5 years). T-statistics are reported below.

<i>Dependent Variable</i>	R&D Growth						Capital Expenditure Growth					
Young CEO	0.1123 5.03	0.1156 5.19	0.1089 4.77	0.0413 1.72	0.0461 1.90	0.0362 1.48	0.0500 1.11	0.0514 1.14	0.0356 0.78	-0.0242 -0.5	-0.0195 -0.4	-0.0345 -0.7
Firm Age	-0.1372 -12.15	-0.1296 -11.44	-0.1207 -10.02	-0.1150 -9.92	-0.1083 -9.32	-0.0975 -7.89	-0.1451 -6.57	-0.1423 -6.42	-0.1233 -5.19	-0.1215 -5.32	-0.1201 -5.24	-0.1002 -4.08
Young Firm * Young CEO				0.4396 8.12	0.4291 7.94	0.4405 8.14				0.4356 4.01	0.4153 3.82	0.4073 3.74
lagged dependent variable	0.0261 3.2	0.0233 2.86	0.0177 2.17	0.0189 2.31	0.0164 2.00	0.0105 1.28	0.0031 1.56	0.0030 1.6	0.0027 1.43	0.0030 1.62	0.0029 1.58	0.0026 1.41
log(Asset)	0.0110 2.33	0.0125 2.64	0.0176 3.54	0.0094 2	0.0109 2.31	0.0161 3.25	-0.0592 -5.99	-0.0603 -6.07	-0.0632 -5.97	-0.0605 -6.12	-0.0616 -6.2	-0.0642 -6.06
Market/Book	0.0000 0.4	0.0000 0.25	0.0000 0.16	0.0001 0.44	0.0000 0.29	0.0000 0.21	0.0003 0.88	0.0003 0.78	0.0003 0.78	0.0003 0.86	0.0003 0.77	0.0003 0.76
industry fixed effect	no	no	yes	no	no	yes	no	no	yes	no	no	yes
year fixed effect	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
N	13398	13398	13398	13398	13398	13398	28418	28418	28418	28418	28418	28418
R-square	0.0181	0.0277	0.0334	0.0229	0.323	0.0382	0.0052	0.0094	0.0106	0.0058	0.01	0.0131

Table VII: CEO Age and Firm Growth

This table documents average measurements of firm growth by CEO age (row) in the two extreme deciles of firm age (column). The youngest firm includes firms within the age group of 1-5 years, the old firm group includes firms have more than 20 years history. Sales growth, asset growth and capital expenditures growth are calculated as the current year value minus the lagged value in previous year (t-1) divided by the current year value. Tobin's Q is measured as the market value of equity plus book value of total liability divided by total assets. T-statistics measure the difference in average growth between firms have the youngest CEOs (≤ 45 years) and firms have the most senior CEOs (>60 years) for each firm age group and for the whole sample. Wilcoxon's p-values are also reported to test the difference in median growth between firms have the youngest CEOs (≤ 45 years) and firms have the most senior CEOs (>60 years) for each firm age group and for the whole sample.

		Firm Age					
		1-5 Years		>20 Years		All Years	
		mean	median	mean	median	mean	median
Panel A:	Sales Growth						
% of CEO aged	≤ 45 years	77.46%	28.95%	8.70%	6.17%	27.61%	12.34%
	46-50 years	45.61%	20.36%	10.12%	5.56%	17.97%	8.75%
	51-55 years	32.10%	17.30%	7.41%	5.55%	13.43%	7.81%
	56-60 years	22.27%	13.35%	7.44%	5.72%	10.74%	7.20%
	> 60 years	31.28%	16.00%	9.30%	6.38%	13.14%	7.70%
	<i>diff between young & old</i>	46.18%	<i>wilcoxon P-value</i>	1.06%	<i>wilcoxon P-value</i>	14.47%	<i>wilcoxon P-value</i>
	<i>t-stat</i>	4.38	<.0001	0.26	0.6344	6.79	<.0001
Panel B:	Asset Growth						
% of CEO aged	≤ 45 years	99.47%	24.37%	8.29%	4.34%	31.70%	9.16%
	46-50 years	48.02%	17.16%	8.36%	4.48%	16.59%	6.96%
	51-55 years	38.44%	15.10%	9.17%	4.96%	14.61%	6.76%
	56-60 years	32.50%	12.19%	8.48%	5.13%	12.66%	6.26%
	> 60 years	31.17%	14.83%	8.94%	5.67%	11.92%	6.60%
	<i>diff between young & old</i>	68.30%	<i>wilcoxon P-value</i>	0.65%	<i>wilcoxon P-value</i>	19.78%	<i>wilcoxon P-value</i>
	<i>t-stat</i>	5.19	<.0001	0.75	0.0290	7.67	<.0001
Panel C:	Capital Expenses Growth						
% of CEO aged	≤ 45 years	101.99%	30.80%	19.14%	5.66%	43.76%	10.28%
	46-50 years	62.54%	21.69%	16.66%	5.43%	37.24%	8.71%
	51-55 years	51.19%	18.50%	14.37%	6.14%	24.20%	7.93%
	56-60 years	51.37%	15.12%	15.87%	6.45%	22.55%	7.68%
	> 60 years	40.41%	20.99%	24.27%	7.01%	25.63%	7.57%
	<i>diff between young & old</i>	61.57%	<i>wilcoxon P-value</i>	5.13%	<i>wilcoxon P-value</i>	18.13%	<i>wilcoxon P-value</i>
	<i>t-stat</i>	5.13	1.97%	0.48	0.7809	0.04	0.01%
Panel D:	Tobin's Q						
% of CEO aged	≤ 45 years	4.20	2.16	1.46	1.12	2.35	1.47
	46-50 years	2.69	1.67	1.35	1.09	1.79	1.30
	51-55 years	2.30	1.60	1.34	1.07	1.65	1.22
	56-60 years	2.38	1.46	1.41	1.06	1.64	1.19
	> 60 years	2.22	1.47	1.41	1.11	1.60	1.19
	<i>diff between young & old</i>	1.98	<i>wilcoxon P-value</i>	0.05	<i>wilcoxon P-value</i>	0.75	<i>wilcoxon P-value</i>
	<i>t-stat</i>	5.89	<.0001	1.38	0.1237	8.51	<.0001

Table VIII: Firm Growth by CEO Age and Firm Age: Regression Analysis

This table documents the results of cross sectional regression of sale growth and asset growth on young CEO dummy, firm age and the interaction term controlling for past growth, asset, and market to book. Young CEO equals to 1 if CEO age is less than or equal to 45, otherwise 0. Firm age is defined as the number of years since first appearance on Compustat with non-missing price information. Young firm equals to 1 if firm belongs to the bottom decile of firm age (where firm age is within 1-5 years). T-statistics are reported below.

<i>Dependent Variable</i>	Panel A: Sales Growth						Panel B: Asset Growth					
Young CEO	0.0611 4.9	0.0617 4.97	0.0593 4.74	0.0026 0.19	0.0045 0.34	0.0018 0.14	0.0953 7.05	0.0901 6.69	0.0824 6.05	-0.0064 -0.39	-0.0088 -0.61	-0.0171 -0.98
Firm Age	-0.1282 -21.01	-0.1237 -20.26	-0.1202 -18.42	-0.1096 -17.4	-0.1057 -16.8	-0.1012 -15.05	-0.1693 -27.69	-0.1607 -26.13	-0.1543 -22.98	-0.1382 -21.90	-0.1309 -20.66	-0.1223 -17.69
Young Firm *				0.3459 11.49	0.3376 11.25	0.3366 11.23				0.6028 18.5	0.5854 18.04	0.5831 17.93
lagged dependent variable	0.0005 2.59	0.0005 2.56	0.0004 2.47	0.0005 2.53	0.0005 2.49	0.0004 2.41	0.0001 0.37	0.0001 0.38	0.0001 0.32	-0.0001 -0.37	-0.0001 -0.3	-0.0001 -0.36
log(Asset)	0.0042 1.53	0.0059 2.13	0.0045 1.55	0.0032 1.17	0.0048 1.76	0.0038 1.29						
Market/Book	0.0002 2.32	0.0002 2.2	0.0002 2.06	0.0002 2.28	0.0002 2.16	0.0002 2.02	0.0002 1.63	0.0001 1.37	0.0001 1.35	0.0002 1.55	0.0001 1.3	0.0001 1.28
industry fixed effect	no	no	yes	no	no	yes	no	no	yes	no	no	yes
year fixed effect	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
N	28777	28777	28777	28777	28777	28777	28868	28868	28868	28868	28868	28868
R-square	0.0202	0.316	0.399	0.0246	0.358	0.441	0.0314	0.0429	0.0466	0.0427	0.0536	0.0571

Table IX: Robustness Test - Wages of Hi-Tech Industry and Non Hi-Tech Industry

This table documents the results of cross sectional regression of CEO total compensation on firm age and CEO age dummy variable controlling for lagged sales, asset, market to book, current and lagged return and ROA. Hi-tech industries include Pharmaceutical (13), Tele Communications (22), Electronics (32), Computer (35, 36) defined using Fama French 49 industry. Total compensation is defined as the sum of salary, bonus, total value of restricted stock granted, total value of stock options granted, and all other payments. Young CEO equals to 1 if CEO age is less than or equal to 45, otherwise 0. Firm age is defined as the number of years since first appearance on Compustat with non-missing price information. Young firm equals to 1 if firm belongs to the bottom decile of firm age (firm age within 1-5 years). Tenure is measured since person first became a CEO. Return is measured at annual basis. ROA is measured as net income divided by total assets.

<i>Dependent Variable</i>	Total Compensation							
	Hi-Tech Industry				Non Hi-Tech Industry			
Young CEO	1.6937	1.3856	0.9937	0.7299	0.6038	0.4801	0.3386	0.1469
	2.56	1.97	1.42	1.03	4.85	3.64	2.59	1.14
log(1+firmage)	-1.8853	-1.7301	-1.4687	-1.1082	-0.6522	-0.6143	-0.6731	-0.2620
	-4.23	-3.75	-3.18	-2.26	-10.49	-9.66	-10.66	-3.95
Young Firm *		1.9610	1.8249	2.0798		0.9510	1.1493	1.4797
Young CEO		1.29	1.21	1.38		2.81	3.43	4.50
log(1+tenure)	0.4638	0.4661	0.4518	0.4494	0.4178	0.4136	0.3361	0.2582
	1.29	1.29	1.26	1.25	7.98	7.9	6.47	5.03
log(Sale_t-1)	-0.3593	-0.3708	-0.4632	-0.7808	0.5108	0.5122	0.5111	0.3518
	-0.98	-1.01	-1.27	-1.95	8.88	8.29	8.96	4.86
Market/Book t-1	0.0314	0.0311	0.0257	0.0257	0.0016	0.0017	0.0015	0.0013
	2.87	2.84	2.39	2.36	1.99	2.01	1.85	1.63
log(Asset_t-1)	3.3667	3.3686	3.4454	3.7996	1.3880	1.3846	1.3300	1.5883
	9.23	9.23	9.46	9.39	24.34	24.28	23.48	22.31
Return	0.0038	0.0038	0.0047	0.0053	0.0330	0.0331	0.0322	0.0319
	0.33	0.33	0.41	0.46	4.84	4.84	4.76	4.81
Return_t-1	-0.0045	-0.0045	-0.0015	-0.0009	-0.0007	-0.0007	-0.0010	-0.0011
	-0.41	-0.41	-0.14	-0.08	-0.83	-0.84	-1.14	-1.32
ROA	0.1038	0.1441	1.0679	1.1935	0.6081	0.6180	0.7133	0.8021
	0.12	0.16	1.18	1.32	2.5	2.54	2.94	3.37
ROA_t-1	0.1032	0.1441	-0.2881	-0.2284	1.7446	1.7641	1.7735	1.7369
	0.09	0.12	-0.25	-0.2	5.36	5.42	5.45	5.42
Industry fixed effect	no	no	no	yes	no	no	no	yes
Year fixed effect	no	no	yes	yes	no	no	yes	yes
N	5026	5026	5026	5026	23024	23024	23024	23024
R-square	0.0848	0.0851	0.1067	0.1088	0.1880	0.1898	0.2073	0.2399

Table X: Robustness Test – Firm Growth of Hi-Tech Industry and Non Hi-Tech Industry

This table documents the results of cross sectional regression of sale growth and asset growth on young CEO dummy, firm age and the interaction term controlling for past growth, asset, and market to book. Hi-tech industries include Pharmaceutical (13), Tele Communications (22), Electronics (32), Computer (35, 36) defined using Fama French 49 industry. Young CEO equals to 1 if CEO age is less than or equal to 45, otherwise 0. Firm age is defined as the number of years since first appearance on Compustat with non-missing price information. Young firm equals to 1 if firm belongs to the bottom decile of firm age (where firm age is within 1-5 years). T-statistics are reported below.

<i>Dependent Variable</i>	Sales Growth				Asset Growth			
	Hi-Tech Industry		Exclude Hi-Tech Industry		Hi-Tech Industry		Exclude Hi-Tech Industry	
Young CEO	0.0706	-0.0011	0.0443	0.0039	0.0834	-0.0372	0.0662	-0.0096
	1.54	-0.02	4.59	0.28	2.12	-0.87	4.89	-0.66
Firm Age	-0.2271	-0.1914	-0.0957	-0.0837	-0.2813	-0.2252	-0.1215	-0.0995
	-7.72	-6.18	-20.19	-17.21	-11.98	-9.15	-19.24	-15.35
Young Firm *		0.3564		0.2588		0.6071		0.4844
Young CEO		3.66		10.53		7.27		14.6
lagged dependent variable	0.0123	0.0116	0.0003	0.0003	0.0164	0.0135	0.0000	-0.0001
	4.14	3.9	2.27	2.27	4.21	3.45	-0.07	-0.68
log(Asset)	-0.0013	-0.0036	0.0093	0.0089				
	-0.12	-0.34	4.18	3.99				
Market/Book	0.0011	0.0010	0.0000	0.0000	0.0008	0.0007	0.0000	0.0000
	2.27	2.13	0.39	0.48	1.89	1.59	0.01	0.13
industry fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
year fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	5200	5200	23577	23577	5233	5233	23635	23635
R-square	0.0399	0.0424	0.0564	0.0608	0.0768	0.0861	0.0384	0.0464

Table XI: Firm Investment Growth of Hi-Tech Industry and Non Hi-Tech Industry

This table documents the results of cross sectional regression of investment growth on young CEO dummy, firm age and the interaction term controlling for past growth, asset, and market to book. Hi-tech industries include Pharmaceutical (13), Tele Communications (22), Electronics (32), Computer (35, 36) defined using Fama French 49 industry. Young CEO equals to 1 if CEO age is less than or equal to 45, otherwise 0. Firm age is defined as the number of years since first appearance on Compustat with non-missing price information. Young firm equals to 1 if firm belongs to the bottom decile of firm age (where firm age is within 1-5 years). T-statistics are reported below.

Dependent Variable	R&D Growth				Capital Expenditure Growth			
	Hi-Tech Industry		Exclude Hi-Tech Industry		Hi-Tech Industry		Exclude Hi-Tech Industry	
Young CEO	0.0774	0.0129	0.1181	0.0528	0.0417	-0.0608	0.0131	-0.0291
	1.92	0.30	4.2	1.76	0.26	-0.35	0.35	-0.71
Firm Age	-0.2250	-0.1874	-0.0881	-0.0719	-0.1570	-0.1059	-0.1135	-0.1010
	-7.82	-6.21	-7	-5.61	-1.54	-0.99	-6.09	-5.27
YoungFirm *		0.3526		0.4627		0.5078		0.2675
YoungCEO		4		6.23		1.51		2.77
lagged dependent variable	0.0219	0.0165	0.0053	-0.0012	-0.0127	-0.0132	0.0034	0.0034
	1.65	1.24	0.48	-0.11	-0.95	-0.98	2.49	2.49
log(Asset)	0.0225	0.0194	0.0194	0.0183	-0.1346	-0.1379	-0.0376	-0.0381
	2.29	1.98	3.4	3.21	-3.6	-3.68	-4.27	-4.33
Market/Book	0.0008	0.0008	0.0000	0.0000	0.0001	0.0000	0.0002	0.0002
	1.36	1.25	-0.23	-0.14	0.08	0.02	0.7	0.72
Industry fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	3997	3997	9401	9401	5154	5154	23264	23264
R-square	0.0432	0.0481	0.0288	0.0329	0.0164	0.0168	0.017	0.0174