Climbing the Corporate Ladder: Whom Do Highly Skilled CEOs Work For?

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ABSTRACT

In this paper we examine whether boards that are more aligned with shareholders' interests end up hiring more talented managers. Using a novel measure of managerial talent, we find that talented CEOs work for firms with less independent boards. We explore whether supply or demand-side labor market frictions can explain this result, and find that talented CEOs are paid more, receive a higher percentage of their pay in cash, and are more likely to serve as chair of the board, consistent with supply-side bargaining power frictions. Our evidence suggests that the preferences of highly-skilled managers impact the supply of managerial talent available to firms with independent boards.

Perhaps not surprisingly, existing empirical work shows that shareholders strive to hire smart, talented managers with a track record of success (Adams, Keloharju, and Knüpfer (2014), Kaplan, Klebanov, and Sorensen (2012), Falato, Li, and Milbourn (2015)). Since the hiring process is delegated to the board of directors, it is natural to conclude that boards that are more aligned with shareholders' interests end up hiring more talented managers. In this paper we examine this idea empirically, but find the opposite: more talented managers are matched with less shareholder-friendly boards.

To perform the empirical analysis, we propose a novel method to measure managerial talent. We use résumé data from a large sample of U.S. executives, board members, and officers, and construct a talent measure based on the complete career history for each individual. We first rank job titles along the corporate hierarchy, ranging from no managerial experience (the lowest level) all the way up the position of chief executive officer. We then calculate excess managerial experience as the difference between an individual's current hierarchy rank and the average rank for all individuals of the same age and birth cohort. Managerial talent is defined as the cumulative sum of prior excess managerial experience.

We validate our measure by showing that managerial talent is a good predictor of out of sample career growth: talented individuals are more likely to receive future promotions, win awards, serve on outside boards, and become CEOs. These results are not driven by firm size, the age that a person first becomes a CEO, or CEO experience, and are robust to cohort and educational network effects. Together, these results support the interpretation of this measure as managerial talent.

To measure how well boards represent shareholder interests, we use board independence. Independent directors have been shown to implement CEO-related policies that are more shareholder-friendly. In particular, there is evidence that independent boards increase shareholder

wealth through increasing the performance sensitivity of executive pay (Ryan Jr. and Wiggins III (2004), Knyazeva, Knyazeva, and Masulis (2013)) and firing poorly performing CEOs (Weisbach (1988), Guo and Masulis (2015)). If independent boards also make hiring decisions to benefit shareholders, one would expect to find that talented managers end up working for more independent boards.

However, our main results show that managerial talent is negatively associated with board independence. This relationship appears both in cross-sectional regressions of existing CEO firm matches and in the analysis of new CEO hires. The results are statistically significant and economically meaningful; a one standard deviation increase in board independence decreases managerial talent by around 13 percent relative to the median talent.

To alleviate the concern that the negative correlation between talent and board independence is driven by an omitted factor, we implement an experiment using the Sarbanes-Oxley Act of 2002 (SOX). We follow Duchin, Matsusaka, and Ozbas (2010) and identify firms that did not have a fully independent audit committee before SOX, but were legally required to have only independent directors serve on their audit committee after SOX. We use noncompliance with the audit committee rule pre-SOX as an instrument to predict changes in board independence post-SOX. The results of this instrumental variable estimation confirm our earlier analysis: talented CEOs match with less independent boards. The estimated magnitude of this relationship is also very similar to the cross-sectional results; a one standard deviation increase in board independence decreases managerial talent by about 11 percent.

Why is it the case that talented managers match with less independent boards? Broadly, there are two possible explanations. First, the matching result could be driven by supply effects. Labor literature shows that talented employees, including CEOs, enjoy more outside options (Rosen

(1981), Malmendier and Tate (2009)). Consequently, talented managers may choose to work for less independent boards to extract the benefits of control. Second, the relationship might be the result of demand side pressures. To the extent that independent directors can substitute for managerial talent (either through monitoring or directly managing firm decisions), firms might optimally trade-off managerial talent for independence of the board.

We start by examining the supply-side explanation of our main result. If highly-skilled CEOs have greater bargaining power, they will push for more personal benefits, such as guaranteed pay, job stability, and power. We find evidence consistent with this type of negotiation. Talented managers are paid more, and receive a higher percentage of their pay in cash.[1] Additionally, we find that talented managers are more likely to serve as chairs or vice chairs of the board. Taken together, these results are consistent with theory by Hermalin and Weisbach (1998) that shows that CEOs with higher perceived ability have higher bargaining power with the board, and push for a less independent board structure.

We also consider the possibility that frictions related to demand for CEO talent influence our results. There are two main channels through which this could occur. First, because independent boards are better able to monitor and dismiss bad CEOs, the cost of employing a bad CEO could be smaller. As a result, independent boards might employ a strategy of hiring less talented executives and quickly firing them in a quest to find a "diamond in the rough". While plausible, such a strategy is misguided in the data; we show that talented managers improve firm performance, particularly during recessions, so on average a firm is likely to be worse off by hiring from the less talented pool of managers. Moreover, the only way this strategy can be effective is if firms quickly churn through less talented CEOs in an attempt to find a person with above average

[1] Because this result holds for new CEO hires, it is not driven by manager entrenchment.

talent. We find no evidence that this is the case either. Employing the SOX experiment described earlier, we show that the frequency of turnover does not increase after boards become more independent.

A second possibility is that independent directors directly substitute for talented managers through managing the firm themselves (or equivalently, providing more managerial advice to the CEO). If this is the case, we should see that more independent boards also have more managerial talent. However, there is no robust relationship between the level of managerial talent on the board and the CEO's talent. Additionally, the managerial talent of the board does not increase after SOX.

Taken together, our results are most consistent with the supply of CEO talent affecting the CEO-firm match. It does not appear that demand for talent leads firms with independent boards to hire less talented managers. Rather, our results imply that CEO preferences impact the supply of managerial talent in the labor force.

An important remaining question is to what extent managerial talent affects firm value. Given the endogenous matching process between managers and boards, this is a difficult question to answer. Still, we present suggestive evidence that more talented CEOs are beneficial to a firm. In particular, highly talented managers run firms with lower levels of financial distress without sacrificing profitability. Broadly, it appears that shareholders trade-off the risk reduction benefits of a more talented CEO with the agency costs of a less independent board of directors.

This paper highlights the importance of the supply side of the CEO labor market. The existing literature has primarily focused on understanding the effects of manager characteristics on firm outcomes conditional on the endogenous matching process between CEOs and firms. Our paper, in contrast, specifically examines this matching process: Whom do highly skilled CEOs work for?

To our knowledge this is the first paper to empirically examine how CEO talent affects the bargaining process with the board of directors.

Our empirical approach also speaks to a growing literature that shows that specific CEO traits and skills, including inherent biographical traits[2] and aspects of work experience[3], matter for firm outcomes. To that extent, we introduce a new measure of managerial talent. This measure is intuitive, based on publicly available data, and easy to calculate for a large number of CEOs, senior executives, and directors. While our measure is new to the academic literature, it is motivated by the real world hiring practices of executive search teams. Our approach to quantifying managerial talent has several advantages over other measures used in the literature. First, it is very broad, and can be applied not only to the entire population of CEOs, but also to directors and other senior managers. Second, unlike most other broadly applicable measures, it captures talent ex-ante (before a person becomes a CEO). Third, the measure is dynamic and allows for different paths to success; it captures both the speed of climbing the corporate ladder and the stability of working in upper management positions. Finally, the measure intuitively corresponds to how executive search teams screen real job candidates' résumés. We believe that the dynamic nature of our measure can provide new insights to a variety of questions related to managerial human capital, including merger negotiation, compensation, and turnover.

Finally, we contribute to the literature exploring the role of independent members of the board of directors. While regulators have strongly pushed for increased board independence, academic

[2] For example, Lindqvist and Vestman (2011), Lindqvist (2011), and Adams et al. (2014) examine IQ, Benmelech and Frydman (2015) look at military experience, Malmendier, Tate, and Yan (2011) find that CEOs who lived through the Great Depression choose more conservative corporate financial policies, Nguyen (2015) and Cronqvist and Yu (2015) document that having a daughter affects CEO decisions, and Graham, Harvey, and Puri (2013) explore CEO optimism and risk aversion.

[3] Custódio and Metzger (2014) looks at financial experience of CEOs, Custódio and Metzger (2013) explores how relevant CEO industry experience effects mergers, and Dittmar and Duchin (2014) and Schoar and Zuo (2015) show that CEOs who have experienced negative shocks in their prior employment have more conservative financial policies.

theory is more ambivalent. Yet, most empirical studies have focused on documenting the benefits of independent directors, including better firm performance (Duchin et al. (2010)), higher transparency (Armstrong, Core, and Guay (2014)), replacement of poorly performing CEOs (Guo and Masulis (2015)),[4] and incentive-compatible CEO pay contracts (Knyazeva et al. (2013)). Our paper highlights a potential drawback of independent boards, and shows that by constraining the pool of potential CEO hires to less talented individuals, independent boards might negatively affect firm operations. This suggests that, at least for some firms, a universal push for independent directors might hurt firm value.

The rest of the paper is structured as followed. Section I provides an overview of the construction and external validation of our measure of managerial talent, Section II describes our main results, Section III explores whether the negative relationship between managerial talent and board independence is driven by supply or demand channels, and Section IV concludes.

I. Measuring Managerial Talent

A. Conceptual Framework

Our measure of managerial talent is based on the idea that on average, skilled individuals climb the corporate ladder more quickly and stay in higher managerial positions longer than less skilled individuals. There is a long tradition of economists and sociologists quantifying human capital based upon individuals moving up a corporate hierarchy.[5] We expand upon this practice by

[4] Duchin et al. (2010) show that outside directors increase firm profitability, stock returns, and value but only for those firms where collecting firm specific information is relatively costless.

[5] Most early work relied on employee records from a single firm to explore promotion within a firm (Rosenbaum (1979), Baker, Gibbs, and Holmstrom (1994)). More recent work uses a small sample of firms collected by the Center for Advanced Human Resources Studies at Cornell University from 1981 to 1988 to examine promotions both within and across firms (Belzil and Bognanno (2004), Belzil and Bognanno (2008), and Belzil, Bognanno, and Poinas (2012)). Our methodology allows us to examine job mobility both within and across firms for executives at several thousand firms from the 1940s to the present.

capturing not only the upward movement, but also the duration of these positions, and by scaling this progression relative to one's peers.

To formalize this idea, we definite a manager hierarchy, ranging from level 0 for non-manager positions to level 6 for the CEO. The rank levels, along with example job titles, are summarized in Table I.

[Table I about here.]

The roles that receive a value of one in our classification scheme describe low-level managers, such as line managers and supervisors. While this position involves some managerial responsibilities, they are typically limited to a small team of employees. Mid-level managers receive a score of two, and include general and group manager. Those positions require managing a larger group of people, but the accountability for team performance is still limited. Managers at a rank of 3 (senior managers) or higher typically have profit and loss responsibility for the group that they manage. The executive suite is made up of managers at level 4, 5, and 6. The rankings are designed to roughly correspond to the reporting distance to the CEO, i.e. a manager at level 3 reports to a manager at level 4 who reports to the CEO, COO, or CFO (level 5 or 6). All the other roles receive a score of zero. Examples of such position include scientists, engineers, and doctors. It is important to note that we do not necessarily consider these as low-talented people. Instead, we view those individuals as professionals who decided to build their career progression through specialization in a certain field, rather than through climbing managerial ladder, thus constituting an entirely different dimension of talent. This makes our measure of talent narrow in the sense that it is directly based on managerial skills (unlike, e.g., IQ). At the same time, though, our measure

broadly reflects not only intrinsic ability, but also effort, persistence, and a variety of human interaction skills.[6]

We use the manager hierarchy shown in Table I to define managerial talent. Each year, we calculate excess managerial rank as the difference between an individual's current rank and the average managerial rank for all individuals who are the same age and in the same birth cohort, where we define birth cohort by decade.[7] Managerial talent of an individual *i* at age *a* is then calculated as the cumulative sum of all prior years of excess managerial rank:

$$Talent_{i,a} = \sum_{a=25}^{a=A} \left(G_{i,a} - PG_{i,a} \right)$$

where $G_{i,a}$ is the rank of the individual's position at age *a*, and $PG_{i,a}$ is the average managerial rank of the birth cohort that an individual belongs to at the same age as the individual.

[Figure 1 about here.]

Figure 1 illustrates the process of constructing the measure of managerial talent. Under this framework, individuals are classified as talented if they ascend the corporate ladder more quickly and stay at the top longer than their peers.

B. Constructing the Measure

We provide a comprehensive overview of the construction of our measure of managerial talent in the Internet Appendix; in this section, we highlight the most salient points. The measure is based on data from the U.S. version of the BoardEx database from 2000–2012. BoardEx collects biographical information on board members and senior executives from publicly traded

[6] Some might worry that our measure reflects luck. While it is true that luck can influence career progression, it seems unlikely that luck systematically explains our measure of talent. Since our talent measure reflects decades of work experience, a manager would need to not only be lucky in quickly ascending the manager hierarchy, but also lucky in staying at the top of the hierarchy for long periods of time.

[7] Our results are robust to both longer (e.g., Pre-baby boom, baby boom, post-baby boom) and shorter (e.g., 5-year spans) definitions of birth cohorts.

companies. Included in this information is age, gender, past employment history—including dates and job titles, education and degree information, and civic and business awards. We use this data to recreate the complete career history for each individual in the database.

To construct the measure of managerial talent, it is necessary to quantify the managerial rank of each job that appears in BoardEx. There does not exist a standard ranking of managerial jobs (or even standardized job titles), so we classify job titles into the hierarchy described in Table I using a text algorithm based on our classification of frequently used job titles. Clearly, the actual management responsibility associated with a given job title varies with firm size. For example, an executive vice president at a very large firm (such as General Electric) might be functionally similar to a CEO at a small private firm. To account for the idea that positions at large companies may require more managerial talent, we scale the rank measures by firm size. In each year, we sort firms into quartiles based on total assets (we assign all private firms to the smallest size quartile).[8] We then add one rank level to managers working for firms in the largest size quartile and subtract one rank level for managers working for firms in the smallest size quartile. Because the job of low-level managers is arguably similar across all firm sizes, we only make this adjustment for managers ranked level 4 and above. This adjustment leads us to classify the rank of a CEO of a large company as level 7, a CEO of a medium size company as level 6, and the CEO of a small company as level 5.[9]

To check if this classification is reasonable, we perform several internal validity tests. First, at the firm-year level we check to make sure that the ranking process leads to a pyramid-shaped

[8] Our results do not change if we treat private firms as if they are in the middle size quartile or if we remove job experience at private firms. The results are also robust to classifying size based on market capitalization instead of total assets.

[9] Our results are robust to multiplicative adjustments to rank, rather than additive adjustments, and to not adjusting for firm size at all.

employee structure: one CEO, a relatively small executive suite, and a larger number of lower level managers.[10] Second, at the job title level we check to make sure that there are no large jumps (more than 2 rankings) in the aggregate data. Finally, at the individual level we examine the relationship between age and average rank. Figure 2 graphs this relationship for several different birth cohorts. Reassuringly, the figure looks very similar to the prediction of various models of human capital accumulation: managerial rank starts out very low, quickly rises for managers throughout the early part of their career, slows down and then peaks for managers in their mid-50s, and then declines slightly as managers approach typical retirement ages.

[Figure 2 about here.]

Figure 2 also highlights the fact the career trajectories have changed over time. Perhaps driven in part by a flattening of the corporate hierarchy (Rajan and Wulf (2006)), successive cohorts of individuals begin their careers at higher positions, climb the corporate ladder more quickly, and reach their peak management positions at earlier ages. These generational shifts reinforce the importance of indexing our measure of talent relative to one's birth cohort.

There are approximately 78,000 individuals in our BoardEx sample with work experience at over 100,000 unique firms, for a combined total of nearly 1.6 million individual-year observations. To mitigate the effect of outliers, we exclude employment history before the age of 25 and after the age of 70. We also exclude the cohorts that were born in 1980 and later, as those are still scarcely populated. We use this data to construct the measure of cumulative excess managerial rank described previously, which we refer to as manager talent. While all of the individuals in our sample are successful in the sense that they end up serving on a board of a public U.S. firm, there

[10] Some firms do have co-CEOs, so it is possible for a firm to have 2 or 3 CEOs in any given year.

is wide variation in their managerial experience. Approximately 15% of our final sample is populated by people at rank level 0, while almost 21% of the observations are CEO-years.

We explore the other dimensions of individuals' career patterns by creating a measure of professional experience (e.g., lawyer, doctor, engineer, professor, etc.). Each year, we count the number of years of prior professional experience that an individual has. We then subtract the average number of years of professional experience for an individual's age and birth cohort so that we have an excess measure of professional experience similar to our measure of managerial talent. We use a similar methodology to classify excess entrepreneurial experience based on the number of years spent working for companies that an individual founded.

Table II summarizes the distribution of managerial talent, along with other demographic characteristics of the individuals in our sample. By construction, the average of our talent measure is approximately 0, but there is significant variation across individuals with the interquartile range spanning -10 to +12. Consistent with existing literature that examines manager characteristics, our sample of directors and executives is primarily male and is well-educated, with around 25% of the individuals graduating from an Ivy League university. Panel B of Table III shows that managerial talent is not highly correlated with most of these observable characteristics. This result further supports the contribution of our measure of talent beyond factors related to education and personal background. It is also inconsistent with alternative interpretation of our measure, according to which successful career progression could be driven by family connections and socio-economic status, or the prestige of the educational institution the individual has attended. However, there is a strong negative correlation between managerial talent and professional talent (and relatedly, earning a PhD or MD degree). This suggests that individual often follow one of

two paths: either they progress by successfully climbing the managerial ladder or they choose to develop professional skills (concentrate in law, science, and medicine).

[Table II about here.]

C. External Validation of Measure

The dynamic nature of our measure allows us to perform several out-of-sample validation tests. If the measure actually reflects talent, we expect to be able to predict future career success. To test this in the data, we estimate logit models that predict the probability of future career promotion, as well as the probability of becoming a CEO, as a function of current managerial talent.

To ensure that our analysis not driven by individuals who have reached the top of the managerial ladder and remained there throughout the rest of their career, we constrain the analysis to observations where individuals are not currently serving as CEO. We define promotion as a binary variable equal to one if an individual moves up in managerial rank any time within the next five years. In other words, we estimate career progression during age interval a+1 through a+5 as a function of managerial talent and control variables as of age a. To avoid data overlaps, which could lead to autocorrelation issues, we look at individuals every 5 years (rather than every year). Thus, we end up including individuals only at ages 25, 30, 35, etc. all the way up to 70. We also cluster our standard errors at the individual level. Because promotion rates vary both by age and current job rank, we include fixed effects for both age and the current level of managerial rank. We also include decade fixed effects to account for the shift in promotion dynamics over time that is evident in Figure 2. Finally, we include controls for the level of professional and founder talent and for gender, ethnicity, and education.

The results are reported in Table III. Column 1 reports the estimated effect of managerial talent on receiving a promotion, while column 2 reports results for a similar specification where

promotion is defined as becoming a CEO. In both cases, managerial talent positively predicts future career growth, and the results are significant at the 1% level. A one standard deviation increase in managerial talent increases the probability of receiving a promotion by about 3% (10% relative to the mean promotion rate). A similar increase in managerial talent raises the probability of becoming a CEO by 18%, or nearly 73% relative to the unconditional probability of being a CEO.

[Table III about here.]

Importantly, these results control for both the level of education and the educational network, so talent is not simply capturing the network benefits of attending a top school. In fact, there is no robust relationship between attending an Ivy League or top 25 university and future career promotions.

These results suggest that individuals with high levels of talent have better career outcomes. As an additional validation of our measure, we use managerial talent to predict whether talented individuals are more likely to receive future awards. We collect data on awards from BoardEx; these awards include business awards such as making the Forbes Best CEOs list as well as civic awards. We use the same methodology that we used to predict promotions to estimate the probability of winning at least one external award in the next 5 years. Column 3 of Table III shows that managerial talent positively predicts winning awards; a one standard deviation increase in talent increases the probability of winning an award by about 8%, which is a huge change relative to the average probability of 9%.

Finally, we expect talent to be rewarded not only in the managerial labor market, but also in the director labor market. To test whether the demand for directors increases with managerial talent, we estimate a linear regression of the number of boards that an individual sits on as a

function of talent and other demographic characteristics. The results are shown in Table IV. In column 1 we show that talented individuals do serve on more boards. A one standard deviation increase in talent increases the number of boards that an individual serves on by about 10% relative to the mean; the effect is highly statistically significant. Next, we restrict the sample to directors that also serve as a CEO of a different firm. Fahlenbrach, Low, and Stulz (2010) document a high demand for current CEOs to serve as outside directors; we expect that demand to be especially strong for more talented CEOs. Column 2 confirms that talented CEOs do serve on more boards of directors; the magnitude of the effect is slightly stronger than, but similar to, the effect for the overall sample.

[Table IV about here.]

To summarize, our measure of managerial talent positively predicts out-of-sample career growth, including becoming a CEO and serving on outside boards of directors, as well as winning outside business and community awards. This is consistent with our interpretation of this measure as managerial talent.

II. Main results

In this section we test whether the characteristics of the board of directors have an impact on CEO abilities by examining whether board independence is associated with managerial talent. We first analyze the relation between board independence and talent in a panel-data setting, while controlling for other factors that could influence firms' choice of CEO characteristics. To ensure that our results are not driven by omitted variables, we next perform an instrumental variable analysis and look at changes in talent following SOX reform.

A. Board Independence and Talent – Cross-sectional Analysis

If independent boards better represent the preferences of shareholders, we should expect to find that firms with a more independent board structure strive to hire more talented managers. Alternatively, in the presence of supply- or demand-side frictions in the CEO labor market, we could find the opposite. For example, a talented manager may shy away from independent boards, as an independent board could impose too many constraints on the CEO or over-control his work. From the demand-side perspective, an independent board could provide a substitute for CEO talent by essentially taking on the CEO managerial role. In this case, board members could tilt towards hiring a less powerful CEO and shrinking his duties to communicating board decisions to lower-level firm executives.

We perform the analysis of managerial talent and board independence at a firm-year level. Our sample consists of all observations in the Compustat-CRSP dataset over the period 2000-2012 that we were able to link to BoardEx data and obtain information on board structure and CEO identity and talent. The final sample consists of over 6,700 firms. We first examine the relation between board independence and CEO managerial abilities by estimating a cross-sectional regression of managerial talent at time t as a function of board independence and a standard set of firm characteristics, also at time t. To account for time trends and cross-sectional differences across industries, we include year and industry fixed effects (the industries are defined based on Fama-French 48 industries classification). To control for potential time-series dependence in the residuals, we cluster the standard errors at the firm level.

We use two proxies to measure board independence. First, using BoardEx data on board composition, we define independence as the proportion of non-executive directors out of the total number of directors on the board. The advantage of this measure is that it captures board characteristics across a wide range of firms, and allows for a fair representation of small firms.

The disadvantage of the BoardEx-based independence measure is that many non-executive directors are not entirely independent, and could be related to existing management through board interlocks or former employment at the firm. As a result, we employ IRRC's definition of board independence as an alternative proxy in our analysis. IRRC considers only individuals that are not affiliated with the company as independent directors. This more precise definition excludes former employees, interlocking directors, and family members of current executives and directors. The downside of the IRRC data is that it is limited to the sample of S&P 1500 firms only.

In addition to board independence, we include a standard set of control variables. To capture aspects of firm reputation, which could attract a certain type of manager, we include firm size (Log(Market Cap)) and age (Log(Firm Age)), as well as performance characteristics (M/B, EBITDA/Sales, Leverage, and a dummy for whether the firm is a dividend payer). It is also possible that managerial talent could be more valuable in innovative and R&D-oriented firms. Therefore, we include asset tangibility (PP&E), the scope of R&D activity, as well as a dummy for positive R&D investment. The detailed description of variable construction is summarized in the Appendix. Table V summarizes the distribution of the main variables used in our sample; Panel B reports the correlation matrix. While CEOs are, not surprisingly, much more talented than an average individual in our BoardEx sample (mean talent = 22.5), there is still considerable variation in talent across CEOs with an interquartile range of 9.1 to 34.7.

[Table V about here.]

The first column of Table VI reports the coefficients of a cross-sectional regression of managerial talent on independence using the BoardEx definition of board independence. Contrary to the idea that independent directors hire more talented CEOs to better serve their shareholders' needs, we find that the relationship is negative and statistically significant. The magnitude of the

effect is also economically large; a decrease in board independence from the 75th to the 25th percentile leads to an increase in managerial talent of about 2.63 units (13% relative to the median value of talent). The significance of control variables, such as size and firm age, points to reputational incentives of talented managers to favor some firms over others. This result is consistent with the study by Fahlenbrach, Low, and Stulz (2010), who show that highly demanded directors choose to work for larger and more established firms. It also fits the literature on compensation, which demonstrates that larger firms pay more. Interestingly, the measures of R&D intensity and growth (M/B) are negative, suggesting that managerial talent is not the most valuable aspect of human capital in those firms. It is possible that other characteristics, such as entrepreneurship experience and education in STEM industries are more important. In column 2 we perform the same analysis using an alternative measure of board independence. While the sample is much smaller, the effect of board independence on CEO talent is also negative, and statistically and economically significant.

[Table VI about here.]

One concern with cross-sectional regressions is that the relationship between talent and board independence might be driven by other factors, such as entrenched CEOs. Talented managers likely have longer tenures; over time, they might use their influence to replace independent board members with sympathetic insiders. This could result in the cross-sectional relationship that we observe even if no labor market frictions exist. To alleviate this concern, we explicitly examine the matching process by looking at how the structure of the existing board is related to the talent of a newly appointed CEO.

To perform the analysis, we start by identifying all the cases where a new CEO was appointed in year t. We then estimate the talent of the newly-appointed CEO as a function of board

independence and control variables in year t-1. Columns 3 and 4 of Table VI present the results when we use BoardEx and IRRC-based definitions of independence, respectively. Once again, the relationship is negative and statistically significant, indicating that less independent directors end up hiring more talented managers.

B. SOX Experiment

It is still possible that the negative correlation between talent and board independence is driven by an omitted factor. To alleviate this concern, we implement an experiment using the Sarbanes-Oxley Act of 2002 (SOX). We follow Duchin, Matsusaka, and Ozbas (2010) and first identify firms that did not have a fully independent audit committee before SOX. After SOX, these firms were legally required to have only independent directors serve on their audit committee. This regulation allows us to observe an exogenous change in the composition of the board. Importantly, this shock to board independence only affects a subset of firms; many companies already had a fully independent audit committee before SOX. By examining changes in manager talent at the firms that experienced this shock in board independence relative to those firms that did not, we can rule out the possibility of omitted variables driving our results.

To implement this experiment we use noncompliance with the audit committee rule pre-SOX as an instrument to predict changes in board independence post-SOX. As documented in Duchin et al. (2010), pre-SOX noncompliance strongly predicts post-SOX increases in board independence, eliminating weak instrument concerns. The instrument also plausibly satisfies the exclusion restriction: pre-SOX noncompliance with the audit committee rule is not likely to influence post-SOX managerial talent except through changes in the structure of the board.

To perform the analysis, we follow the methodology in Duchin et al. (2010) and use year 2000 as the pre-SOX year, and year 2005 as the cut-off point by which the changes to board structure

have been implemented. As a first stage of our instrumental analysis, we estimate the change in board independence between 2000 and 2005 as a function of a dummy variable that takes on a value of one if the board was not compliant with the independent audit committee requirement in 2000, and the same set of control variables that we used in our previous regressions (also as of year 2000). Consistent with Duchin et al. (2010), we find that the dummy for non-compliance is a strong a positive predictor of whether the overall board of directors will shift towards more independence by the end of 2005 (see column 1 of Table VII).

[Table VII about here.]

We then identify all the cases where the CEO has changed during the 2000 – 2005 period, and estimate the difference in talent of the new versus old CEO as a function of the instrumented change in board independence and the same vector of controls. Looking at differences in talent between the departing and the new CEO is essential for our analysis, since the changes in CEO talent of the same person over time are primarily driven by additional years of tenure as a CEO and time-series variation of the talent of his corresponding peer cohort, and therefore are not conceptually meaningful. The results of this second-stage instrumental variable estimation, reported in column 2 of Table VII, confirm our earlier findings: talented CEOs match with less independent boards. The estimated magnitude of this relationship is also very similar to the cross-sectional results. For example, according to specification (2), a one-standard deviation increase in instrumented board independence reduces the talent of the newly appointed CEO by 3.4 units (equivalent to 11% of the median talent of the sample firms).

One caveat of our instrumental analysis is that in the second stage we have to limit ourselves to the subsample of CEO turnover cases. If the decision to replace a CEO is endogenous to board independence, it could bias our results. To address this issue, we would ideally like to examine

only the cases of exogenous CEO turnover (for example, due to death or health issues). However, those are rare, and can be applied only when examining a large sample of firms over an extended period of time.

As a result, we address this issue by re-estimating the second stage regression after removing all cases of involuntary CEO turnover, as forced CEO exists could be potentially endogenous to board composition. Identifying forced exits is also a non-trivial task, as CEOs are rarely openly fired from their position. Therefore, we adopt an indirect, but broader and more conservative approach, and identify forced turnover based on career path information, as well as firm performance. Specifically, in column 3 we exclude all the instances of potential demotion, which we define as situations where the departing CEO was between 50 and 55 years old at the time of his departure (according to our sample, managerial talent peaks in this age range), and does not re-enter the BoardEx sample as a CEO of a different firm. In column 4 we eliminate CEO turnovers that occur after a period of poor firm performance. Turnover after poor performance is more likely to be involuntary, and since sensitivity to performance increases with board independence, some of those departures could be driven by the change in board composition. Following Jenter and Kanaan (2015), we use a 20% drop in stock price of a firm in the year prior to CEO departure to identify cases where a CEO was forced to leave the company due to underperformance. Finally, we exclude turnover cases where the CEO departs after a relatively short tenure with the firm. Schwab and Thomas (2006) find that over 50% of CEO contracts are for a definite term of up to three years (with three years being the most common length). Therefore, in column 5 we remove all cases where the CEO leaves after serving for three years or less, which could indicate that the contract has been terminated prematurely or was not renewed. As shown in Table VII, the results

of the second stage estimation do not change significantly when we restrict the analysis to potentially exogenous cases of CEO turnover.

III. Demand versus supply channel

Our results point to a strong and robust negative relationship between talented managers and independent boards. In this section, we explore the reasons for that relationship. First, we examine the possibility that supply-side CEO labor market frictions lead to talented CEOs matching with less independent boards. Then, we consider whether demand-side labor market frictions can explain this result.

A. Supply-side Labor Market Frictions

One potential explanation for the negative relationship between manager talent and board independence is that highly-skilled CEOs have more bargaining power. Since independent boards reduce the ability of an executive to enjoy the benefits of control, CEOs with more bargaining power might choose to work for firms with less independent boards. Alternatively, talented CEOs could push the firm into agreeing to implement a less independent board structure (Hermalin and Weisbach (1998)).

To examine the plausibility of this explanation, we look for evidence that talented CEOs do, in fact, have more bargaining power. While we cannot directly observe the contract negotiating process between a potential CEO candidate and the board, there are at least three observable aspects of the job that a CEO can explicitly contract over: the level of pay, the composition of pay, and whether or not the CEO will also serve as chairman of the board. As rational and risk-averse individuals, CEOs with greater bargaining power will push for higher levels of pay, as well as a higher percentage of guaranteed pay. To ensure control over the company, and the board in particular, a powerful CEO should be also more interested in serving as chairman of the board.

To test these ideas, we start by estimating CEO compensation and its components using cross-sectional regressions and report the results in Table VIII. One difficulty in estimating these regressions is that independent boards influence CEO pay directly, and not just through their attractiveness to certain CEO types. While the literature relating board independence to the level of executive compensation finds mixed results, there is strong evidence that independent boards increase the performance sensitivity of CEO pay (Knyazeva, Knyazeva, and Masulis (2013)). To investigate if there is an effect of managerial talent on compensation beyond the fact that talented managers work for less independent boards, we first orthogonalize the measure of managerial talent by regressing it on independence and our standard set of firm controls. We then use the residuals from this regression as the explanatory variable for the level and composition of CEO pay. This procedure helps to ensure that the estimated effect of managerial talent on CEO pay is not driven by the structure of the board.

In columns 1 and 2 of Table VIII, we report the results of a linear regression of the log of total CEO pay on the othogonalized measure of managerial talent and other firm characteristics that are common in the executive pay literature. We obtain executive compensation data from S&P's Execucomp database and merge this data with our BoardEx sample. Because Execucomp only covers S&P 1500 firms, the sample size for these regressions is smaller. Column 1 measures total pay using Execucomp variable *TDC1* which represents the expected value of the contract in that year. Column 2 measures pay with *TDC2* which captures the actual value of realized pay in that year, which might include profits from exercising options granted in previous years.

[Table VIII about here.]

We find that the expected value of total pay is lower for talented executives, though the effect is statistically weak and the economic magnitude is small (a one standard deviation increase in

talent reduces pay by only about 3%). However, talented CEOs end up making more money *ex post*—though the difference is again small (about 4%). Overall, we conclude that the level of pay is similar for both talented and less talented CEOs.

We find more consistent results when looking at the composition of pay. Column 3 shows that talented CEOs receive a higher percentage of pay in cash, while column 4 shows that these CEOs receive a lower percentage of their pay in options. These results are highly statistically significant. A one standard deviation increase in talent is associated with a 6% increase in the percentage of total pay made up of cash relative to the standard deviation, and a 3% decrease in the percentage of options relative to the standard deviation.[11] These results are consistent with talented managers bargaining to keep their level of pay constant, while simultaneously reducing the performance-sensitivity of their pay package.

In Table IX we provide evidence that a highly-skilled executive is also more likely to serve as the chairman of the board of directors. In this table, we estimate a logistic model where the dependent variable is a dummy variable for CEO-chair duality and the main independent variable is the orthogonalized measure of managerial talent described above. Column 1 reports estimates for the entire sample, while column 2 shows the results for the subsample of firms using the IRRC-based definition of independence. In both specifications, we find a strong and significant positive relationship between managerial talent and CEO-chair duality. A one standard deviation increase in managerial talent doubles the probability that the CEO simultaneously serves as the chairman of the board.

[Table IX about here.]

[11] The results, reported in Table VIII, use the BoardEx definition of board independence. We obtain very similar results when we re-estimate all the regressions using the IRRC definition of independence (unreported for the sake of brevity).

The results in Table VIII and IX are consistent with highly-skilled CEOs having increased bargaining power. Together with our main results, this suggests that the preferences of CEOs impact the supply of managerial talent in the labor force.

B. Demand-side Labor Market Frictions

In this sub-section we consider the possibility that the negative relationship between board independence and CEO talent is influenced by characteristics of firms' demand for CEO talent. We explore several mechanisms that could explain the observed relation.

B.1. Firing Costs

First, we consider low firing costs as an explanation for hiring less observably talented CEOs. Existing literature demonstrates that an independent board can better monitor and more easily dismiss bad CEOs (Weisbach (1988)). In this case, the cost of hiring a CEO with an unconfirmed track record for a short period of time could be lower. As a result, independent boards might employ a strategy of looking for a "diamond in the rough": Instead of relying on previous managerial success as a signal of true ability, independent directors may prefer to assess the talent of a potential CEO using a hands-on approach.[12] If this is the case, we could observe that independent board members consistently hire less talented executives, and then fire them if their performance does not meet the desired standards.

However, for this explanation to hold, we should also find that CEO turnover is higher in firms with an independent board structure. The evidence indicates otherwise. Using cross-sectional analyses, existing literature demonstrates that while CEO turnover is more sensitive to firm performance in the presence of a more independent board, board independence on its own does not affect the probability of CEO turnover (Kaplan and Minton (2012)). We further examine this

[12] Denis, Denis, and Walker (2015) suggest that independent boards are better at assessing the quality of a potential CEO.

question using an instrumental variable approach, and perform a second-stage SOX experiment where the dependent variable is a dummy for whether the CEO was replaced between the years 2000 and 2005. The results, reported in column 6 of Table VII support the cross-sectional findings by Kaplan and Minton (2012), and contradict the explanation of searching for a "diamond in the rough". The coefficient on the change in board independence is negative and statistically insignificant, which is inconsistent with the argument that firms with independent directors quickly churn through less talented CEOs in an attempt to find a person with above average abilities that are orthogonal to our talent measure.

B.2. Managerial Talent and Firm Performance

Another possible explanation for the negative relationship between board independence and talent on one side, and no impact of board independence on CEO turnover on the other is that our measure of talent could be negatively associated with firm performance. For example, it could unintentionally pick up some aspects of managerial entrenchment, overconfidence, or myopic behavior, along with successful career progression. In this case, independent boards would essentially act in the best interests of firm shareholders by hiring a CEO with a less impressive personal record, but a value-enhancing managerial strategy. Delivering good performance would, in turn, reduce the probability that a less talented manager will be dismissed from his current position, so that on aggregate, we would observe no relationship between turnover and board independence.

To explore this possibility, we test whether our measure of CEO talent is associated with poorer firm performance. Evaluating value implications is a notoriously difficult task, as the choice of CEOs characteristics is (at least partially) determined by the characteristics of the board, which, in turn, could be driven by firms optimally adjusting the composition of the board to reflect

monitoring needs (Coles, Daniel, and Naveen (2008)). To control for a variety of factors that affect the match between the CEO and the firm, and at the same time may be correlated with firm performance, as well as the potential non-linearity of those relations, we perform a propensity score matching exercise, and ask whether the future performance of firms is different when they are managed by above- versus below-average CEOs. We proceed in the following way.

First, we estimate a logistic propensity-score regression of CEO talent. Since talent is a continuous variable, we convert it into a dummy variable by ranking all firm-year observations into quintiles based on CEO talent, and picking the top (*High talent)* and the bottom (*Low talent)* quintiles. We then estimate a logistic regression of the high talent dummy as a function of parameters that may be correlated with CEO matching with the firm, as well firm performance (our control variables are the same as the one used on Table VI). After fitting the model, we calculate the propensity score for each observation, which is the estimated probability of belonging to a high talent CEO type (the results of the propensity score estimation are available in the Internet appendix).

Next, we match firms from the treated group (firms with highly-talented CEOs) with firms that are run by low-talented CEOs. Specifically, we implement nearest neighbor matching within a caliper, and for every firm-year in the treated group we search for the closest match in the non-treated group, conditional on its propensity score falling within a 0.05 distance from the propensity score of the treated observation. To enhance the quality of the match and ensure that we obtain the closest match based on all the available observations in the control group, the match is performed with replacement (Abadie and Imbens (2006)). To further ensure that our covariates are balanced, we require that the treated and control firms have the same board size and proportion of independent directors, are in the same year, and fall in the same quintile of sales, market-to-book,

and asset tangibility. For every pair of firms matched on characteristics as of year t, we compare the performance and risk characteristics as of t+1.

The distribution of the variables of interest, as well as the distribution of the matching covariates, is reported in Table X. The bottom panel shows that covariate balance is achieved, and the differences in control variables should not confound the differences in the variables of interest. Specifically, the differences in the distribution of the treatment and control groups are statistically insignificant, as indicated by the p-values of the independent group t-tests and the Wilcoxon rank sum tests.

At the same time, Panel A of Table X shows that there are differences in firm outcomes. In particular, the z-score is much higher for firms with talented managers. Consistent with this finding, the probability of going into distress, as indicated by the z-score below 1.81, is over 2% lower in firms whose managers had a successful career progression. One may argue that talented CEOs adopt less risky strategies as part of an incentive to underinvest, but this is not the case. Future operating performance of firms managed by talented CEOs (sales growth, EBITDA, and net income) is statistically and economically indistinguishable from firms managed by low talent CEOs. Additionally, stock returns are identical between the two groups. Taken together, our results suggest that talented CEOs are able to reduce the riskiness of the firm and protect its financial health without sacrificing profits. More broadly, our findings indicate that our measure of talent is associated with value enhancing characteristics. As a result, the explanation that less talented managers are beneficial to firm performance, and therefore, are in higher demand by firms with independent board members, does not hold ground.

[Table X about here.]

B.3. Board substitution for talent

A third possibility is that independent directors directly substitute for CEO talent through managing the firm themselves (or equivalently, providing more managerial advice to the CEO). If this is the case, we should see that more independent boards have more managerial talent. To explore this possibility, we estimate average managerial talent of the non-executive directors as a function of board characteristics and the same set of control variables that we used in the estimation of managerial talent. The results, presented in Table XI, are mixed. While the relationship between board independence and the managerial talent of independent directors is positive and significant in the panel regression, it is insignificant when we examine director appointments using the BoardEx sample (in cases where several directors join in the same year, we average the talent across all newly appointed directors). Additionally, the managerial talent of the board does not increase after SOX: the change is negative and statistically insignificant. Taken together, we do not have strong evidence to suggest that an independent board substitutes CEO talent with the managerial talent of its board members.

[Table XI about here.]

To explore the relationship between board independence and the talent of directors and managers through an alternative lens, we repeat the analysis of CEO talent and board independence after augmenting the main specification of Table VI with the board talent variable. The idea behind this analysis is as follows: if substitution between board and managerial talent is, indeed, the channel through which board independence affects managerial talent, we should find that after including board talent in the regression, the relationship between independence and CEO talent disappears. To ensure that our results are not affected by multicollinearity between board independence and board talent, we first orthogonalize the measure of board independence by regressing it on board talent and our standard set of firm controls. Thus, including the residual of

board independence should pick up the effect that board independence has on CEO talent beyond its correlation with board talent. The results are presented in Table XII. While both the magnitude and significance of the impact of independent directors' talent on managerial talent is once again unstable, the effect of orthogonalized board independence is statistically significant, and the magnitude of the coefficients is close to the magnitude of the main specification. As a result, board independence has an impact on CEO talent above and beyond the talent substitution channel.

[Table XII about here.]

IV. Conclusion

Because the chief executive officer (CEO) can have a substantial impact on firm outcomes (Bertrand and Schoar (2003), Gabaix and Landier (2008)), shareholders should have strong incentives to hire talented CEOs. Rather than directly searching for and hiring these executives themselves, shareholders delegate this responsibility to the board of directors. Since independent directors are generally associated with more shareholder-friendly decisions, it seems plausible that firms with more independent boards will hire the most talented CEOs.

We show that the opposite occurs: talented CEOs match with firms with less independent boards of directors. Because talented CEOs reduce the riskiness of the firm without sacrificing stock returns or profitability (and because compensation expenses to the firm are similar across low and high talent CEOs), this result does not seem to be consistent with demand-side frictions in the CEO labor market. Instead, the evidence suggests that talented managers have increased bargaining power and that they use this bargaining power to work for firms where they are more likely to be able to enjoy the benefits of control.

This paper shows a potential downside of independent boards. By constraining the potential pool of CEO candidates to less talented managers, board independence might increase the riskiness

of the firm. More broadly, these results emphasize the importance of the supply-side of the CEO labor market in determining the governance environment of the firm.

Appendix

This appendix defines each of the variables used throughout the paper. Variables are measured at either the individual-age level or the firm-year level. For clarification, we use the following subscripts: *i* for individuals, *a* for age, *j* for firms, and *t* for year.

Variable	Definition	Source
Age_{ia}	Age of an individual as of December 31 based on year of birth.	BoardEx
$American_{i}$	A dummy variable that takes on a value of one if the nationality of an individual is American, and zero otherwise.	BoardEx
Board $independence_{jt}$ (BoardEx)	The ratio of the number of non-executive directors to total board size.	BoardEx
Board $independence_{jt}$ (IRRC)	The ratio of the number independent directors (as defined by IRRC) to total board size.	IRRC
Board $Size_{jt}$	The total number of the directors on the board as of December 31.	BoardEx
Board $Talent_{jt}$	The average managerial talent of the non-executive directors serving on the board as of December 31.	Authors' calculations using BoardEx
Dividend $payer_{jt}$	A dummy variable that takes on a value of 1 if a firm reported positive dividends (DVC) during the fiscal year, and zero otherwise.	Compustat
$EBITDA/Sales_{jt}$	The ratio of Operating Income Before Depreciation (OIBDP) to total sales (SALE). The ratio is winsorized at -1 and 5.	Compustat
$Female_{i}$	A dummy variable that takes on a value of one if an individual is female, and zero otherwise.	BoardEx
Financial $distress_{jt}$	A dummy variable that takes on a value of one if Altman's Z-score is within the lower bound of the zone of ignorance (that is, below 1.81), and zero otherwise.	Compustat
Founder $talent_{ia}$	The number of years of prior experience working for a firm that the individual founded or co-founded minus the average number of years spent working for such a firm across all individuals that are the same age and born in the same decade. The ratio is winsorized at 1% and 99%.	Author's calculations using BoardEx
$Rank_{ia}$	The level of an individual's highest managerial position as of the calendar year end, based on the job title. The possible levels range from 0 to 6 and are defined in Table I.	Author's calculations using BoardEx
Into financial $distress_{jt}$	A dummy variable that takes on a value of one if Altman's Z-score in year *t* has reached the lower bound of the zone of ignorance (that is, dropped below the threshold of 1.81), and zero otherwise.	Compustat
Ivy_{ia}	A dummy variable that takes on a value of one if an individual has completed a degree at an Ivy League school, and zero otherwise.	BoardEx
$Leverage_{jt}$	The sum of long- and short-term debt (DLTT and DLC, respectively), scaled by firm assets (AT). The ratio is winsorized at 0 and 1.	Compustat
Log(Firm Age_{jt})	Natural logarithm of one plus the number of years since the firm appears in Compustat and has a non-missing asset value.	Compustat
Log(Market Cap_{jt})	Natural logarithm of market capitalization (product of shares outstanding (CSHO) and price (PRCC_F)) of at the end of the fiscal year (in million $US)).	Compustat

Variable	Definition	Source
$Log(sales_{jt})$	Natural logarithm of total sales (SALE).	Compustat
M/B_{jt}	Market-to-book assets ratio. It is calculated as the sum of book assets (AT) and market cap, minus book value of equity (CEQ) and deferred taxes (TXDB if available; zero otherwise), all scaled by book assets. The ratio is winsorized at values of 0 and 20.	Compustat
Managerial $talent_{ia}$	At each calendar year end, we subtract an individual's current managerial rank from the average managerial rank across all individuals that are the same age and born in the same decade. We then calculate the cumulative sum of all prior years of excess rank. The variable is winsorized at 1% and 99%.	Authors' calculations using BoardEx
$Masters_{ia}$	A dummy variable that takes on a value of one if an individual has a non-MBA master's degree, and zero otherwise.	BoardEx
MBA_{ia}	A dummy variable that takes on a value of one if an individual has an MBA degree, and zero otherwise.	BoardEx
MD_{ia}	A dummy variable that takes on a value of one if an individual has a Doctor of Medicine (MD) degree, and zero otherwise.	BoardEx
Net $income_{jt}$	The ratio of net income (NI) to total sales (SALE). The ratio is winsorized at -1 and 5.	Compustat
$Noncompliance_{j}$	A dummy variable that takes on a value of one if a firm did not have a fully independent audit committee in year 2000, and zero otherwise.	IRRC
PhD_{ia}	A dummy variable that takes on a value of one if an individual has a PhD degree, and zero otherwise.	BoardEx
Positive $R\&D_{jt}$	A dummy variable that takes on a value of 1 if a firm reports positive R&D expenses (XRD), and zero otherwise.	Compustat
$PP\&E_{jt}$	The ratio of plant, property and equipment (PPENT) to total assets (AT). The ratio is winsorized at 0 and 1.	Compustat
Professional $talent_{ia}$	The number of years of prior experience working in a professional position in finance, law, science/technology, medical, academic, military, or government sectors less the average professional experience of all individuals that are the same age and born in the same decade. The variable is winsorized at 1% and 99%.	Authors' calculations using BoardEx
$R\&D/Sales_{jt}$	The ratio of R&D expenses (XRD if non-missing, zero otherwise) to total sales (SALE).	Compustat
Sales $Growth_{jt}$	The change in the natural logarithm of total sales ($log(SALE_t)$-$log(SALE_{t-1})$	Compustat
Stock $Returns_{jt}$	Stock return over the fiscal year, calculated based on stock prices and adjusted for stock splits and dividends in the following way: $(PRCC\_F_t/ADJEX\_F_t)/(PRCC\_F_{t-1}/ADJEX\_F_{t-1})$-1. The variable is winsorized at 1% and 99%.	Compustat
$Top25_{ia}$	A dummy variable that takes on a value of one if an individual has completed a degree at one of the top 25 schools based on the 2015 national university rankings of U.S. News and World Report and zero otherwise.	BoardEx
Z-$score_{jt}$	Altman's measure of financial distress, based on the following formula: Z=1.2*WCAP/AT+1.4*RE/AT+3.3*EBIT/AT+0.6*MCAP/LT +0.999*SALE/AT where WCAP is working capital, RE is retained earnings, EBIT is earnings before interest and taxes and MCAP is market cap. The variable is winsorized at 0 and 50.	Compustat

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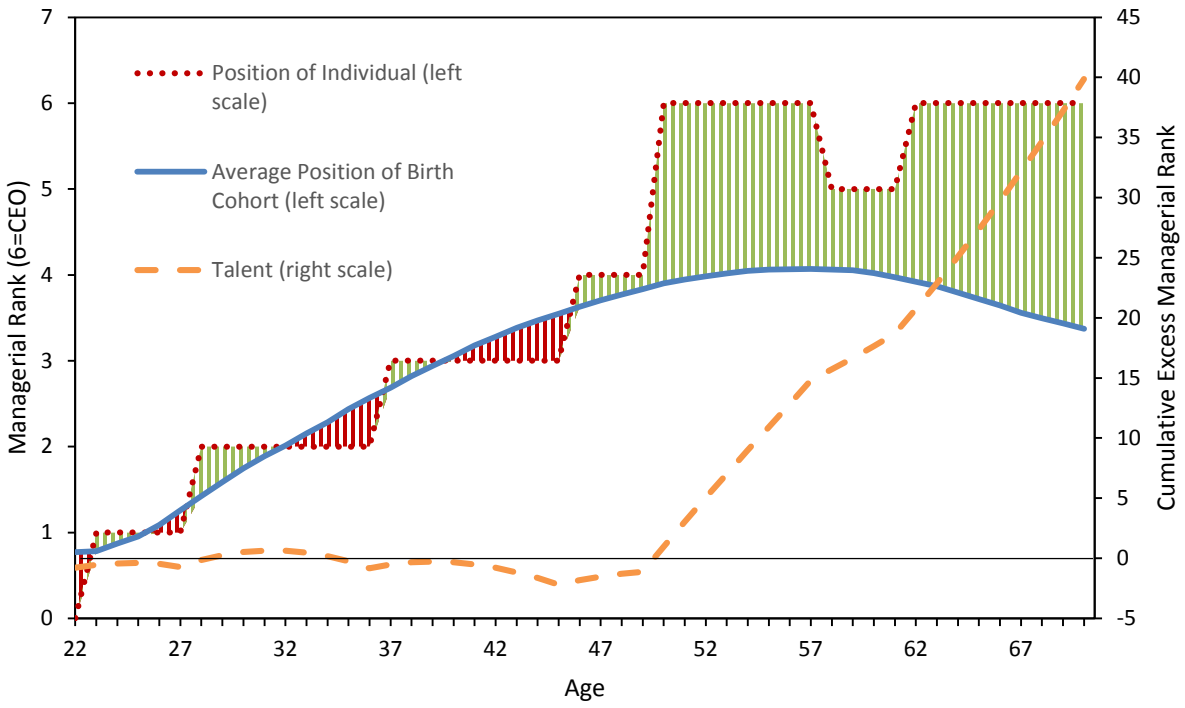

Figure 1. Measuring manager talent. This chart illustrates the conceptual framework behind our measure of managerial talent. At the end of each year, we observe the managerial rank of an individual (dotted line). This rank ranges from no managerial experience to chief executive officer; the possible rank levels are summarized in Table I. We take the average rank for all individuals who are the same age and in the same birth cohort (solid line). The difference between the individual's rank and the average rank is defined as excess managerial rank. Our measure of managerial talent is then defined as the cumulative sum of all prior years of excess managerial rank (dashed line).

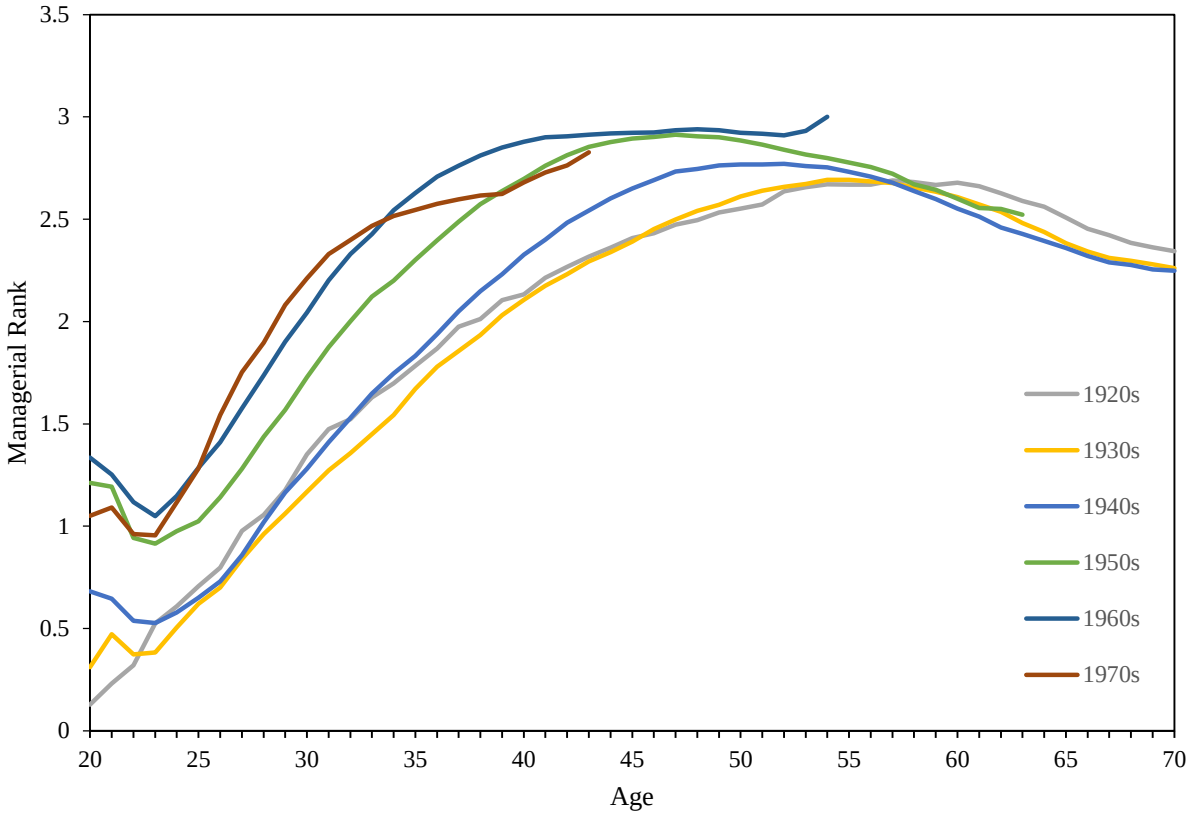

Figure 2. Managerial rank by age. This figure displays the average managerial rank by age, split into cohorts based on birth decade. A rank of 0 corresponds to a position with no managerial responsibilities, while a rank of 6 corresponds to a chief executive officer (see Table I). The data is based on employment history for U.S. executives, senior managers, and directors found in the BoardEx database.

Table I
Defining the Manager Hierarchy

We classify job titles from 0 to 6 where 0 represents a job with no managerial responsibility and 6 represents the chief executive officer. The intermediate levels are split based on the reporting distance to the CEO. The examples are illustrative job titles that might appear within that managerial rank.

Level	Description	Examples
0	Non-manager position	Scientist, Engineer, Professor, Lawyer
1	Line managers	Supervisor, Team Leader, Office Manager
2	Mid-level managers	General Manager, Group Manager, Director
3	Senior managers	Division President, Regional President, Vice President
4	Executive Suite	Executive Vice-President, Chief Technology Officer, General Counsel
5	Second-in-command	Chief Financial Officer, Chief Operating Officer, President
6	CEO	Chief Executive Officer

Table II
Summary Statistics: Individual-Year Level

This table summarizes the demographic characteristics of the directors, senior managers, and executives that appear in our BoardEx sample. We use this sample to create our measure of managerial talent. Panel A shows summary statistics for these characteristics, while Panel B displays the correlation matrix for these variables. Definitions for each variable are contained in the Appendix.

Panel A:

Variable	N	Mean	Median	Min	25th Pctl	75th Pctl	Max	Std Dev
Managerial Talent	1,590,156	0.02	0.60	-74.66	-9.54	11.54	64.71	23.63
Founder Talent	1,590,156	-0.05	-1.90	-5.21	-3.16	-0.55	30.36	6.29
Professional Talent	1,590,156	-0.04	-1.94	-5.56	-3.56	-0.85	37.08	7.24
Rank=0	1,590,375	0.15	0	0	0	0	1	0.36
Rank=1	1,590,375	0.02	0	0	0	0	1	0.13
Rank=2	1,590,375	0.20	0	0	0	0	1	0.40
Rank=3	1,590,375	0.20	0	0	0	0	1	0.40
Rank=4	1,590,375	0.18	0	0	0	0	1	0.38
Rank=5	1,590,375	0.21	0	0	0	0	1	0.40
Rank=6	1,590,375	0.03	0	0	0	0	1	0.18
Rank=7	1,590,375	0.01	0	0	0	0	1	0.09
Age	1,590,375	48	48	25	40	57	70	11.04
Female	1,590,375	0.08	0	0	0	0	1	0.27
American	1,590,375	0.44	0	0	0	1	1	0.50
Ivy	1,308,647	0.24	0	0	0	0	1	0.43
MBA	1,308,647	0.28	0	0	0	1	1	0.45
Masters	1,308,647	0.20	0	0	0	0	1	0.40
PhD	1,308,647	0.10	0	0	0	0	1	0.30
MD	1,308,647	0.17	0	0	0	0	1	0.38
Top25	1,308,647	0.39	0	0	0	1	1	0.49

Panel B:

	Manager Talent	Founder Talent	Prof. Talent	Age	Female	American	Ivy	MBA	Masters	PhD	MD	Top25
Managerial Talent	1											
Founder Talent	0.20	1										
Professional Talent	-0.48	-0.04	1									
Age	-0.01	-0.03	-0.04	1								
Female	-0.08	-0.02	0.06	-0.03	1							
American	0.01	-0.02	0.08	0.05	0.02	1						
Ivy	-0.03	-0.01	0.05	-0.01	0.00	0.10	1					
MBA	0.09	-0.02	-0.10	-0.04	-0.01	0.00	0.24	1				
Masters	-0.10	0.00	0.17	0.02	0.06	0.00	0.02	-0.14	1			
PhD	-0.15	0.01	0.29	0.03	0.04	0.02	0.02	-0.10	0.28	1		
MD	-0.20	-0.01	0.21	0.00	0.01	0.08	0.07	-0.17	-0.03	-0.02	1	
Top25	-0.04	0.00	0.07	-0.02	0.01	0.13	0.70	0.26	0.08	0.07	0.09	1

Table III
CEO Talent and Out-of-sample Career Progression

This table presents results from estimating a logistic regression in which the dependent variable is a binary indicator of career progression. In column 1, the dependent variable is equal to 1 if the individual has an increase in managerial rank at any time in the next 5 years. In column 2, the dependent variable is a dummy variable indicating that the individual becomes a CEO in the next 5 years. Column 3 estimates the probability that an individual will receive at least one external award (business and civic awards collected by BoardEx) in the next 5 years. To alleviate concerns about autocorrelation, we limit the sample to individuals at 5-year spans between ages 25 and 65 and cluster the standard errors (in parenthesis) at the individual level. We report the raw logistic coefficients. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	Prob. of promotion in the next 5 years	*Prob. of becoming a CEO in the next 5 years*	*Prob. of winning an award in the next 5 years*
	(1)	*(2)*	*(3)*
Intercept	-2.22***	-2.051***	-1.496***
	(0.072)	(0.098)	(0.099)
Managerial Talent	0.001***	0.008***	0.004***
	(0.0004)	(0.0006)	(0.0005)
Founder Talent	-0.026***	-0.021***	0.02***
	(0.001)	(0.002)	(0.0014)
Professional Talent	-0.007***	-0.018***	0.046***
	(0.001)	(0.002)	(0.0013)
Female	-0.292***	-0.641***	0.853***
	(0.018)	(0.035)	(0.029)
American	0.213***	0.087***	0.389***
	(0.011)	(0.017)	(0.02)
Ivy	-0.069***	-0.033	0.065**
	(0.017)	(0.027)	(0.03)
MBA	0.132***	0.066***	-0.096***
	(0.013)	(0.019)	(0.023)
Masters	0.019	0.13***	0.159***
	(0.014)	(0.022)	(0.024)
PhD	-0.082***	0.088***	0.695***
	(0.019)	(0.032)	(0.029)
MD	-0.286***	-0.252***	0.458***
	(0.015)	(0.026)	(0.024)
Top25	0.021	0.02	0.014
	(0.016)	(0.024)	(0.027)
Decade FE	Yes	Yes	Yes
Age FE	Yes	Yes	Yes
Rank FE	Yes	Yes	Yes
Obs.	205,111	205,111	257,742
# of directors/clusters	69,433	69,433	69,626
Prob. > Chi-squared	0.000	0.000	0.000

Table IV
Managerial Talent and Board Service

This table shows results from estimating a linear regression in which the dependent variable is the number of boards that an individual sits on in a given year. Column 1 shows results for the entire sample of directors, while column 2 limits the sample to directors who are also currently working as a CEO. Standard errors, clustered by individual, are in parenthesis. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	# of Directorships	
	Overall sample	*Sample of CEOs*
	(1)	*(2)*
Intercept	-0.802***	-1.564***
	(0.068)	(0.136)
Managerial Talent	0.003***	0.005***
	(0.0003)	(0.0006)
Founder Talent	0.015***	0.009***
	(0.001)	(0.002)
Professional Talent	0.032***	0.04***
	(0.001)	(0.003)
Age	0.022***	0.026***
	(0.001)	(0.001)
Female	0.077***	0.257***
	(0.016)	(0.043)
American	0.086***	0.184***
	(0.01)	(0.021)
Ivy	0.191***	0.156***
	(0.016)	(0.033)
MBA	0.092***	0.071***
	(0.011)	(0.022)
Masters	0.014	0.02
	(0.013)	(0.026)
PhD	0.046**	-0.124***
	(0.02)	(0.039)
MD	0.054***	0.124***
	(0.014)	(0.035)
Top25	0.051***	0.013
	(0.013)	(0.028)
Year FE	Yes	Yes
Obs.	577,230	141,144
# of directors/clusters	55,862	21,386
R-squared	0.120	0.070

Table V
Summary Statistics: Firm-Year Level

This table summarizes the firm characteristics used in our main analysis. The sample consists of all firms in the Compustat-CRSP universe over the period 2000-2012 that we are able to match to BoardEx data. Panel A shows summary statistics for these characteristics, while Panel B displays the correlation matrix for these variables. Definitions for each variable are contained in the Appendix.

Panel A:

	N	Mean	Median	Min	25th Pctl	75th Pctl	Max	Std Dev
Managerial Talent	59,644	22.51	20.21	-74.66	9.10	34.70	64.71	20.04
Director Talent	58,673	-0.86	-0.28	-74.66	-9.35	8.25	64.71	14.32
Board Independence	59,644	0.78	0.83	0.00	0.73	0.88	1.00	0.14
Firm Age	59,644	17	12	0	7	22	62	14.42
Log(Market Cap)	57,672	5.86	5.90	-4.80	4.33	7.35	13.13	2.22
M/B	57,662	2.06	1.33	0.12	1.04	2.10	20.00	2.37
EBITDA/Sales	57,895	0.07	0.12	-1.00	0.03	0.25	5.00	0.36
R&D/Sales	59,644	0.08	0.00	0.00	0.00	0.04	1.00	0.22
Positive R&D (dummy=1)	59,644	0.50	1	0	0	1	1	0.50
Board Size	59,644	8	8	1	6	10	33	2.92
PP&E	57,763	0.23	0.13	0	0.03	0.35	1	0.25
Leverage	59,430	0.23	0.17	0	0.03	0.35	1	0.23
Dividend payer (dummy=1)	59,644	0.40	0	0	0	1	1	0.49

Panel B:

	Man. Talent	Dir. Talent	Indep.	Firm Age	ln(Mkt Cap)	M/B	EBITDA /Sales	R&D /Sales	Positive R&D	Board Size	PP&E	Lev	Div. payer
Managerial Talent	1												
Director Talent	-0.01	1											
Independence	-0.10	0.07	1										
Firm Age	0.11	0.09	0.26	1									
Log(Market Cap)	0.11	0.14	0.16	0.33	1								
M/B	-0.11	-0.04	-0.09	-0.12	-0.05	1							
EBITDA/Sales	0.16	0.04	0.03	0.14	0.36	-0.36	1						
R&D/Sales	-0.15	-0.05	-0.02	-0.16	-0.13	0.34	-0.67	1					
Positive R&D	-0.10	0.04	0.06	0.01	-0.01	0.19	-0.30	0.38	1				
Board Size	0.08	0.04	0.12	0.31	0.51	-0.22	0.27	-0.16	-0.19	1			
PP&E	0.01	0.05	0.01	0.19	0.14	-0.07	0.13	-0.18	-0.15	-0.02	1		
Leverage	0.04	0.02	0.03	0.04	0.01	0.06	0.04	-0.10	-0.08	-0.01	0.27	1	
Dividend payer	0.13	0.03	0.14	0.32	0.37	-0.18	0.36	-0.28	-0.25	0.39	0.05	0.04	1

Table VI
CEO Talent and Board Independence

This table shows results from estimating a linear regression in which the dependent variable is the managerial talent of the chief executive officer. Columns 1 and 2 present results from cross sectional regressions where CEO talent and firm characteristics are both measured at year t. Columns 3 and 4 shows results for the sample of newly appointed CEOs, where CEO talent is measured at year t and firm characteristics are measured at year t-1. For the BoardEx sample (columns 1 and 3), board independence is defined as the percentage of non-executive directors. For the IRRC sample (columns 2 and 4), independence is defined as the percentage of non-affiliated directors. Standard errors, clustered by firm, are in parenthesis. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	Cross-sectional regression		*CEO appointment*	
	BoardEx	*IRRC*	*BoardEx*	*IRRC*
	(1)	*(2)*	*(3)*	*(4)*
Intercept	19.877***	40.689***	11.847*	17.155*
	(2.109)	(5.372)	(6.16)	(9.15)
Board Independence	-17.808***	-16.637***	-16.231***	-13.178***
	(2.066)	(2.322)	(3.158)	(4.612)
Log(Market Cap)	0.931***	1.798***	1.561***	1.896***
	(0.123)	(0.297)	(0.224)	(0.497)
Log(Firm Age)	3.851***	2.77***	4.305***	3.874***
	(0.282)	(0.642)	(0.5)	(1.062)
M/B	-0.555***	-0.647**	-0.093	0.418
	(0.081)	(0.285)	(0.133)	(0.398)
EBITDA/Sales	2.619***	-2.163	2.693*	9.178**
	(0.709)	(2.238)	(1.399)	(3.658)
R&D/Sales	-1.087	-5.553	3.463	9.505
	(1.279)	(4.093)	(2.159)	(6.124)
Positive R&D (dummy=1)	-1.239**	-2.392**	-1.672*	-0.885
	(0.603)	(1.026)	(0.949)	(1.68)
Log(Board Size)	-0.993	-10.63***	1.08	-3.04
	(0.751)	(1.609)	(1.292)	(3.008)
PP&E	-0.728	-1.443	3.281	-0.951
	(1.376)	(2.502)	(2.261)	(4.221)
Leverage	3.735***	2.015	3.7**	1.162
	(0.885)	(2.084)	(1.526)	(3.931)
Dividend Payer (dummy=1)	0.137	0.606	1.859**	2.561*
	(0.485)	(0.82)	(0.886)	(1.415)
Year FE	Yes	Yes	Yes	Yes
FF 48 Industry FE	Yes	Yes	Yes	Yes
Obs.	54,921	16,774	3,876	1,406
# of firms/clusters	6,752	2,234	2,889	1,054
R-squared	0.084	0.081	0.165	0.143

Table VII
SOX Experiment

This table presents the results of a two-stage least squares regression of the change in board independence on the change in managerial talent. The changes are measured pre- to post-SOX (2000 to 2005). We use a dummy variable for firms that did not have a 100% independent audit committee in 2000 (*noncompliance)* as an instrument for board independence (column 1). Columns 2-6 show the results of the second stage. The subsamples shown in columns 3-5 exclude cases of non-voluntary CEO turnover. In column 3, we drop observations where the CEO leaves the firm between ages 50-55 and does not reappear as a CEO in BoardEx. In column 4, we exclude turnovers that occur after a 20% or greater drop in stock price in the previous year. Column 5 removes cases where the CEO worked for the firm for 3 years or less. In column 6, the dependent variable is a dummy variable equal to 1 if the CEO changes between 2000 and 2005. Standard errors are robust to heteroscedasticity and are reported in parenthesis. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

		IV Stage II				
	IV Stage I	*all cases of CEO replacement*	*excl. turnovers at career peak age*	*excl. turnovers after poor performance*	*excl. short tenure*	*Prob. of CEO turnover (dummy=1)*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Intercept	0.09	-7.838	-21.023	-3.145	-26.265	-2.457***
	(0.066)	(18.603)	(14.533)	(23.376)	(16.493)	(0.947)
Noncompliance (dummy=1)	0.117***					
	(0.011)					
Δ Board Independ (instr.)		-49.957**	-56.552**	-63.342**	-47.705*	-0.697
		(23.916)	(25.14)	(30.891)	(26.372)	(1.302)
Log(Market Cap)	0.007	0.11	0.37	0.087	0.293	0.142**
	(0.004)	(1.167)	(1.224)	(1.523)	(1.271)	(0.065)
Log(Board Size)	-0.012	6.144	5.816	7.481	5.54	0.7**
	(0.016)	(5.504)	(5.727)	(6.757)	(6.256)	(0.309)
Leverage	0.022	7.146	7.891	8.711	9.597	0.433
	(0.037)	(9.002)	(9.696)	(12.405)	(9.646)	(0.456)
Log(Firm Age)	-0.021**	-0.468	-0.586	-0.697	2.031	-0.022
	(0.01)	(2.199)	(2.487)	(2.758)	(2.554)	(0.137)
Positive R&D (dummy=1)	0.002	-8.152*	-6.399	-9.923*	-4.778	0.193
	(0.015)	(4.254)	(4.383)	(5.541)	(4.708)	(0.22)
R&D/Sales	-0.121**	26.588**	27.24*	65.772**	26.617*	0.938
	(0.058)	(13.339)	(14.911)	(32.484)	(14.53)	(1.031)
Dividend Payer (dummy=1)	-0.007	-10.116***	-9.786***	-10.448**	-12.917***	-0.007
	(0.014)	(3.487)	(3.738)	(4.405)	(3.704)	(0.189)
EBITDA/Sales	-0.005	0.541	0.582	0.952	1.236*	-0.12**
	(0.003)	(0.683)	(0.686)	(0.767)	(0.728)	(0.051)
PP&E	-0.02	-3.28	-7.407	-11.504	-9.515	0.693
	(0.04)	(13.486)	(14.105)	(19.313)	(14.171)	(0.693)
FF48 Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1005	423	371	318	371	948
R-squared	0.180	0.190	0.210	0.210	0.190	N/A

Table VIII
CEO Talent and Compensation

This table shows the results of linear regressions of CEO pay on managerial talent. To capture the effect of talent on pay that is independent of the relationship between talent and independent boards, we first orthogonalize talent with respect to board independence and the other firm characteristics shown in the table. Columns 1 and 2 estimate the effect of talent on the natural logarithm of the level of total pay, where *TDC1* is expected pay and *TDC2* is realized pay. The independent variables in columns 3 and 4 represent the composition of pay, defined as the percentage of total pay made up of cash and options, respectively. Standard errors, clustered by firm, are in parenthesis. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	Log(TDC1)	*Log(TDC2)*	*% cash*	*% options*
	(1)	*(2)*	*(3)*	*(4)*
Intercept	3.802***	3.545***	1.039***	-0.109*
	(0.248)	(0.269)	(0.067)	(0.063)
Managerial talent (orthog.)	-0.002*	0.003**	0.001***	-0.0005***
	(0.001)	(0.001)	(0.0002)	(0.0002)
CEO age	0.001	0.013***	0.003***	-0.003***
	(0.003)	(0.003)	(0.0005)	(0.001)
Board Independence	0.962***	0.553***	-0.39***	0.238***
	(0.184)	(0.196)	(0.041)	(0.04)
Log(Market Cap)	0.423***	0.423***	-0.063***	0.036***
	(0.024)	(0.024)	(0.003)	(0.003)
Log(Firm Age)	0.005	0.025	0.011**	-0.01*
	(0.025)	(0.027)	(0.005)	(0.006)
M/B	-0.114***	-0.043*	0.012***	0.001
	(0.023)	(0.025)	(0.003)	(0.003)
EBITDA/Sales	0.228*	0.444***	-0.062***	0.011
	(0.12)	(0.125)	(0.023)	(0.022)
R&D/Sales	0.723**	-0.065	-0.24***	0.292***
	(0.314)	(0.313)	(0.044)	(0.047)
Positive R&D (dummy=1)	0.062	0.037	-0.034***	0.021**
	(0.064)	(0.067)	(0.01)	(0.01)
Log(Board Size)	0.03	-0.053	0.002	-0.011
	(0.099)	(0.098)	(0.016)	(0.016)
PP&E	-0.431***	-0.543***	0.019	-0.023
	(0.112)	(0.119)	(0.022)	(0.023)
Leverage	0.628***	0.544***	-0.062***	-0.049***
	(0.098)	(0.106)	(0.016)	(0.017)
Dividend Payer (dummy=1)	-0.047	-0.014	0.03	-0.045***
	(0.05)	(0.051)	(0.007)	(0.008)
Year FE	Yes	Yes	Yes	Yes
FF 48 Industry FE	Yes	Yes	Yes	Yes
Obs.	15,511	15,511	15,493	15,493
# of firms/clusters	1,842	1,842	1,842	1,842
R-squared	0.340	0.330	0.290	0.250

Table IX
CEO Talent and CEO Chair Duality

This table shows the results of a logistic regression that estimates the probability that the CEO concurrently serves as the chairman of the board as a function of CEO talent. To capture the effect of talent on pay that is independent of the relationship between talent and independent boards, we first orthogonalize talent with respect to board independence and the other firm characteristics shown in the table. For the BoardEx sample shown in column 1, independence is defined as the percentage of non-executive directors. For the IRRC sample (column 2), independence is defined as the percentage of non-affiliated directors. Standard errors, clustered by firm, are in parenthesis. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	BoardEx	*IRRC*
	(1)	*(2)*
Intercept	-1.188***	-3.195***
	(0.24)	(0.535)
Managerial talent (orthog.)	0.036***	0.036***
	(0.001)	(0.002)
Board Independence	-0.096	2.941***
	(0.218)	(0.265)
Log(Market cap)	0.092***	0.227***
	(0.015)	(0.037)
Log(Firm Age)	0.082**	-0.053
	(0.033)	(0.073)
M/B	0.01	-0.055*
	(0.01)	(0.031)
EBITDA/Sales	-0.293***	-0.37
	(0.08)	(0.244)
R&D/Sales	-0.902***	-1.513***
	(0.151)	(0.485)
Positive R&D (dummy=1)	0.156**	0.06
	(0.065)	(0.118)
Log(Board Size)	-0.532***	-0.883***
	(0.09)	(0.181)
PP&E	-0.52***	0.007
	(0.142)	(0.298)
Leverage	0.54***	0.332
	(0.099)	(0.23)
Dividend Payer (dummy=1)	0.027	0.191**
	(0.055)	(0.094)
Year FE	Yes	Yes
FF 48 Industry FE	Yes	Yes
Obs.	54,116	16,638
# of firms/clusters	6,712	2,230
Chi-squared	<0.01	<0.01

Table X
Firm Performance and CEO Talent

This table shows the effects of CEO talent on firm performance. We sort firms into high talent and low talent based on the top and bottom quintiles of CEO talent in each year. We then use a propensity score matching model to select a low talent control firm for each high talent firm in our sample. Panel B reports the distribution of independent variables that were used in propensity score estimation. We then examine differences in firm outcomes in the year following the match (Panel A), as well as differences in the control variables at the year of the match (Panel B). We evaluate the statistical significance of the differences using independent group t-tests, as well as the Wilcoxon rank-sum test for two samples (the p-values for these tests are reported in the last two columns). Definitions for the independent variables are found in the Appendix.

Panel A: Firm Performance at t=1					
	High Talent	Low Talent	Difference	*t*-test Pr > |t|	Wilcoxon Pr > |z|
Z score	5.156	4.357	0.799	<.0001	0.000
Financial Distress	0.238	0.276	-0.038	0.005	0.005
Into Financial Distress	0.038	0.061	-0.023	0.001	0.001
Stock Returns	0.164	0.170	-0.006	0.773	0.467
EBITDA/Sales	0.089	0.093	-0.004	0.586	0.401
Net Income	-0.011	-0.009	-0.002	0.838	0.575
Sales Growth	0.078	0.069	0.009	0.336	0.373

Panel B: Firm Characteristics at t=0					
	High Talent	Low Talent	Difference	*t*-test Pr > |t	Wilcoxon Pr > |z|
Board Independence	0.813	0.814	0.000	0.987	0.988
Log(Market Cap)	5.868	5.824	0.044	0.443	0.739
M/B	1.891	1.871	0.020	0.657	0.773
EBITDA/Sales	0.080	0.088	-0.007	0.378	0.379
R&D/Sales	0.070	0.075	-0.005	0.311	0.023
Positive R&D (dummy=1)	0.537	0.546	-0.009	0.501	0.501
Log(board size)	2.015	2.015	0.000	1.000	1.000
PP&E	0.234	0.231	0.003	0.630	0.132
Leverage	0.540	0.544	-0.004	0.561	0.585
Dividend payer (dummy=1)	0.372	0.364	0.007	0.582	0.582

Table XI
Board Talent and Independence

This table shows results from estimating a linear regression in which the dependent variable is the average managerial talent of the non-executive directors of the firm. Columns 1 and 2 present results from a cross sectional regression where board talent and firm characteristics are both measured at year t. Columns 3 and 4 shows results for the sample of newly appointed directors, where board talent is measured at year t (and averaged across new directors in the event of multiple new appointments) and firm characteristics are measured at year t-1. For the BoardEx sample (columns 1 and 3), board independence is defined as the percentage of non-executive directors. For the IRRC sample (columns 2 and 4), independence is defined as the percentage of non-affiliated directors. Column 5 reports the results of the second stage of the SOX experiment described in Table VII where the dependent variable is board talent. Standard errors, clustered by firm, are in parenthesis. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	Cross-sectional regression		*Director appointment*		*SOX (Stage II)*
	BoardEx	*IRRC*	*BoardEx*	*IRRC*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Intercept	-12.042***	-10.881***	-4.836**	-2.654	0.075
	(1.747)	(3.182)	(1.994)	(5.444)	(8.288)
Board Independence	9.021***	8.654***	1.912	6.657***	-2.84
	(1.418)	(1.56)	(1.432)	(2.389)	(12.333)
Log(Market Cap)	0.882***	0.586***	0.687***	0.694**	-0.707
	(0.092)	(0.207)	(0.114)	(0.306)	(0.693)
Log(Firm Age)	-0.064	0.169	-0.173	0.487	0.842
	(0.214)	(0.459)	(0.271)	(0.627)	(1.389)
M/B	-0.277***	-0.569***	-0.298***	-0.1	-0.001
	(0.082)	(0.206)	(0.095)	(0.362)	(0.443)
EBITDA/Sales	-0.957*	-1.837	-1.596**	-3.818	-2.49
	(0.545)	(1.552)	(0.781)	(2.546)	(6.194)
R&D/Sales	-0.258	-3.145	-1.836	-0.129	15.251
	(0.943)	(3.257)	(1.285)	(4.757)	(9.634)
Positive R&D (dummy=1)	-0.273	-0.483	0.577	-1.167	-3.572*
	(0.44)	(0.785)	(0.571)	(1.111)	(1.957)
Log(Board Size)	-0.934**	1.16	-0.652	-0.149	0.253
	(0.436)	(1.106)	(0.489)	(1.518)	(2.719)
PP&E	-1.755**	-2.26	0.603	4.265	-3.158
	(0.885)	(1.811)	(1.233)	(2.693)	(5.67)
Leverage	1.798***	1.449	1.012	-3.157	2.728
	(0.642)	(1.453)	(0.914)	(2.288)	(4.074)
Dividend Payer (dummy=1)	-0.143	-0.072	0.279	0.009	0.586
	(0.346)	(0.592)	(0.522)	(0.928)	(1.963)
Year FE	Yes	Yes	Yes	Yes	Yes
FF 48 Industry FE	Yes	Yes	Yes	Yes	Yes
Obs.	63,958	17,649	19,068	6,340	435
# of firms/clusters	7,443	2,279	5,842	1,863	435
R-squared	0.060	0.081	0.010	0.020	0.17

Table XII
CEO Talent, Board Talent, and Independence

This table shows repeats the main analysis of Table VI, but adds a control variable for the average level of managerial talent of the non-executive directors of the firm. To help ensure that the relationship between board talent and independence does not confound the results, we first orthogonalize board independence with respect to board talent and the other firm characteristics shown in this table. Columns 1 and 2 present results from a cross sectional regression where CEO talent and firm characteristics are both measured at year t. Columns 3 and 4 shows results for the sample of newly appointed CEOs, where CEO talent is measured at year t and firm characteristics are measured at year t-1. Standard errors, clustered by firm, are in parenthesis. Definitions for the independent variables are found in the Appendix. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	Cross-sectional regression		*CEO appointment*	
	BoardEx	*IRRC*	*BoardEx*	*IRRC*
	(1)	*(2)*	*(3)*	*(4)*
Intercept	7.956***	31.308***	6.208*	10.315
	(1.999)	(5.316)	(3.524)	(7.541)
Board Independence (orthog.)	-24.827***	-15.853***	-17.854***	-13.416***
	(2.009)	(2.303)	(3.464)	(4.327)
Board Talent	-0.047***	-0.112***	0.007	0.003
	(0.014)	(0.026)	(0.026)	(0.048)
Log(Market cap)	0.73***	1.739***	1.538***	2.277***
	(0.126)	(0.298)	(0.213)	(0.457)
Log(Firm Age)	3.766***	2.458***	4.327***	2.764***
	(0.281)	(0.633)	(0.496)	(1.05)
M/B	-0.377***	-0.664**	-0.509***	-0.554
	(0.08)	(0.283)	(0.148)	(0.391)
EBITDA/Sales	2.485***	-2.027	1.974	1.793
	(0.713)	(2.224)	(1.339)	(3.795)
R&D/Sales	-1.936	-6.426	-3.252	-3.926
	(1.289)	(4.012)	(2.229)	(6.632)
Positive R&D (dummy=1)	-1.273**	-2.911***	-0.989	-1.041
	(0.602)	(1.015)	(0.934)	(1.645)
Log(Board Size)	-1.661**	-11.1***	-2.052	-4.5
	(0.774)	(1.635)	(1.272)	(2.765)
PP&E	-1.071	-1.67	0.569	0.247
	(1.371)	(2.495)	(2.179)	(4.214)
Leverage	4.242***	1.475	5.019***	-0.894
	(0.887)	(2.086)	(1.523)	(3.828)
Dividend Payer (dummy=1)	0.248	0.5	1.581*	2.329
	(0.484)	(0.816)	(0.883)	(1.44)
Year FE	Yes	Yes	Yes	Yes
FF 48 Industry FE	Yes	Yes	Yes	Yes
Obs.	54,212	16,766	3,907	1,405
# of firms/clusters	6,687	2,232	2,917	1,053
R-squared	0.090	0.084	0.160	0.144