The Market for CEO Talent: Implications for CEO Compensation[1]

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We study the market for CEO talent in public U.S. firms during the years 1993-2005. About 68% of new CEOs are former employees of their own firms ("insider CEOs") and the rest come from outside the firm ("outsider CEOs"). We find wide disparities in talent pool structure across industries, with some industries having almost no outsider CEOs and other industries having a majority of outsider CEOs. Our central conjecture in this study is that, to the extent that the exogenous (to the firm) costs of hiring CEOs from outside the firm limit the potential outside options of the CEO and the firm, the compensation to the CEO should depend more on the compensation distribution within the pool rather than outside the pool. Consistent with this conjecture, industry talent pool structure helps explain several compensation practices: CEO compensation is benchmarked against other firms only in industries that have high percentage of outsider CEOs and pay-for-luck is less prevalent when the industry has a low percentage of outsider CEOs. Finally, while CEO talent pools seem to explain cross-sectional variations in CEO compensation, they have little power in explaining the rise in CEO compensation in public U.S. firms in recent years.

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1. Introduction

There is considerable debate among academics and practitioners regarding the economic forces that drive CEO compensation practices in the U.S. While some view the market for CEO talent as the main economic force that drives the level and form of CEO compensation (e.g., Rosen, 1992, Himmelberg and Hubbard 2000, Hubbard 2005, Gabaix and Landier 2009), others argue that these forces have little effect on CEO compensation because of different frictions such as managerial entrenchment, asymmetric information, transaction costs of replacing managers etc, and that compensation practices are by and large driven by the bargaining power that the CEO has vis-à-vis the board (e.g., Bebchuk and Fried 2003).

The debate has intensified in recent years due to several controversial compensation practices. For example, the large increase in compensation levels to CEOs in the U.S. (e.g., Murphy 2002, Bebchuk and Grinstein 2005) was attributed by some to the power that CEOs have over the board of directors (e.g., Bebchuk and Fried 2003), while others attributed it to the market for CEO talent (e.g., Gabaix and Landier 2009).

Another controversial practice is the tendency of firms to benchmark CEO compensation to that of other CEOs. While some find this practice to consistent with competitive compensation to CEOs (Holmstrom and Kaplan, 2003, Bizjak, Lemmon and Naveen, 2008), others argue it is a way for CEOs to increase their compensation by benchmarking themselves to highly-paid CEOs (e.g., Faulkender and Yang, 2009).

A third practice that received large attention in the literature is the tendency of firms to compensate their CEOs for firm performance that is outside their control. Bertrand and Mullainathan (2001) argue that this practice is driven by CEO self interest, while others, such as Himmelberg and

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Hubbard (2000), argue that this practice reflects competitive compensation practices, as it embeds both CEO performance and the change in the value of CEO talent in the market (since higher market price reflects higher marginal contribution to CEO talent and therefore higher price for CEO talent).

In this study we wish to shed new light on the role of the market for CEO talent in explaining these controversial compensation practices. Our approach is to examine the extent to which these controversial practices can be explained by the cross-sectional variation in CEO talent pool structure. To the extent that compensation practices are shaped by the market for CEO talent, we should expect to see a strong relation between compensation practices at the firm level and the CEO talent pool. If, on the other hand, compensation practices are not shaped by the market for CEO talent, then the relation between talent pool structure and CEO compensation would be weak.

To measure talent pool structure we borrow heavily from Parrino (1997). In his study, Parrino (1997) examines the characteristics of new CEOs who enter their job at the firm. He finds that industries in which CEOs tend to come from outside the firm tend to be more homogeneous in the sense that CEO talent from other firms can readily replace CEO talent from inside the firm. In contrast, industries in which CEOs tend to come from inside their own firms are more heterogenous in nature, implying that CEO talent from inside the firm is harder to replicate.

We use Parrino's insight in constructing our measure of talent pool structure. Since industries in which CEOs tend to come from outside the firm are more homogenous, CEO talent pools will be less firm-specific in these industries. To the extent that compensation to CEOs is driven by the market for CEO talent, CEO compensation in these industries should be more strongly affected by compensation practices in other firms in the industry. In contrast, the compensation to CEOs in industries in which CEOs tend to come from inside the firm should be less related to compensation practices in the other firms in the industry. For example, to the extent that benchmarking is the result

of competitive market for CEO talent, we should observe a stronger tendency to benchmark in industries where CEOs tend to come from outside the firm. Similarly, if "pay for luck" is driven by changes in the value of CEO talent in the market then we should observe more "pay for luck" in industries where CEOs tend to come from outside the firm. Finally, if the increase in compensation in recent years is the result of intensified competition for CEO talent then we should observe a stronger association of the (proxy of) industry-level talent distribution with CEO compensation in industries where CEO talent is more homogenous.

To construct our talent-pool measure, we collect information from 1,827 CEO replacements in Execucomp companies between the years 1993 and 2005. For each new CEO, we identify her position before becoming CEO, as well as the firm and the industry from which she arrives. For each industry we then compute the ratio of new insider CEOs at the industry level to total new CEOs.

Consistent with prior studies, we find that managerial talent pools are generally firm-specific. We find that 63% of new CEOs are *insider CEOs*. We find little variation in these characteristics over time. For example, 63% of the new CEOs are *insiders* between 1993-1996, while 61% are insiders between 2003-2005. Moreover, we find wide disparities in the percentage of insider CEOs across industries.

We find strong evidence that benchmarking is prevalent *primarily* in industries in which new CEOs tend to come from outside the firm. In contrast, the compensation to the CEO is not affected by changes in the compensation of CEOs in peer firms in industries in which CEO talent pools are almost entirely firm-specific. This finding supports the important role of the market for CEO talent in affecting benchmarking and is consistent with the interpretation in Bizjak, Lemmon, and Naveen (2008).

We also find evidence of a stronger relation between CEO compensation and industry performance ("pay for luck") in industries that have the largest percentage of outsider CEOs. In contrast, the relation between firm performance and industry performance is weaker in industries where talent pools are more firm specific. This result is consistent with CEO labor market competition (partly) driving the relation between CEO compensation and industry-wide performance.

Finally, we study the extent to which variations in talent pool structure across industries explains the growth in CEO compensation in recent years. Many studies have emphasized the importance of return-to-talent and variation in return-to-talent in explaining the level and changes in the level of executive compensation. Building on the insight of Rosen (1992), Gabaix and Landier (2009, henceforth GL) present a model in which more talented CEOs are attracted to larger firms, predicting that changes in CEO compensation should depend both on changes in the size of the firm in which the CEO operates and the changes in the size distribution of firms in the economy (capturing the productivity of talent across firms, and hence the outside opportunities of CEOs with different talents). Their specification assumes that CEO skills are substitutable across firms and that profitability is a function of skills and firm size. Therefore, in equilibrium, more talented CEOs will be attracted to larger firms. Given our findings of the importance of heterogeneous firm- and industry-specific skills, we explore whether the size distribution of firms in the industry (arguably the more relevant measure of productivity of talent in actual CEO talent pools), better explains variation in compensation than size distribution of all firms in the economy.

We find that despite the evidence of fragmented CEO talent pools, variations in firm size (as a proxy for talent as in GL) within industries explain only a very small portion of the variation in CEO compensation over time. We find this result puzzling and explore several reasons for this

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finding. One possibility is that executives make career decisions early on, knowing that once they enter an industry they cannot leave. In that case more talented potential CEOs may enter industries with higher future rewards, restoring equilibrium compensation that is again driven by market-wide, not industry-specific factors.[2] Empirically, though, we find that insider CEOs typically have very long tenures with their own firm before becoming CEOs. For example, more than 90% of new insider CEOs have been with their firms 5 years or more, and thus would likely have made their career decisions many years before that. As a result, projections regarding the potential growth of (compensation in) different industries would arguably seem to be hard to make that far in advance by young executives deciding on their career path.

A second possibility is that the size of the market-wide reference firm may proxy for something else not directly related to the equilibrium model in GL. Recent papers challenging the interpretation of GL include Frydman and Saks (2007), who find a much smaller elasticity between CEO compensation and average firm size with data starting in 1936, as well as Dew-Becker and Gordon (2007), who find widely varying elasticities for 1970-2005 compensation data using rolling 20-year regressions.

The rest of the paper continues as follows. In section 2, we describe our data collection process and the construction of the main variables, explain talent pool structure differences across industries, and, finally, explore how CEO talent pool structure is related to the level, growth and the equity-based incentives in CEO compensation. Section 3 provides the analysis of the benchmarking results and section 4 of pay-for–luck. In section 5, we revisit the GL framework and section 6 concludes.

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[2] We thank Xavier Gabaix for proposing and illustrating this possibility in his NBER discussion of our paper.

2. Research Design

2.1 Measuring CEO Talent Pools

When directors need to replace a CEO they should look for a qualified successor for the task. The relevant pool of candidates from which directors should choose a successor will depend on the qualifications and the experience of candidates in the pool. For example, if the firm needs candidates with firm-specific human capital, it will prefer lower-ranked managers from within the firm, rather than outside candidates, to replace the CEO (Becker, 1964, Parrino, 1997, Murphy and Zabojnik 2007). In contrast, the firm is more likely to choose outside candidates when outside candidates have experience which closely matches that of the current management, (Parrino, 1997, Zhan and Rajagopalan, 2003).

It is natural to expect talent pool structure to depend on the industry in which the firm operates. For example, Parrino (1997) finds that industries in which CEOs tend to come from outside the firm are more homogeneous in the sense that CEO talent from other firms can readily replace CEO talent from inside the firm[3]. Zhan and Rajagopalan (2003) find that outside succession is more likely when other firms in the industry follow the same strategy as the current firm.

Our identification strategy in this study is therefore to classify industries by the percentage of new CEOs that are outsiders versus insiders. Following the existing literature, we expect industries in which CEOs come from inside the firm to be more heterogeneous and therefore the human capital of the manager in one firm should be less transferable to other firms. We hypothesize that, to the

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[3] See also Bailey and Helfat (2001), who find that in industries where CEO's human capital is more firm-specific there is a larger variation in strategy and performance across firms.

extent that CEO compensation is driven by supply and demand forces for human capital, CEO compensation in these industries will be less influenced by shocks to compensation of other CEOs in the industry.[4]

We identify the background f new CEOs in the largest public U.S. corporations. Our universe of firms includes all firms in the Execucomp database for the years 1993-2005. Execucomp provides information on the five highest paid top executives for firms included in the S&P 1500 composite index (or that have belonged to it in the past). Our sample starts in 1993, as Execucomp started a full collection of the data then. The database consists of 24,084 firm-year observations.

2.1 Identifying New CEOs

We first identify entry of new CEOs in the sample. Table 1 shows the identification procedure. For some firms in the database, Execucomp identifies the executive who is the CEO (variable *ceoann*), and the year in which the CEO was appointed or reappointed (variables *becamece* and *rejoin*, respectively). For firms for which these three variables are available, we define a 'new CEO' as a CEO whose year of becoming a CEO or of rejoining the firm is the same as the recorded firm-year. This procedure allows us to identify whether a CEO is new in a total of 21,339 firm years.

For firms with missing data on *becamece* and *rejoin* but where *ceoann* is not missing, we look at whether the same executive was identified by Execucomp as a CEO in the previous year. If a different executive was the CEO then we define the current CEO as a new CEO. If the variable

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[4]The literature has also pointed to economic frictions which lead firms to choose insider CEOs. For example, commitment to choosing insiders in order to motivate lower-ranked managers to exert effort (Chan, 1996), adverse selection problems when choosing outsider CEOs (Greenwald 1975), and managerial entrenchment (Parrino, Huson, and Starks 2001, Borokhovitch, Parrino, and Trapani 1996, Helmich 1974, Helmich and Brown 1972. See also Taylor 2010). To the extent that these frictions reduce the effectiveness of the external market for CEO talent, they should lead to similar predictions regarding insider CEOs and weaker relation between CEO compensation and compensation of other CEOs in the same industry.

ceoann is also missing or if the firm is not in the database in the previous year, then we read the proxy statement in that year and in the previous year to identify whether the CEO is new. This procedure allows us to identify whether the CEO is a new CEO in additional 2,064 firm-years. Our final sample therefore consists of 23,403 firm-years or 97% of the entire Execucomp database. Of the 23,403 firm years we identify 1,890 firm years in which the CEO was new.[5]

2.2 Identifying CEO Background

Securities regulation section 229.401 requires that firms provide background information in their proxy filings about each executive officer and director. This information includes each person's principal occupations and employment during the past five years; the name and principal business of any corporation or other organization in which such occupations and employment were carried out; and whether such corporation or organization is a parent, subsidiary or other affiliate of the firm.

We read the background information for each new CEO from the proxy statements and identify the name of the previous employer of the CEO and the occupation of the CEO under that employer. We were able to find proxy statement information for 1,827 out of the 1,890 new CEOs (about 97%).

In some cases, new CEOs are entering the firm few months before becoming CEOs, to ensure a smooth transition with the current CEO. We argue that the last employer of these new CEOs (i.e., before becoming CEO) should not be the current firm, since the decision to have them as CEOs was most probably made before they entered the current firm. Instead, if the CEO was affiliated with the current firm for less than two years, we use the previous employer and position of

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[5] For 3% of firm-years, we could not identify whether the CEO was a new CEO in the particular year for various reasons, such as the firm does not identify who the CEO is, or the firm has more than one CEO or the firm does not have electronic filings in that particular year to ensure that the CEO is new.

the CEO as the new CEO's last position before becoming CEO.[6] In other cases, boards choose interim CEOs while looking for a new, non-interim CEO. We define a CEO as an interim CEO if the firm explicitly writes in the proxy statement that the CEO is an interim CEO, or if the CEO is replaced within a year of becoming a CEO.

We also identify the four-digit SIC industry code of the new CEOs' previous employer. If the previous employer is a public firm, the industry code is taken from the CRSP header file. If the employer is a private firm, the code is taken from the Hoovers' database. In the few cases where the information is not available in CRSP or in the Hoover database, we assign an industry code based on the SIC code description and the information that we collect about the previous employer. However, Parrino (1997) argues that even when CEOs come from a different industry, they often have some relevant industry experience, either because they worked in the past in the industry or because their firm operates in more than one industry. To assess whether this is the case also in our sample, we take a closer look at the past experience of the 235 CEOs which come from a different industry. Indeed, in most cases we do find some relevant past experience in the relevant industry and focus our analysis on differences in compensation between CEOs that come from outside the firm and CEOs that come from inside the firm.[7]

Table 2 presents summary statistics of our sample. Panel A shows that out of the 1,827 new CEOs between 1993 - 2005, 1,147 (63%) are insiders, whose prior employer was the firm for at least

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[6] This procedure is consistent with Bailey and Helfat (2003). Parrino (1997) classifies new CEOS as those who have been in the firm for one year or less. We also ran all of our regression, classifying insider CEOs in accordance with Parrino (1997). None of our results change. Reclassification affects thirteen firms in our sample.

[7] We also did the entire analysis, differentiating between outsider CEOs who come from the same industry and outsider CEOs who come from outside the industry. There was no significant difference in our results among the two groups. The classification into these subcategories and the analysis can be provided upon request.

2 years.[8] An additional 547 new CEOs (30%) are outsiders, i.e. they did not work for at least 2 years in the firm before becoming CEOs. An additional 133 new CEOs are interim CEOs (7%).

Panel A also shows that these characteristics are relatively stable over the years. Between 1993 - 1996, 63% of the new CEOs were insiders, 31% were outsiders, and 7% were interim CEOs, compared with 60%, 32%, and 9% in the years 2003 - 2005.[9]

These findings are consistent with Murphy and Zabojnik (2007), who report that an average of 32.7% of new hires between 2000 - 2005 can be classified as outside hires. For the years 1990 - 2000 they find an average of 27% of CEOs who are outside hires, but their sample for that period includes only Forbes 500 firms, which are larger firms than the firms in our study and larger firms tend to hire fewer outsider CEOs. The percentage of outside hires in our sample is also larger than the percentage of outside hires in Parrino (1997). In his sample, the percentage of outside hires is 15.57%. We believe that the reason for the difference is the different time period. His sample consists of hires between 1969-1989. Arguably, the market for CEO talent has evolved over the years, with an increase of the number of outside successions over the last 40 years, as suggested also by Murphy and Zabojnik (2007).

In the appendix, we provide additional analysis of the characteristics of insider and outside CEOs. The main findings are that outsider CEOs usually have prior experience in a public company in a senior management position, usually related to production (e.g., Chief operating officers, presidents, or managers of subsidiaries). Most of them were not CEOs prior to entering their current position. Insider CEOs usually had a prior position as Chief Operating Officer (39%), followed by division manager / Vice president (23%) and company President (20%). These characteristics

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[8] SEC regulations require directors to provide information about prior occupations in the past five years. We can therefore fully track the occupations of new CEOs up to five years before becoming CEOs. We find that about 93% of the new insider CEOs worked in their firms for at least 5 years before becoming CEOs.

[9] Other studies point to an increase in outside hire over time, occurring in an earlier period (e.g. Frydman 2005).

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suggest that prior experience in senior management position, but not necessarily as CEOs, is important to the current position.

2.3 Insider and Outsider CEOs Across Industries

Our measure of variation of talent pool structure across industries is the percentage of CEOs who come from inside the firm and outside the firm across the different industries. Parrino (1997) shows that this measure captures homogeneity of firms within industries, and therefore captures the relevance of CEO talent in one firm to having a position in another firm. In our study we examine whether this variable can explain variation in CEO compensation across industries.

In this subsection, we show the distribution of this variable across industries. Table 3 shows the distribution of outsider and insider new CEOs across the classification of 48 industry groups of Fama and French (1997).[10] Among industries that have 10 or more replacements in the database, the industries that have the largest percentage of insiders are Construction (92%), Steel Works (85%), and Transportation (82%). Among the industries that have the smallest percentage of insiders are Trading (41%), Aircraft (47%), Computers (51%) and Personal Services (53%). Thus, there seems to be a large variation in this variable across industries – a variation that we will exploit in the next sections. Our findings are largely consistent with Parrino (1997). For example, we also find that banks, insurance companies, and the companies in the fabricated metal products industry are those with the largest percentage of insiders. However, there are also some differences. For example, we find that CEOs of oil producers tend to come from inside the firm (19% outsiders), while Parrino (1997) finds that they are more likely to come from outside the firm (36% outsiders). We attribute these differences to the different sample periods across the two studies.

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[10] The classification of industries is from Kenneth French's Website.

2.4 Dependent variables, Control variables and Descriptive statistics

To capture the level and growth of CEO compensation, we use the log of CEO total compensation (Execucomp variable TDC1) and the changes in the log of CEO total compensation, respectively. Our independent variable is the percentage of CEO appointments in the industry that are from inside the firm.

We further add a set of controls that has become standard in the executive compensation literature, including lagged total CEO compensation, the Herfindahl concentration index based on sales (using all firms in Compustat in the industry), stock price volatility, market beta, performance (return on equity, equity market capitalization and its one-year lag and growth in log sales), the market capitalization of the 250th largest firm in the current and the previous year (see GL) and CEO tenure. Descriptive statistics for the four CEO talent pool proxies and all controls can be found in Table 4.

3. Benchmarking

Our goal is to study the extent to which variations in talent pools across industries explain cross-sectional variation in CEO compensation. We conduct three tests of the effects of the talent pool structure on the structure of CEO compensation. The first test measures the extent of benchmarking CEO compensation (this section), the second explores the importance of 'pay-for-luck' or pay for industry-wide performance (section 4), and the last considers the relation between firm size and compensation as in GL (section 5).

In determining CEO compensation, public corporations as well as compensation advisors rely on compensation to CEOs in other, similar firms. This practice, called benchmarking, is perhaps the most convenient way to ensure that CEO compensation is adjusted for changes in the supply and

demand forces in the economy for CEO talent and to establish a CEO's reservation wage (Holmstrom and Kaplan, 2003). Benchmarking opponents have been worried that firms pick peer firms that generally give high compensation in order to increase CEO compensation regardless of performance (Faulkender and Yang 2009). .

Bizjak, Lemmon, and Naveen (2008, henceforth BLN) find widespread evidence of benchmarking CEO compensation to that of other firms, but no systematic evidence that the use of benchmarking is more prevalent in firms with weaker governance. They also find that benchmarking is more likely for executives with shorter tenure and with better firm performance. BLN also consider labor market effects through proxies such as firm age and the unemployment rate, but do not consider direct evidence from CEO talent pools as this paper.

CEO talent pools could have a significant effect on benchmarking. In industries with a large fraction of outsider CEOs, the CEO's outside option should be determined by the compensation of CEOs in other firms, most likely in the same industry. In a competitive labor market, firms would adjust the compensation of the CEO to that of others in the industry (Oyer 2004). If, however, there are very few outsider CEOs in the industry and the relevant talent pool of CEO candidates is given by top executives from inside the firm, then CEO compensation in other firms should not be an important determinant of the compensation to the manager. In those industries, any evidence for benchmarking might be interpreted as evidence for opportunistic pay-setting practices, or CEOs being compensated with little regard to changes in their outside opportunities.

3.1 Benchmarking Methodology

A natural way to examine whether CEO compensation is benchmarked against peer groups is to test whether changes in CEO compensation between year t-1 and year t are explained by the

relative position of the CEO compensation in year t-1 vis-à-vis compensation in the peer group (the benchmark), after controlling for the relevant variables that determine compensation. In particular, we closely follow the procedure in BLN, whose specification is as follows:

$$\Delta Compensation_{i,t} = a_1 * Distance(Compensation_{i,t-1}, Benchmark\ Compensation_{t-1}) +$$

$$a_2 * Controls_{it} + Error_{it}. \qquad (1)$$

The function $Distance(Compensation_{i,t-1}, Benchmark\ Compensation_{t-1})$ is a measure of the distance between CEO compensation in year t-1 and the benchmark compensation in the same year. Like BLN, we consider the benchmark compensation as the median compensation in the peer group in the previous year and employ two different proxies for such distance. First, a Low Compensation Dummy that equals one if compensation$_{i,t-1}$ < benchmark median compensation$_{t-1}$, and zero otherwise. Second, the cumulative distribution function of the difference between the last year's benchmark median compensation minus the firm's compensation last year (CDF Distance). CDF Distance is positive if last year's CEO pay was below the peer group median and is negative when last year's pay was above the peer group median.

The benchmark group formation also closely follows BLN, and is based on industry and size. Each year and within each of the 48 industry groups, we classify firms as being in one of two industry size groups: namely the large (small) firm group if they have market capitalization above (below) the industry median. Each firm's benchmark group is then given by all firms in the same industry-size group, such that with 48 industry groups, there are 96 industry-size groups.

The control variables include performance measures (return on equity in the previous year, change in log shareholder value from previous year and growth in log sales) as well as CEO tenure.

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As GL suggests that changes in the distribution of firm size across large firms in the economy affect CEO compensation, we also include as control variables the market capitalization of the 250th largest firm in the current and the previous year. We further add the Herfindahl concentration index based on sales to control for the product market structure. Finally, we add the firm's stock price volatility and its market beta (both based on the last 5 years) to control for differences in risk, which may be particularly important for the valuation of the option packages (see also Aggarwal and Samwick 1999a). However, these additional controls (i.e., those not included in BLN) do not significantly affect our results.

We propose two methodological changes compared to BLN. The first is relatively innocuous and consists of having changes in log compensation rather than changes in compensation as our dependent variable. While results are largely similar across these specifications, results using log compensation are less sensitive to outliers and small sample problems. Further, once we use log compensation rather than compensation, we can no longer reject of the normality of the regression residual errors using a standard skewness test.

The second methodological change we propose is more critical. Specification (1) assumes that, after controlling for the performance, tenure, and economy-wide variables, changes in compensation follow a random walk. However, this ignores the very significant positive autocorrelation of firms' CEO compensation across time. For example, a pooled panel regression of log CEO compensation on a constant and its one-year lag gives an R^2 of 56% and an AR(1) coefficient of 0.76, which is significantly smaller than 1. Because of this, the first difference of (log) compensation has very significantly *negative* autocorrelation. For negatively autocorrelated variables, a relatively low (high) value tends to be followed by a subsequent increase (decrease). Therefore, without adjusting changes in (log) compensation for strong negative autocorrelation,

there is, by construction, a large positive association between changes in compensation and both benchmarking proxies described above. In particular, negatively autocorrelated changes in (log) compensation mean that firms with previous compensation decreases tend to increase their compensation the subsequent year. However, firms with previous compensation decreases are also more likely to have low compensation relative to their benchmark, such that this negative autocorrelation, if not corrected for, could significantly increase evidence for benchmarking.

Fortunately, such effects are relatively easy to correct for by controlling for the lagged level of CEO compensation. Note that controlling for the lagged level of CEO compensation should not affect the evidence for benchmarking in a well-specified regression. Benchmarking specifically links the change in CEO compensation to its distance to the compensation of *other* firms, not its distance to its *own* lagged compensation.

Table 5 shows the importance of controlling for the lagged level of CEO compensation in the benchmarking regressions similar to those run in BLN, using changes in log CEO compensation as the dependent variable and the Low Compensation Dummy (in Panel A) and CDF Distance (in Panel B) as the benchmarking proxies. In the first two columns of each panel, the specifications do not control for lagged compensation. The lagged compensation is then added in the last two columns. Throughout the paper, robust standard errors clustered by firm are used. Further, all samples only include CEOs with at least 2 years of tenure to make sure that all compensation changes are for the same CEO.

In Panel A, the coefficient on the Low Compensation Dummy equals 0.458 and is highly significant in column 1, and is hardly affected by adding industry dummies in column 2. However, controlling for lagged compensation in column 3 lowers the coefficient on the benchmarking dummy to 0.017, which is insignificant (p-value of 30%). Once industry dummies are added in column 4, the

coefficient on the Low Compensation Dummy equals -0.006 (thus with the opposite sign) and is insignificant. In contrast, the lagged compensation variable is highly significant and its addition almost doubles the R^2. Likewise, the results in Panel B using CDF Distance as the proxy for benchmarking show a very strong reduction in benchmarking once lagged compensation is controlled for: the coefficient on CDF Distance drops by about 90%, from 1.010 (column 2) to 0.0093 (column 4), where it is only statistically significant at the 5% level.

Without taking logs, the results are even stronger (results not reported but available upon request). For example, the coefficient on the Low Compensation Dummy equals $1,743 without controlling for lagged compensation (similar to the results in BLN), but changes to -$342 with the control, i.e., with the opposite sign. The same sign reversal happens for the CDF Distance as the proxy for benchmarking.

Overall, once lagged compensation is controlled for, we find much weaker or no evidence for benchmarking. In the next subsection we explore whether benchmarking depending on the CEO talent pool structure.

3.2 Benchmarking and CEO Talent Pool Structure

Our main goal is to explore how important peer groups are for CEO compensation. We previously documented that CEO talent comes from pools that are clearly distinct by industry, with significant differences in the number of insiders across industries. For the analysis in this section, we divide industries into quartile groups based on the percentage of new CEOs who come from inside the firm.[11] We then define the High-Insider (percentage) group dummy as a dummy variable which

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[11] We use the whole sample to reduce noise and because there is little time variation in the percentage of insiders across industries in our sample.

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equals 1 if the firm belongs to an industry that is in the highest quartile of insider CEOs and zero otherwise, and the Low-Insider group dummy as a dummy variable which equals 1 if the firm belongs to an industry that is in the lowest quartile and zero otherwise.

One would expect the CEO compensation of firms in the Low-Insider group to be most affected by benchmarking against other firms with a similar size in their industry. For this group, there are significant outside opportunities for the CEOs, while those firms also have to remain competitive in their ability to attract top talent from other firms.

We examine the differences in benchmarking across the different industry groups by interacting the two benchmark proxies with the High-Insider and Low-Insider dummies, and present the results in Table 6. Panel A of Table 6 shows the regressions where our benchmarking proxy is the Low Compensation Dummy, while Panel B of Table 6 uses CDF Distance.

The first specification shows that the coefficient of the Low Compensation Dummy is 0.109 and it is statistically significant from zero (at the 1% level). The coefficient of the interaction of the Low Compensation Dummy with the Low Insider Dummy is 0.030 and is not statistically significant from zero. The coefficient of the interaction of the Low Compensation Dummy with the High Insider Dummy is -0.144 and it is statistically significant from zero. Results using the CDF Distance proxy are even stronger, with its interaction with Low Insider having a coefficient of 0.172 and with High Insider a coefficient of -0.259 (both coefficients are significant at 1%). These results suggest that benchmarking exists in industries where CEOs tend to come from outside the firm, but there is no evidence for benchmarking in industries where CEOs tend to come from inside the firm.

One potential driver of our result is that different industries tend to have different conversions to the median peer group compensation, not related to whether CEOs tend to come from inside the firm or outside the firm. To control for this possibility, we add to the original specification

industry dummies, obtaining similar results (second specification). The coefficient of the Low Compensation Dummy is 0.117 and is statistically significant from zero. However, the coefficient of Low Compensation Dummy interacted with High Insider equals -0.095 and statistically significant from zero, consistent with no benchmarking in industries where outsider CEOs are rare. Results using the CDF Distance proxy in Panel B of Table 6 are similar.

The high-insider and low-insider dummies are based on within-sample averages across firms that replaced their CEOs. It is possible that our results are driven by those particular firms-year observations where the new CEOs enter their job. To control for this possibility we include an Outside CEO dummy variable which equals 1 if in the previous year a new CEO entered the firm and that new CEO is an outsider. The results, presented in specification 3, are not affected by the inclusion of this dummy variable.

Finally, it is interesting to explore the circumstances that affect insider and outsider hires. Parrino (1997) shows that forced turnovers are often followed by outside hires. The interpretation of this finding is that when the board is not happy with its CEO's strategy and performance, it will often look for an outsider to bring a new strategy and a new vision to the firm. An industry with many forced turnover would therefore be an industry with high demand for CEOs with new views and visions and an industry in which different firms are more likely to look for new or different directions. Thus, even though such industry is more likely to bring outside hires, it is probably less likely to benchmark their compensation to other firms in the industry because the CEO talent may be less likely to be replicated by other CEOs.

To examine the effect of high-forced-turnover industries on the likelihood of benchmarking, we add to our third specification two interaction variables: the Low Compensation Dummy interacted with a dummy for High Forced Turnover industries and the Low Compensation Dummy

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interacted with a dummy for Low Forced Turnover industries. Our definition of a forced turnover is similar to Parrino (1997).[12] We classify an industry as Low Forced Turnover (High Forced Turnover) industry if it is in the lowest quartile (highest quartile) in terms of percentage of forced turnovers across all industries in our sample.

The results, shown in the fourth specification, suggest that when the industry has a high percentage of forced turnovers there is indeed less tendency to benchmark CEO compensation (i.e., with a negative coefficient that is strongly statistically significant). When the firm has more inside hires there is less tendency to benchmark but the coefficient is not statistically different from zero and is much smaller in magnitude.

Adding the interactions of the benchmarking proxy with the forced turnover dummies does not change the previous result that there benchmarking also depends on CEO talent pool structure. While the interactions of the Low Compensation Dummy with Low Insider and High Insider in Panel A no longer have statistically significant coefficients (equal to 0.050 and -0.042), their difference is still economically and statistically significant (p-value of 6%).

We get similar results when we use the CDF distance as the measure of benchmarking rather than the low-CEO Compensation dummy. The results are stronger, likely because the CDF distance measure may be a more accurate measure of the relative ranking of CEO compensation compared to other firms in the industry, than the low-compensation dummy. For example, in specification 4 of

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[12] We thank Dirk Jenter for providing us with the forced-turnover data as used in Jenter and Kanaan (2006) and updated subsequently. Following Parrino (1997), Jenter searches the Factiva news database for the exact turnover announcement date and classifies each CEO turnover according to whether the turnover was forced or voluntary. A departure is defined as a forced departure if the CEO is fired, forced out, or retires or resigns due to policy differences or pressure. All other departures for CEOs above and including age 60 are classified as not forced. All departures for CEOs below age 60 are reviewed further and classified as forced if either the article does not report the reason as death, poor health, or the acceptance of another position (including the chairmanship of the board), or the article reports that the CEO is retiring, but does not announce the retirement at least six months before the succession. Finally, the cases classified as forced can be reclassified as voluntary if the press reports convincingly explain the departure as due to previously undisclosed personal or business reasons that are unrelated to the firm's activities. For further details, see Jenter and Kanaan (2006).

Panel B the coefficient on the interaction of CDF Distance and Low Insider equals 0.195, and is strongly statistically significant.

Our results contribute to the findings of BLN in two ways. First, controlling for lagged compensation essentially takes away the average effect of benchmarking on the dynamics of executive compensation. Second, in the subset of firms in industries with high percentage of outsider CEOs, there is still very strong evidence for benchmarking. In contrast, there is no evidence for benchmarking in industries with few outsider CEOs, which is consistent with competitive benchmarking and CEO labor market considerations.[13]

4. Pay-for-Luck

CEO compensation may change not only with firm-specific performance, but also with the industry or even economy-wide performance. This finding stands in seeming contrast to the intuition of e.g. Holmstrom (1979) that CEOs should only be paid for the part of performance that they can influence (denoted by "Skill"), and not for the performance that is due to other factors such as industry-wide shocks (denoted by "Luck").[14] Bertrand and Mullainathan (2001) argue that 'pay for luck' is a manifestation of an agency conflict. In contrast, Himmelberg and Hubbard (2000) and Hubbard (2005) argue that pay for luck can be due to the correlation between the value of CEO skill and market conditions. When the industry is booming, the value of CEO skill increases and therefore the CEO should receive higher compensation.

In this section, we explore the relation between pay for luck and the structure of CEO talent pools. To the extent that pay for luck is the result of changes in the value of CEO skills, shocks

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[13] Our results also do not change if we do not control for lagged compensation. The evidence for benchmarking is still much stronger in industries with many outside CEOs.

[14] DeMarzo et al. (2009) show in a dynamic agency problem that luck could optimally enter compensation contracts.

within pools, rather than outside pools, should explain CEO compensation. Specifically, in an industry with many outsider CEOs and where the overall supply of CEOs will be relatively inelastic, boards may be forced to raise their CEOs compensation if there is a positive industry-wide shock. An industry-wide boom clearly improves each CEO's next best alternative in those industries. However, in industries with very few outsider CEOs, such a competitive labor market argument would be less compelling, if CEOs and top executives are beholden to the firm and (almost) never move to outside opportunities.

4.1 Methodology for Measuring Pay-for-Luck

Our measure of performance is the firms' annual excess stock return (dividends reinvested, above the risk-free rate). This measure has a large explanatory power for cross-sectional variations in CEO compensation (Jensen and Murphy 1990), and is commonly used. To separate the component of performance that is due to luck from the component that is due to skills, our two-stage regression closely follows Garvey and Milbourn (2006) and BLN. In the first stage, we conduct a pooled panel regression of annual firm excess stock returns on value- and equally-weighted industry excess stock returns, industry dummies and year dummies, using the 48 Fama-French industry groups.[15] Next, the estimated coefficients are used to calculate the component of the return that is explained by the industry returns and the industry and year dummies. As in Garvey and Milbourn (2006) and BLN, we define this fitted component as the "luck" component of the return, which is not explained by the firm-specific CEO skills. The regression residual, i.e., the difference between the annual return and the luck component, is denoted as the "skill" component. We then scale these two

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[15] We use both equal-weighted industry returns and value-weighted industry returns in the regression to ensure that our results are not biased because of the size distribution within industries. We tried both French's 48 industry classification of industries and the 10 industry classification in the first stage, and results using either are very similar.

components of the return by the log of the market capitalization of the firm in the beginning of the year. We define these two components as Skill and Luck.

In the second stage, we regress changes in log compensation on Skill and Luck plus controls, year dummies and firm fixed effects. We further interact the proxies of Skill and Luck with the high/low-insider, and the high/low-outsider-industry dummies. The controls are similar to those used in the benchmarking test.

4.2. Results

The results of the second stage are given in Table 7. The first column includes Skill, Luck the cumulative distribution function of the stock volatility, plus the other control variables from Table 5 including lagged CEO compensation. Both Skill and Luck have statistically significant and economically large effects on CEO compensation. Using column 1, a 1% increase in the Skill component of stock market performance is associated with a 0.243% increase in compensation, and a 1% increase in the Luck component is associated with an about 0.165% increase in compensation.

Next, we consider the effect of CEO talent pool structure. In column 2, we interact Skill and Luck with dummies for whether the industry has a high and low percentage of inside CEOs. We find that Skill remains significantly different from zero, but there is no significant difference in the elasticity of compensation changes to the firm-specific component of performance (i.e., Skill) across industries with high and low percentages of insiders. In contrast, while Luck by itself remains significant, Luck or the industry-wide performance component is statistically significantly (p-value of 7%) larger in industries that have a low percentage of insider CEOs, while Luck interacted with the "high-insider" dummy is insignificant. Economically, the coefficient on Luck is almost twice as large for firms in industries with many outsiders compared to the average. This result is consistent

with the argument that pay-for-luck is at least partly driven by outside opportunities to the CEO. When the pool for CEOs is largely other executives from outside the firm, CEO compensation responds more to the luck component compensation.[16]

5. Talent Pools, Firm Size, and CEO Skill

Gabaix and Landier (GL) analyze the relation between managerial talent and CEO compensation. In their general-equilibrium setting, all firms choose managers from the same pool of talent. Following the insight of Rosen (1992) that productivity of talent increases with firm size, their matching model implies a relation between CEO compensation and the size distribution across large public companies. Empirically, their results rely on the assumption that firm size is a reasonable proxy for CEO talent.

Under some mild distributional assumptions of firm size in the economy, GL show that the compensation to the CEO should be related both to the size of the firm in which the CEO operates and the size of the nth largest firm in the economy, where n is a constant. They then test this prediction using the following specification on a panel of large public US firms:

$$Log\ (CEO\ compensation_{it}) = a_0 + a_1\ Log(Size_{it}) + a_2\ Log(Size\_Reference\_Market_t) + e_{it}$$

The variable $Size\_Reference\_Market_t$ is the size of the mth largest firm in the economy. Theoretically, m could be any size ranking as long as it captures the tail of the size distribution. In their empirical specification, GL use m=250 (the 250th largest firm is the reference firm). GL

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[16] Similar to the previous section, we have confirmed that these results are robust to also adding the interactions of Skill and Luck with dummies for high and low forced turnovers in the industry.

acknowledge that if talent pools are segmented, then "…the reference firm size should be industry-specific which will lead to an attenuation bias in the coefficient on the reference firm size" (GL page 35).

In this section, we wish to explore the extent to which firm-specific and industry-specific variations in CEO talent pools help explain variations in the compensation. Previously, we documented large differences in CEO talent pools across industries. In pools of CEO candidates that are highly segmented, the GL model would predict that what matters is not the size distribution of firms in the whole economy, but the size distribution of firms within the particular talent pool.

To test the effect of the industry specific talent, we introduce the following regression specification over the entire Execucomp data between the years 1993-2005 that closely follows the specification in GL:

$$Log\ (CEO\ compensation_{it}) = a_0 + a_1\ Log(Size_{it}) + \quad a_2\ Log(Size\_Reference\_Market_t)+$$

$$a_3\ Log(Size\_Reference\_Industry_t)+\ e_{it}$$

where $Size\_Reference\_Industry_t$ is the size of the 20th largest firm in Compustat that belongs to the same industry as the CEO's firm (using the 48 industry specification of Fama and French (1997) and using all firms in the Compustat database, not just those firms in the ExecuComp sample). The size of the largest 20th firm is used as an additional explanatory variable to help explain whether distribution of talent within the industry explains changes in compensation. Other than our addition of an industry reference firm (i.e., a reference firm which is industry specific), this specification is similar to GL. We further define firm size as the market value of the equity of the firm rather than the total value of the firm, as using market value of equity gives a clearly higher R^2 than using total

cap that includes the book value of debt (as used in GL), though results are very similar when using total cap. Finally, like GL we adjust compensation and market capitalizations for inflation (as we cannot use year fixed effects).

5.1 Market and Industry Reference Firm Size

Table 8 shows the results. Column 1 shows the results of the GL specification with the addition of the industry reference firm and the interaction of the firm's market cap variable with high-insider and low-insider dummy variables. As expected, the coefficients of both market size and the size of the market-wide reference firm are significant. Further, variations in the size of the industry-reference firms explain very little of the variation in CEO compensation. The coefficient of the industry reference firm's market cap is statistically different than zero, but is much smaller than that of the market reference firm (0.03 compared to 0.48).

One interpretation of these findings is that the markets for CEO talent are integrated and therefore the change in the size distribution of firms across the entire economy is the more relevant indicator for the change in the return to talent in our sample. However, this result seems inconsistent with our documentation that the labor market for CEO has explanatory power when examining other features of compensation.

To further explore the result we check whether the effect of the market reference firm or the industry reference firm will differ between industries with high percentage of CEO insiders and industries with high percentage of CEO insiders. We expect firms in industries with a high percentage of CEO insiders to be affected less by reference size variables because, to the extent that these reference size variables represent distribution of skill in top firms, these should be less relevant when the market for talent is firms specific.

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The second specification in Table 8 shows that industries with high percentage of insider CEOs are less influenced by the distribution of talent in the economy than industries with low level of insider CEOs. The coefficients, however, are extremely small compared to the coefficient of the market cap of the market-wide reference firm. Interactions of the firm's market cap are likewise economically not meaningful (see the first specification). We obtain similar results when we interact the high/low insider-CEO dummies with the size of the industry reference firm (third specification).

These findings suggest that CEO compensation is related to the distribution of talent in the economy regardless of whether the talent measure is relevant for the CEO talent pool, and that what matters is the distribution of talent in the whole economy rather than the firm's industry.

This seems puzzling given the wide differences in CEO talent pools across industries as documented in Table 3 and our previous results on the relation between talent pool structure, benchmarking, and pay for luck. We suggest two possible explanations for this finding. First, it may be the case that executives make career decisions early on, knowing that once they enter certain industry they close-off other options outside that industry. In that case, more talented potential CEOs may enter industries where they expect higher rewards, and vice versa for less talented potential future CEOs. This could generate equilibrium compensation that is again driven by market-wide, not industry-specific factors, even if CEO talent is not homogeneous across industries at the CEO stage of talent's careers.[17]

Empirically however, we find that insider CEOs typically have very long tenures with their own firm before becoming CEOs. For example, more than 90% of new insider CEOs in our sample have been with their firms five years or more. It seems likely that many of those CEOs made their career decisions many years before that. As a result, projections regarding the potential growth of

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[17] We thank Xavier Gabaix for proposing and illustrating this possibility in his NBER discussion of our paper.

different industries would arguably seem to be hard to make that far in advance by young executive talent deciding on their career path.

Second, the size of the market-wide reference firm may proxy for something else not directly related to the equilibrium model in GL. Recent papers challenging the interpretation of GL include Frydman and Saks (2007), who find a much smaller elasticity between CEO compensation and average firm size with data starting in 1936, as well as Dew-Becker and Gordon (2007), who find widely varying elasticities for 1970-2005 compensation data using rolling 20-year regressions.

6. Conclusion

Our results suggest that there are two important and different markets for CEO talent. The first market is external and is composed of managers and CEOs from other companies (largely within the same industry). The second is the internal market for CEOs. Compensation to CEOs whose market is internal does not respond to industry shocks and is less strongly tied to industry performance. Compensation to CEOs whose market is external responds to industry shocks and is tied to industry performance.

These findings stand in contrast to the widely held belief that CEO skills are relatively homogenous and mainly related to firm size (or complexity). They further suggest that the forces which determine executive compensation could be both driven by outside market pressure and by internal bargaining and that the importance of each force differs depending on the talent pool structure that the firm faces.

In this paper we studied the effect of talent pool structure on executive compensation. As such, we extend the literature on talent pools which have concentrated mainly on its relation to CEO replacements (Parrino 1997). We believe that the CEO talent pool structure could also affect

monitoring decisions by boards and board structure itself. We plan to explore these issues in future research.

Finally, our results question the use of firm size as a proxy for the relative talent of different CEOs (Rosen 1992) and the interpretation of the empirical results in Gabaix and Landier (2008). Their model and specification assume homogeneity in CEO skills across firms, while their empirical results rely on the assumption that firm size can proxy for CEO talent. Having documented the importance of heterogeneous firm- and industry-specific skills, we find that variations in firm size (used as a proxy for talent in GL) within industries explain only a very small portion of the variation in CEO compensation over time.

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TABLE 1: DATA CONSTRUCTION

The table shows the construction of the database of new CEOs. The sample consists of all CEOs in the Execucomp database between 1993 and 2005. From that sample, a subsample of new CEOs was extracted. The final sample of new CEOs consists of 1,827 persons.

Total number of Execucomp firm years (93-05):	24,084
Firm years with unidentifiable CEOs	2,745
Total number of firm years with CEOANN	21,339
Identifying additional CEOs:	2,064
Total firms with CEO info:	23,403
Number of firm-years with new CEOs:	1,890
No proxy information about the past experience of the CEO	63
Total number of firm years with New CEOs that have available data	1,827

TABLE 2: CHARACTERISTICS OF NEW CEOS

The table shows the characteristics of new CEOs in the Execucomp database. Panel A shows the distribution of new CEOs by Insiders, Outsiders, and Interim. Insider CEOs are CEOs whose previous position in the previous two years was with the same company. Interim CEOs are new CEOs who were replaced within a year from becoming CEOs, or who declared in the proxy statement that they are interim CEOs once they took their position. In panels B, C, and D, the information about previous employment of the CEOs is from the proxy statements, which provides information about the employment history of the CEO within the past five years. If the CEO's past employment was for less than 6 months, we take the previous employment record.

Panel A: Insiders, Outsiders, and Interim CEOs

Period	All CEOs	Insiders	Outsiders	Interim
1993-1996	498	312	152	34
		63%	31%	7%
1997-1999	463	284	146	33
		61%	32%	7%
2000-2002	466	313	122	31
		67%	26%	7%
2003-2005	400	238	127	35
		60%	32%	9%
1993-2005	1,827	1,147	547	133
		63%	30%	7%

Panel B: Former Employment of Outsider CEOs

Period	Total Outsiders	Former CEOs	Former CEOs from Public Firms	Former CEOs from private Firms	Former Non CEOs	Former Non CEOs from Public Firms	Former Non CEOs from Private Firms
1993-1996	152	47	28	19	105	71	34
		31%	18%	13%	69%	47%	22%
1997-1999	146	44	25	19	102	72	30
		30%	17%	13%	70%	49%	21%
2000-2002	122	36	30	6	86	59	27
		30%	25%	5%	70%	48%	22%
2003-2005	127	46	23	23	81	59	22
		36%	18%	18%	64%	46%	17%
1993-2005	547	173	106	67	374	261	113
		32%	19%	12%	68%	48%	21%

TABLE 3: INDUSTRY DISTRIBUTION OF INSIDER AND OUTSIDER CEOS

The table shows the distribution of new CEOs across industries from the sample of all new CEOs between 1993 and 2005, and whose firm is in Execucomp, using 10 (Panel A) and 48 industry groups (Panel C). For the outsider CEOs and 10 industry groups, Panel A also shows the number (and as a percentage in two ways: first as the percentage of all CEO coming to that industry, secondly as the percentage of all CEO from that industry) of outsider CEOs who came from a given industry and ended up as CEOs in a different industry. Panel B shows the meaning of the industry abbreviations which are used in Panel A.

	Industry	Total	Total Insiders	Total outsiders	% insiders
1	AGRICULTURE	4	3	1	75%
2	FOOD PRODUCTS	33	18	15	55%
3	CANDY & SODA	7	5	2	71%
4	BEER & LIQUOR	11	9	2	82%
5	TOBACCO PRODUCTS	5	3	2	60%
6	TOYS AND RECREATION	10	7	3	70%
7	FUN AND ENTERTAINMENT	20	15	5	75%
8	BOOKS	18	12	6	67%
9	CONSUMER GOODS	34	23	11	68%
10	APPAREL	19	13	6	68%
11	HEALTHCARE	24	16	8	67%
12	MEDICAL EQUIPMENT	35	27	8	77%
13	PHARMACEUTICAL PRODUCTS	48	28	20	58%
14	CHEMICALS	55	37	18	67%
15	RUBBER & PLASTIC PRODUCTS	9	5	4	56%
16	TEXTILES	7	7	0	100%
17	CONSTRUCTION MATERIALS	29	22	7	76%
18	CONSTRUCTION	13	12	1	92%
19	STEEL WORKS ETC	33	28	5	85%
20	FABRICATED PRODUCTS	3	3	0	100%
21	MACHINERY	62	46	16	74%
22	ELECTRICAL EQUIPMENT	32	23	9	72%
23	AUTOMOBILES & TRUCKS	40	26	14	65%
24	AIRCRAFT	15	7	8	47%
25	SHIPBUILDING EQUIPMENT	5	4	1	80%
26	DEFENSE	1	1	0	100%
27	PRECIOUS METALS	8	7	1	88%
28	NON-METALLIC AND INDUSTRIAL METAL MINING	6	4	2	67%
29	COAL	1	1	0	100%
30	PETROLEUM AND NATURAL GAS	52	42	10	81%
31	UTILITIES	111	86	25	77%
32	COMMUNICATION	43	24	19	56%

33	PERSONAL SERVICES	19	10	9	53%
34	BUSINESS SERVICES	158	96	62	61%
35	COMPUTERS	79	40	39	51%
36	ELECTRONIC EQUIPMENT	93	64	29	69%
37	MEASURING AND CONTROL EQUIPMENT	38	23	15	61%
38	BUSINESS SUPPLIES	35	25	10	71%
39	SHIPPING CONTAINERS	7	6	1	86%
40	TRANSPORTATION	34	28	6	82%
41	WHOLESALE	44	35	9	80%
42	RETAIL	101	73	28	72%
43	RESTAURANTS, HOTELS, MOTELS	32	20	12	63%
44	BANKING	85	68	17	80%
45	INSURANCE	66	53	13	80%
46	REAL ESTATE	2	0	2	0%
47	TRADING	61	25	36	41%
48	MISCELLANEOUS	23	15	8	65%

TABLE 4: CEO COMPENSATION - DESCRIPTIVE STATISTICS

The table presents descriptive statistics of the variables used in the analysis: sample average ('Mean'), standard deviation ('St.Dev.'), minimum ('Min.') and maximum ('Max.'). $TDC1_t$ is the total CEO compensation in year t and is taken from Execucomp. The 48 industry groups are from the Fama-French classification. The Herfindahl concentration measure is based on sales of all firms in Compustat. Volatility, Beta and the change in log Sales are from ExecuComp. ROE is net income over book value of equity from Compustat. MarketCap is the equity market capitalization. MarketCap_250 is the equity market capitalization of the 250th largest firm in Compustat. Tenure is the number of years since the CEO took place. Percentage of Equity-Based Compensation measures the flow of incentives, i.e., the ratio of the value of restricted stock grants and option grants over total compensation (TDC1). Stock Incentives is the stock of equity-based incentives, i.e., the sum of the value of restricted stock holdings and option grants (exercisable and unexercisable), from ExecuComp.

	Mean	St.Dev.	Min.	Max.
Log($TDC1_t$)	8.055	1.013	5.504	10.570
Outside CEO dummy	0.170	0.376	0.000	1.000
Percentage of Inside CEOs, in 48 Industry Group	0.732	0.100	0.553	0.909
Percentage of Outside CEOs from outside the industry, in 48 Industry Group	0.121	0.053	0.000	0.209
Outside CEOs from top executives / # of firms, in 48 Industry Group	0.005	0.003	0.001	0.010
Herfindahl Concentration	0.043	0.020	0.008	0.185
Stock Price Volatility	0.419	0.224	0.114	4.117
Market Beta	0.964	0.555	0.042	2.804
Log($Sales_t$)- Log($Sales_{t-1}$)	0.106	0.224	-0.683	1.024
ROE	0.096	0.297	-1.843	1.340
Log($MarketCap_t$)	7.663	1.572	1.787	13.180
Log($MarketCap\_250_t$)	9.081	0.239	8.499	9.328
Tenure	6.976	6.943	0.000	54.000
Percentage of Equity-Based Compensation	0.388	0.246	0.000	0.918
Log(Stock Incentives)	8.211	1.914	0.000	16.650

TABLE 5: BENCHMARKING

The table shows regression results of changes in log compensation on two benchmarking proxies and controls. In panel A, the benchmark proxy is a dummy variable for whether the CEO compensation last year was lower than the median compensation of its 48-industry-2-size group in the previous year. In panel B, the benchmark proxy is the cumulative distribution function of the median compensation of its industry-size group minus the CEO compensation during the previous year (CDF Distance). TDC1 is the total CEO compensation and is taken from Execucomp. Market Cap_250 is the equity market capitalization of the 250th largest firm in Compustat. Tenure is the number of years since the CEO took place. The numbers in parentheses are robust standard errors clustered at the firm level. ***, **,* represent significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Benchmarking – Low Compensation Dummy

Dependent variable: $Log(tdc1_{it})-Log(tdc1_{it-1})$

	coef	SE	sig	coef	SE	sig	coef	SE	sig	coef	SE	sig
Low Compensation Dummy$_{t-1}$	0.458	(0.016)	***	0.461	(0.016)	***	0.017	(0.016)		-0.006	(0.016)	
Log(tdc1$_{t-1}$)							-0.441	(0.020)	***	-0.464	(0.021)	***
Herfindahl Concentration	-0.453	(0.257)	*	-1.699	(0.562)	***	1.403	(0.340)	***	-0.426	(0.600)	
Stock Price Volatility	0.028	(0.042)		0.041	(0.044)		0.209	(0.044)	***	0.217	(0.047)	***
Market Beta	0.000	(0.014)		0.007	(0.015)		-0.007	(0.014)		-0.005	(0.015)	
Log(Sales$_t$)- Log(Sales$_{t-1}$)	0.150	(0.035)	***	0.154	(0.036)	***	0.100	(0.033)	***	0.099	(0.033)	***
ROE	0.006	(0.001)	***	0.006	(0.001)	***	0.006	(0.002)	***	0.006	(0.002)	***
Log(MrketCap$_t$)- Log(MarketCap$_{t-1}$)	0.314	(0.019)	***	0.319	(0.019)	***	0.335	(0.018)	***	0.336	(0.018)	***
Log(MarketCap$_{t-1}$)	0.042	(0.004)	***	0.047	(0.004)	***	0.210	(0.011)	***	0.218	(0.011)	***
Log(MarketCap_250$_t$)	-0.169	(0.050)	***	-0.176	(0.051)	***	-0.113	(0.045)	**	-0.120	(0.045)	***
Log(MarketCap_250$_{t-1}$)	0.153	(0.047)	**	0.149	(0.047)	**	0.314	(0.044)	***	0.316	(0.044)	***
Tenure	-0.002	(0.001)	**	-0.002	(0.001)	**	-0.002	(0.001)	***	-0.003	(0.001)	***
Constant	-0.322	(0.187)	*	-0.220	(0.191)		0.011	(0.187)		0.255	(0.191)	***
Industry Dummies	-			+			-			+		
R^2	0.138			0.139			0.268			0.275		
Observations	11,699			11,699			11,699			11,699		

Panel B: Benchmarking – Cumulative Distribution Function of Distance

Dependent variable: $Log(tdc1_{it})-Log(tdc1_{it-1})$

	coef	SE	sig	coef	SE	sig	coef	SE	sig	coef	SE	sig
CDF Distance$_{t-1}$	1.010	(0.036)	***	1.019	(0.036)	***	0.151	(0.035)	***	0.093	(0.036)	**
Log(tdc1$_{t-1}$)							-0.408	(0.021)	***	-0.436	(0.022)	***
Herfindahl Concentration	-0.304	(0.288)		-1.569	(0.573)	***	1.293	(0.339)	***	-0.481	(0.600)	
Stock Price Volatility	0.097	(0.041)	**	0.119	(0.044)	***	0.209	(0.044)	***	0.218	(0.047)	***
Market Beta	-0.013	(0.014)		-0.005	(0.015)		-0.008	(0.014)		-0.005	(0.015)	
Log(Sales$_t$)- Log(Sales$_{t-1}$)	0.134	(0.034)	***	0.139	(0.035)	***	0.100	(0.033)	***	0.100	(0.033)	***
ROE	0.006	(0.001)	***	0.006	(0.001)	***	0.006	(0.002)	***	0.006	(0.002)	***
Log(MarketCap$_t$)- Log(MarketCap$_{t-1}$)	0.321	(0.018)	***	0.326	(0.019)	***	0.335	(0.018)	***	0.337	(0.018)	***
Log(MarketCap$_{t-1}$)	0.057	(0.005)	***	0.064	(0.005)	***	0.201	(0.011)	***	0.211	(0.011)	***
Log(MarketCap_250$_t$)	-0.159	(0.048)	***	-0.165	(0.048)	***	-0.115	(0.045)	**	-0.122	(0.045)	***
Log(MarketCap_250$_{t-1}$)	0.119	(0.045)	*	0.113	(0.045)	**	0.294	(0.044)	***	0.300	(0.044)	***
Tenure	-0.002	(0.001)	**	-0.002	(0.001)	**	-0.002	(0.001)	**	-0.003	(0.001)	***
Constant	-0.517	(0.186)	***	-0.414	(0.190)	**	-0.050	(0.187)		0.202	(0.191)	
Industry Dummies	-			+			-			+		
R^2	0.189			0.191			0.269			0.276		
Observations	11,699			11,699			11,699			11,699		

TABLE 6: BENCHMARKING AND TALENT POOLS

The table shows regression results of changes in log compensation on two benchmarking proxies interacted with CEO talent pool structure and controls. In panel A, the benchmark is a dummy variable for whether the CEO compensation in the current year is lower than the median compensation of its industry-size group in the previous year. Industry grouping is according to Kenneth French's 48 industry classification. Within each industry and each year, we further classify firms into large and small–size based on whether they are above or below the median equity market capitalization for all Compustat firms within the industry in the particular year. In panel B, the benchmark proxy is the cumulative distribution function of the median compensation of its industry-size group minus the CEO compensation during the previous year (CDF Distance). Low (High) Insider is a dummy variable for whether the industry to which the firm belongs is at the bottom (top) 25% in terms of the percentage of CEOs that are coming from within the firm. Low (High) Outsider Industry is a dummy variable for whether the industry to which the firm belongs is at the bottom (top) 25% in terms of the percentage of outsider CEOs that are coming from within the same industry. The rest of the variables are defined in Table 4. The numbers in parentheses are robust standard errors clustered at the firm level. ***, **,* represent significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Benchmarking measure – Low Compensation Dummy

Dependent variable: $\text{Log}(tdc1_{it}) - \text{Log}(tdc1_{it-1})$

	coef	(SE)	sig	coef	(SE)	sig	coef	(SE)	sig	coef	(SE)	sig
Low Compensation Dummy $_{t-1}$	0.109	(0.031)	***	0.117	(0.038)	***	0.096	(0.038)	***	0.072	(0.039)	*
Low Compensation Dummy $_{t-1}$ * Low Insider	0.030	(0.019)		-0.008	(0.021)		-0.019	(0.021)		0.050	(0.034)	
Low Compensation Dummy $_{t-1}$ * High Insider	-0.144	(0.028)	***	-0.095	(0.033)	***	-0.088	(0.033)	***	-0.042	(0.036)	
Low Compensation Dummy $_{t-1}$ * High Forced Turn. Ind.										-0.113	(0.038)	***
Low Compensation Dummy $_{t-1}$ * Low Forced Turn. Ind.										-0.060	(0.052)	
Outside CEO Dummy							0.023	(0.021)		0.022	(0.021)	
Percentage of Insiders in Industry	0.387	(0.110)	***									
Log(tdc1$_{t-1}$)	-0.434	(0.020)	***	-0.459	(0.021)	***	-0.493	(0.021)	***	-0.489	(0.021)	***
Stock Price Volatility	0.201	(0.044)	***	0.218	(0.047)	***	0.319	(0.058)	***	0.312	(0.058)	***
Market Beta	-0.005	(0.014)		-0.007	(0.014)		0.018	(0.017)		0.019	(0.017)	
Log(Sales$_t$)- Log(Sales$_{t-1}$)	0.100	(0.033)	***	0.099	(0.033)	***	0.104	(0.033)	***	0.104	(0.033)	***
ROE	0.006	(0.002)	***	0.006	(0.002)	***	0.005	(0.004)		0.005	(0.004)	
Log(MarketCap$_t$)- Log(MarketCap$_{t-1}$)	0.334	(0.018)	***	0.337	(0.018)	***	0.319	(0.018)	***	0.318	(0.018)	***
Log(MarketCap$_{t-1}$)	0.205	(0.011)	***	0.217	(0.011)	***	0.238	(0.012)	***	0.237	(0.012)	***
Log(MarketCap_250$_t$)	-0.121	(0.045)	*	-0.118	(0.045)	*	-0.090	(0.044)	**	-0.090	(0.044)	**
Log(MarketCap_250$_{t-1}$)	0.318	(0.044)	***	0.322	(0.044)	***	0.347	(0.044)	***	0.347	(0.044)	***
Tenure	-0.003	(0.001)	***	-0.003	(0.001)	***	-0.003	(0.001)	***	-0.003	(0.001)	***
Constant	-0.193	(0.203)		0.141	(0.185)		-0.277	(0.204)		-0.295	(0.205)	
R^2	0.2705			0.2777			0.2951			0.296		
Industry Dummies	NO			YES			YES			YES		
Observations	11,699			11,699			10,385			10,385		

Panel B: Benchmarking measure – CDF Distance

Dependent variable: $\text{Log}(tdc1_{it})-\text{Log}(tdc1_{it-1})$

	(1)			(2)			(3)			(4)		
CDF Distance $_{t-1}$	0.188	(0.046)	***	0.231	(0.072)	***	0.186	(0.074)	***	0.137	(0.076)	*
CDF Distance $_{t-1}$ * Low Insider	0.172	(0.036)	***	0.092	(0.044)	**	0.066	(0.045)		0.195	(0.069)	***
CDF Distance $_{t-1}$ * High Insider	-0.259	(0.045)	***	-0.180	(0.067)	***	-0.168	(0.065)	***	-0.090	(0.068)	
CDF Distance $_{t-1}$ * High Forced Turn. Ind.										-0.208	(0.073)	***
CDF Distance $_{t-1}$ * Low Forced Turn. Ind.	0.731	(0.145)								-0.114	(0.097)	
Outside CEO Dummy							0.024	(0.021)		0.024	(0.021)	
Percentage of Insiders in Industry						***						
Log($tdc1_{t-1}$)	-0.402	(0.021)	***	-0.428	(0.022)	***	-0.465	(0.022)	***	-0.460	(0.022)	***
Stock Price Volatility	0.195	(0.044)	***	0.220	(0.047)	***	0.320	(0.058)	***	0.312	(0.059)	***
Market Beta	-0.006	(0.014)		-0.008	(0.014)		0.017	(0.017)		0.018	(0.017)	
Log(Sales$_t$)- Log(Sales$_{t-1}$)	0.097	(0.032)	***	0.097	(0.033)	***	0.103	(0.033)	***	0.103	(0.033)	***
ROE	0.006	(0.002)	***	0.006	(0.002)	***	0.005	(0.004)		0.005	(0.004)	
Log(MarketCap$_t$)- Log(MarketCap$_{t-1}$)	0.334	(0.018)	***	0.338	(0.018)	***	0.320	(0.018)	***	0.319	(0.018)	***
Log(MarketCap$_{t-1}$)	0.196	(0.011)	***	0.209	(0.011)	***	0.231	(0.012)	***	0.229	(0.012)	***
Log(MarketCap_250$_t$)	-0.122	(0.045)	***	-0.118	(0.045)	*	-0.090	(0.044)	**	-0.090	(0.044)	**
Log(MarketCap_250$_{t-1}$)	0.306	(0.044)	***	0.310	(0.044)	***	0.337	(0.045)	***	0.337	(0.045)	***
Tenure	-0.003	(0.001)	**	-0.003	(0.001)	***	-0.003	(0.001)	***	-0.003	(0.001)	***
Constant	-0.562	(0.218)		0.014	(0.185)		-0.388	(0.206)		-0.410	(0.206)	
R^2	0.2734			0.279			0.2957			0.2969		
Industry Dummies	NO			YES			YES			YES		
Observations	11,699			11,699			10,385			10,385		

TABLE 7: PAY FOR LUCK

The table shows the regression results where the dependent variable is the change in Log compensation between the current year and the previous year, including year and firm fixed effects. The variable Luck is the fitted return from a pooled regression of annual firm returns on value- and equally-weighted industry returns plus year and industry fixed effects (using 48 industry groups). The variable Skill is the difference between the annual firm return and Luck. Low insider is a dummy variable for whether the industry to which the firm belongs is at the bottom 25% in terms of the percentage of CEOs that are coming from within their own firm. High insider is a dummy variable for whether the industry to which the firm belongs is at the top 25% in terms of the percentage of CEOs that are coming from within the firm. Similarly, Low (High) Outsider Industry is a dummy variable for whether the industry to which the firm belongs is at the bottom (top) 25% in terms of the percentage of outsider CEOs that are coming from within the same industry. CDF BS Volat is the cumulative distribution of the stock return volatility of the firm relative to all firms in Execucomp, where the volatility is from Execucomp. The rest of the variables are defined in Table 5. The numbers in parentheses are robust standard errors clustered at the firm level. ***, **,* represent significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: $\text{Log}(tdc1_{it}) - \text{Log}(tdc1_{it-1})$

Skill	0.243	(0.020)	***	0.246	(0.025)	***
Luck	0.165	(0.031)	***	0.123	(0.041)	***
Skill * Low Insider				-0.007	(0.042)	
Skill * High Insider				0.010	(0.040)	
Luck * Low Insider				0.096	(0.053)	*
Luck * High Insider				0.013	(0.056)	
CDF BS Volat	0.183	(0.133)		0.180	(0.133)	
Outside CEO Dummy	0.091	(0.053)	*	0.091	(0.053)	*
Log (tdc1 (t-1))	-0.962	(0.019)	***	-0.961	(0.020)	***
Herfindahl Concentration	1.529	(0.819)	*	1.501	(0.823)	*
Stock Price Volatility	-0.005	(0.215)		0.003	(0.215)	
Market Beta	0.024	(0.022)		0.022	(0.022)	
Log_sales_ch	0.154	(0.037)	***	0.155	(0.037)	***
ROE	0.007	(0.003)	*	0.007	(0.003)	**
Log(market cap (t-1))	0.407	(0.020)	***	0.408	(0.020)	***
Tenure	-0.002	(0.002)		-0.002	(0.002)	
R2	0.574			0.574		
Observations	10,376			10,376		

TABLE 8: GABAIX AND LANDIER RESULTS (2009) AND TALENT POOLS

The table shows the results of panel regressions where the dependent variable is the natural log of CEO compensation. The sample consists of all Execucomp firms with CEO compensation information between the years 1993-2005. CEO compensation is the variable tdc1 from Execucomp and it consists of the sum of salary, bonus, value of restricted stock, and Black-Scholes value of option grants for the fiscal year. The independent variable log (Total cap) is the natural log of the market capitalization of the firm at the end of the fiscal year. Market Cap Ref. Firm$_t$ is the equity market capitalization of the 250th largest firm in the Compustat database in each year. Market Cap Ind. Ref. Firm$_t$ is the equity market capitalization of the 20th largest firm in the Compustat database in each industry that year. Both compensation and market caps are inflation-adjusted. Low insider is a dummy variable for whether the industry to which the firm belongs is at the bottom 25% in terms of the percentage of CEOs that are coming from within their own firm. High insider is a dummy variable for whether the industry to which the firm belongs is at the top 25% in terms of the percentage of CEOs that are coming from within the firm. The industry classification is based on the 48 industries in Fama and French (1997). The numbers in parentheses are the standard deviations of the coefficients. All errors are clustered at the firm level. ***, **,* represent significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Log(tdc1$_{it}$)

Log (Market Cap$_{it}$)	0.417	(0.009)	***	0.416	(0.009)	***	0.415	(0.009)	***
Log (Market Cap Ref. Firm$_{it}$)	0.480	(0.026)	***	0.482	(0.026)	***	0.482	(0.026)	***
Log (Market Cap Industry. Ref. Firm$_{it}$)	0.030	(0.013)	***	0.033	(0.013)		0.032	(0.013)	***
Log (Market Cap$_{it}$) * High Insider	-0.018	(0.004)	***						
Log (Market Cap$_{it}$) * Low Insider	0.007	(0.005)							
Log (Market Cap Ref. Firm$_{it}$)* High Insider				-0.018	(0.004)	***			
Log (Market Cap Ref. Firm$_{it}$)* Low Insider				0.006	(0.003)	**			
Log (Market Cap Ind. Ref. firm$_{it}$)* High Insider							-0.021	(0.005)	***
Log (Market cap Ind. Ref. firm$_{it}$)* Low Insider							0.008	(0.005)	**
Constant	0.202	(0.238)		0.172	(0.238)		0.182	(0.238)	
R^2	0.4143			0.4154			0.4147		
Observations	18,466			18,466			18,466		

APPENDIX: CHARACTERISTICS OF INSIDER AND OUTSIDER CEOS

Panel A: Former Employment of Outsider CEOs with No Prior CEO Experience

Lower ranked Manager (of a division / subsidiary/VP)	213	43%
COO	40	8%
President	56	11%
CFO	9	2%
Director	18	4%
Investor	4	1%
	340	

Panel B: Former Employment of Insider CEOs
(Note: the sample consists of 599 CEOs, which is about 52% of all insider CEOs)

	Entire period	93-96	97-99	00-02	03-05
Chief Operating Officer	39%	38%	36%	40%	44%
Manager of a division / Vice President	23%	21%	29%	22%	17%
President	20%	29%	19%	17%	14%
CEO of a subsidiary / acquired company	9%	7%	8%	11%	10%
CFO	4%	1%	4%	4%	9%
Owner/Founder	3%	2%	3%	4%	3%
Director	2%	1%	2%	2%	3%
Former CEO of company	1%	3%	0%	1%	1%