

Compensation Peer Choice and Managerial Capital

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Abstract

This paper examines the role of CEO managerial capital in the formation of compensation peer groups. We argue that a CEO's compensation peer is another CEO, not a firm, and that a compensation peer group is a group of other CEOs, not a group of firms. Controlling for variables used in prior studies, including firm industry and size, similarity to the reference (sitting) CEO of an index of general human capital is associated with an economically and statistically significant increase in the likelihood of selection to the reference CEO's compensation peer group. The evidence is similar and strong for individual dimensions of work history and education, including: age; prior work positions held; experience in a conglomerate firm; service as a board chairman; and educational background. Firms match on managerial human capital to construct compensation peer groups. We also find that there is a bias towards selecting peers with high general human capital and high pay.

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1. Introduction

Becker (1962) and Murphy and Zabojnik (2004, 2007) distinguish between general versus firm-specific managerial capital. The former is manifested in managerial capabilities that generally are materially useful and productive in multiple or even many firms. Firm-specific managerial capital is reflected in capabilities valuable wholly or primarily within one firm, such as the current employer, or perhaps in a very small number of firms, but not elsewhere. General human capital is easily transferable across firms and even industries, while specific human capital trades in a thin market or in no market at all. At the executive level, if general managerial skills are important to many firms and firm-specific to a very few firms, in an active managerial labor executives with general capital will receive higher pay and specialist CEOs, with little bargaining power, will not. Custodio, Ferreira, and Matos (2013, CFM), Gabaix and Landier (2009), and Tervio (2008) make a similar argument and CFM (2013) find supporting evidence, specifically that CEOs with general skills, both those who move and those who are retained, receive significantly higher pay. Market pay for CEOs and other top executives depends on the nature and composition of their managerial capital.

In practice many firms use the pay of executives at “peer” firms to provide an external benchmark in setting CEO compensation.¹ Prior evidence, including that reported in Bizjak, Lemmon, and Naveen (2008, BLN), Bizjak, Lemmon, and Nguyen (2011, BLNg), Faulkender and Yang (2010, 2013, FY), and Cadman and Carter (2013), indicates that the firms in the compensation peer group appear to be selected based at least in part on similarity in firm characteristics, with industry and firm size being particularly important.²

We extend the prior literature by applying the notion of similarity to people and the

¹ In our data over the period 2006-2016, around 72% of firms covered by the Incentive Lab data base explicitly report that they use a set of peer firms to provide an external benchmark for setting executive pay.

² One of the authors of this paper, who has directly observed the formation of peer groups by multiple firms and their compensation committees and consultants, provides anecdotal support for the assertion that product market and firm scale are the two most important explicit criteria for peer firm selection. Bizjak, Lemmon, and Nguyen (2011) find evidence that other firm characteristics affect peer group formation, including accounting performance (ROA), market-to-book assets (MTB), credit rating, and number of business segments.

composition of their human capital, rather than (or in addition) to firms and their observable characteristics. We posit that a CEO's peer is another CEO, not a firm, and that a compensation peer group is a group of other CEOs, not a group of other firms. A competitive labor market should generate similar compensation for CEOs with similar transferable managerial capital. Of course, one potential mechanism facilitating such an outcome would be the use of compensation peer groups based on similarity of managerial capital. Our primary prediction is that as a firm assembles its compensation peer group it does so at least in part by identifying CEOs in other firms with marketable managerial capital that is similar to that of the reference CEO in place.

To test this hypothesis, we empirically deploy proxies for managerial human capital based on data on the characteristics of a CEO's work experience and educational history. We follow Custodio, Ferreira, and Matos (2013) to create a one-dimensional index of general managerial ability based on CEOs' past work experience. Controlling for variables used in prior studies, including firm size and industry, similarity of a potential peer to the CEO in the Custodio et al. (2013) general human capital index is associated with an economically and statistically significant increase in the likelihood of selection to the CEO's compensation peer group. The evidence is similar and strong for individual dimensions of work history and education. Likelihood of membership in a compensation peer group is significantly related to similarity to the reference CEO in: age; prior work positions held; experience in a conglomerate firm; service as a board chairman; and educational background (MBA, Ivy League). Our evidence is consistent with firms matching on managerial human capital to construct compensation peer groups to determine CEO pay.

To be clear, we do not claim that firm characteristics are irrelevant. First, to the contrary, if a CEO-firm match pair's managerial capital with product markets and productive assets, then similarity in assets should matter even after controlling for similarity of managerial capital. Second, if our proxies do not fully characterize relevant aspects of managerial capital, it is possible that firm characteristics contain information about omitted aspects of managerial capability. For example, we acknowledge that some managerial capital is neither fully general nor fully specific, and so instead such semi-general capital has value for productive assets located not in all firms but in a limited set of firms. Similarity in firm characteristics, such as industry, size, asset intangibility, and performance would proxy for the match of semi-general managerial capital to

semi-general firm assets. Consistent with this hypothesis, our estimates confirm some of the prior evidence on the importance of firm characteristics in compensation peer group formation.³ We find that firms tend to select peer CEOs from firms that are similar in size (sales), product market (industry), performance (ROA), market-to-book ratio (assets), etc. It is important to note, however, that we also impinge directly on prior literature insofar as controlling for similarity of managerial capital, a previously omitted variable, does alter the magnitude and precision of some of the estimates relative to those in prior work.

The question of whether peer groups are opportunistically chosen to bias CEO pay upward attracts persistent interest. Some studies, including this one, support this notion (e.g., Faulkender and Yang, 2010, 2013; Bizjak, Lemmon, and Nguyen, 2011), while others do not (e.g., Bizjak, Lemmon, and Naveen, 2008; Albuquerque, De Franco, and Verdi, 2013). First, we provide new empirical evidence on the old assertion that compensation peer groups to some degree are constructed to misrepresent value in the labor market. We find that firms systematically choose peer CEOs whose managerial capital is more general and marketable than that of the reference CEO. For example, we find that firms are more likely to choose generalist CEOs as compensation peers. Based on the Custodio et al. (2013) measure, all else equal a specialist is 7.8% less likely to be chosen as a compensation peer for a generalist, but a generalist is 2.4% more likely to be chosen as a compensation peer for a specialist. The asymmetry is statistically and economically significant. By favoring generalist CEOs, a board exaggerates the value of (and labor market competition for) its CEO's talent and inflates CEO compensation upward. Second, like some prior studies, after controlling for managerial capital our analysis indicates that firms are more likely to choose CEOs from larger and better performing firms as compensation peers.

Nonetheless, although peer selection biases appear each year from 2006 to 2016, we find that the bias in firm size diminishes over time. We attribute the observed diminishing bias to the fact that prior studies have documented this type of peer-selection bias and shareholders have become aware of it. In contrast, we find that peer selection is opportunistically biased towards generalist CEOs over the full sample period.

We advance the literature on the determinants of CEO compensation in several ways.

³ In particular, see Bizjak, Lemmon, and Naveen (2008), Bizjak, Lemmon, and Nguyen (2011), Faulkender and Yang (2010, 2013), and Cadman and Carter (2013).

First, we reorient the conceptual basis for compensation peer group selection. We apply the idea of similarity to people and the composition of their human capital, rather than to firms and their observable characteristics. While allowing that firm characteristics, such as product market and scale, also matter, we propose that a CEO's peer is another CEO, not a firm, and that a compensation peer group is a group of other CEOs, not a group of other firms. This approach provides a deeper and broader framework that nests prior studies. Second, our empirical results indicate that similarity in managerial capital is an economically and statistically significant determinant of peer group formation. Third, we provide updated estimates of the importance of firm characteristics in peer group selection by controlling for previously omitted variables, specifically the characteristics of managerial human capital. Fourth, we have evidence that shapes the debate on whether there are biases in peer group formation that give rise to upward bias in CEO pay. Firms bias compensation peer selection towards CEOs with more general human capital and, like prior studies, towards CEOs in firms that are larger and perform better. All of these tendencies bias CEO pay upward. Finally, like Faulkender and Yang (2013), enhanced disclosure rules for executive pay likely have not diminished these biases, except those based on firm size.

Our results also contribute to the literature that links a CEO's transferable managerial capital to market wages. Frydman (2005), and Murphy and Zabojnik (2004, 2007) suggest that an increasing importance of transferable managerial capital has driven the dramatic increase through time of equilibrium CEO wages.⁴ Our paper indicates that compensation peer group formation is an important part of the mechanism. Similarity in the generality of managerial capital is a significant element in peer group formation. This channel, per Custodio et al. (2013), is a legitimate explanation for the growth in top executive pay. Nonetheless, the second channel we document, the bias towards selecting peer CEOs with more general managerial capital than the reference CEO, implies upward bias in CEO pay beyond what would be justified in a competitive, fully-informed labor market for top executives.

⁴ Other theories also suggest that the dramatic CEO pay increase can be explained by economic fundamentals. For example, Gabaix and Landier (2008) develop a simple equilibrium model of CEO pay and they suggest that the recent rise in CEO pay can be attributed to substantial growth in firm size. Marin and Verdier (2004) argue that an increase in international trade has led to the increase in demand for managerial talent, which in turn push up the CEO pay.

The remainder of this article is divided into several parts. Section 2 describes the data and variables. In section 3, we provide evidence that general managerial capital affects compensation peer group formation and, thus, CEO compensation. We also assess a broad spectrum of previously utilized determinants of peer group composition. Section 4 concludes.

2. Data and variables

Our data on CEO compensation peer groups come from the Incentive Lab (IL) Compensation and Metrics Data. Incentive Lab covers over 2,000 mostly large-cap and mid-cap firms. IL collects detailed compensation peer data from corporate proxy statements since 2006, the year that corporate disclosure requirements for US firms were enhanced. The sample consists of a panel of 14,429 firm-years and 254,929 peer-years observations in the fiscal years 2006 through 2017.⁵ This data sample is much larger than samples used in prior peer studies. FY (2010), BLNg (2011), and Albuquerque, De Franco, and Verdi (2013) have 657 firm-years, 707 firm-years, and 2,158 firm-years, respectively. Table 1 presents descriptive statistics for our sample. On average, approximately 72% of firms covered by Incentive Lab database used compensation peers in setting CEO pay. Both peer group usage and size have remained fairly stable through time. The median number of compensation peers for each CEO increased from 11 in 2006 to 14 in 2007, and then stayed largely at the same level in the following years. The size distribution of peer groups was largely unchanged as well.

The Incentive Lab data contain only firm identifier information. We use other means to find the corresponding CEOs for each firm and each reported peer. We merge the raw sample data with BoardEx database and in many cases manually check corporate proxy statements to identify the corresponding CEOs. Our test sample consists of a panel of 12,910 firm-years, which includes 2,595 unique CEOs and 183,056 peer-years with 5,617 unique peer CEOs.

Table A1 provides a complete list of our proxy variables for CEOs' marketable managerial capital. We use these variables in estimating a peer choice model. The variables are based either the characteristics of a CEO's employer firm or the CEOs managerial capital, as measured by characteristics of a CEO's background and experience. We obtain firm characteristics from

⁵ Our sample does not contain all the firms reporting compensation peers in the fiscal year 2017. Our data is obtained in January 2018, at a time when some firms had not reported their peers for the fiscal year 2017.

the CRSP and COMPUSTAT databases. We collect CEO experience variables from BoardEx. We largely follow Bizjak, Lemmon, and Nguyen (2011) in choosing our firm characteristics, including size, industry, credit rating and market-to-book ratio. In what follows, we briefly discuss a number of CEO experience and education variables.

Number of positions a CEO worked: A CEO who worked in many different positions is likely to have acquired knowledge in multiple organizational areas. The CEO's managerial skills are likely to be readily deployable and more transferable.

Number of firms a CEO worked for: A CEO who worked for multiple firms is likely to have better developed managerial skills transferable across firms. The CEO is likely to have greater opportunities on the labor market.

Number of industries in which a CEO worked: A CEO who worked for multiple industries is likely to have been exposed to different industrial environments. The CEO's managerial skills are likely to be broadly demanded in the labor market.

Experience as a CEO of another firm: A CEO who worked in a top managerial position at another firm is likely to have developed managerial skills are less specific to any given organization. These skills should be applicable across multiple firms.

Conglomerate experience: A CEO who worked for a multi-division firm is likely to have been exposed to more product markets and a more complex business environment. This experience may help the CEO to be more generally effective.

MBA degree: A CEO who earned a MBA degree is likely to have acquired a body of knowledge in multiple disciplines, such as economics, management science, finance, and accounting. The knowledge is not firm-specific, and MBA education is likely to support a CEO in developing her/his general managerial skills.

CEO-Chair: A CEO who also holds the chairman position is likely to have a deep understanding of how to manage a modern corporation. Such understanding should be applicable across firms.

CEO Age: An older CEO is likely to be more experienced and have better developed general managerial skills.

An alternative way to measure the generality of a CEOs' marketable managerial capital is to construct the General Ability Index (GAI) developed by Custodio, Ferreira, and Matos (2013,

CFM). The *GAI* is a one-dimensional index based on five variables that proxy for CEOs' general managerial capital. The five variables are *Number of firms a CEO worked for*($X1$), *Number of Positions a CEO worked*($X2$), *Number of Industries in which a CEO worked*($X3$), *CEO Experience Dummy*($X4$), and *Conglomerate Experience Dummy*($X5$). We follow CFM (2013) to use principal component analysis to extract common components from the five variables to create *GAI*. Specifically, the *GAI* index for CEO i in year t is calculated by applying the scoring coefficients to the five standardized components.

$$GAI_{i,t} = 0.330X1_{i,t} + 0.287X2_{i,t} + 0.303X3_{i,t} + 0.183X4_{i,t} + 0.221X5_{i,t}$$

The *GAI* index gives a relatively high weight to *Number of firms a CEO worked for* ($X1$) and relatively low weight to *CEO Experience Dummy*($X4$). A higher value of *GAI* suggests more general managerial capital that is more transferable in the market for managers.

Table 2 presents summary statistics. We compute the statistics both for our sample-firm CEOs (12,910 observations) and for all the observations of selected peer CEOs (183,056 observations). On average sample-firm CEOs are largely similar to the selected peer CEOs in both CEO characteristics and firm characteristics. This similarity provides preliminary evidence that actual compensation peers are selected based on CEOs' managerial capital. Nonetheless, Table 2 also suggests that on average the peer CEOs are more transferable and work for larger and better-performing firms. For example, the number of positions a CEO worked (7.7) and the fraction of CEOs who worked for a multi-division firm (39.2%) are higher than those of the reference CEOs (7.3 and 39.0%). The average *GAI* index of peer CEOs (0.226) is higher than the average *GAI* of the reference CEOs (0.144). Peer CEOs are more likely to be chairman of the board (79.2%), obtain MBA degree (38.1%) and graduate from an Ivy League school (25.9%). In addition, the average size of peer-CEO firms is larger than the size of sample CEO firms (\$13.5 billion vs. \$9.9 billion of sales). The average performance (return on assets) of peer-CEO firms is better than the performance of sample CEO firms (3.94% vs. 3.55%). These systematic differences raise concerns that actual peers are opportunistically selected. In the next section, we estimate a peer choice model.

3. Peer Selection

3.1. General Managerial Ability and CEO Pay

The positive relation between general managerial ability and CEO pay has been documented in CFM (2013). According to CFM (2013), generalist CEOs earn a wage premium of 19% more than specialist CEOs. Our data sample, a panel of CEOs in the 2006-2016 period, has very little overlap with the CFM (2013) sample, which consists of a panel of CEOs over the 1993-2007 period. To ensure that we can rely on the main finding of CFM (2013), we replicate their main test with our sample.

Table 3 reports that the main finding in CFM (2013) of a strong positive relation between CEO pay and the *General Ability Index* (Table 5 in CFM 2013) is present as well in more recent data. In the panel regressions, the dependent variable is the logarithm of total pay of sample CEOs and peer CEOs in the 2006–2012 period. Independent variables include measures of firm characteristics and CEO characteristics, as well as the constructed *General Ability Index*, for each CEO-year. We include year and industry (two-digit SIC codes) fixed-effects. For robust t-statistics we adjust for firm-level clustering.

Consistent with CFM (2013), CEOs with higher general managerial ability earn a wage premium. In Column 3 of Table 3, CEOs who are one standard deviation higher in the *General Ability Index* distribution earn 10.6% higher annual pay. This is quite similar to the 11.7% premium reported in CFM (2013, Table 5, Column 3). We also construct a *General Ability Index* dummy variable that takes a value of one when the CEO's *General Ability Index* exceeds the yearly median, and zero otherwise. In Column 5 of Table 3, a generalist CEO earns about 20.4% more than a specialist CEO, compared with 18.6% as reported in CFM (2013, Table 5, Column 6). In summary, despite using a very different test sample, our estimates are quantitatively quite close to those reported in CFM (2013). The regressions reconfirm that CEOs with higher general managerial ability receive higher pay. These estimates also enable us to assess the economic significance of peer selection effects and biases documented below in Sections 3.2 and 3.3.

3.2. Managerial Human Capital and Peer Group Selection

In our main test, we estimate multivariate logit regressions to identify the variables that drive the choice of peers. Specifically, we use the approach as described in BLNg (2011).

$$Peer\ Selection_{ij} = \alpha + \sum^n \beta_n S_{n,ij} + \varepsilon_{ij}$$

where the dependent variable $Peer\ Selection_{ij}$ takes the value of one if CEO j is chosen as a peer of CEO i and zero otherwise. The pool of potential peer CEOs in each year includes all sample CEOs and all disclosed peer CEOs in that year. The independent variable $S_{n,ij}$ measures the difference between CEO i and CEO j in the value of variable n , and $S_{n,ij}$ is normalized. As we discussed in Section 2, variable n is a proxy for the marketable managerial capital of CEOs. Accordingly, the independent variables $S_{n,ij}$ capture the similarity between CEO i and CEO j in their marketable managerial capital. Specifically, $S_{n,ij}$ covers the differences in firm characteristics, such as the difference in firm sales, the difference in ROA, the difference in market-to-book, and the same industry dummy, etc. $S_{n,ij}$ also covers the differences in CEO lifetime experience, such as the difference in the *General Ability Index*, the difference in the number of worked positions, the difference in the number of worked firms, whether CEO i and CEO j both have conglomerate experience, etc. Table 4 provides a complete list of the independent variables $S_{n,ij}$, as well as the process we employ to construct each variable. The hypothesis is that a larger difference, $S_{n,ij}$, between CEO i and CEO j would lead to a smaller probability of CEO j being chosen as a peer of CEO i .

For each difference $S_{n,ij}$ between CEO i and CEO j , we construct a pair of asymmetric measures $S_{n,ij}^+$ and $S_{n,ij}^-$. The first variable $S_{n,ij}^+$ is equal to the difference $S_{n,ij}$ when the difference is positive and is set to equal to zero otherwise. The second variable $S_{n,ij}^-$ is equal to the difference $S_{n,ij}$ when the difference is negative, and zero otherwise. The hypothesis is that, in the absence of biases in the choice of peers, a positive difference $S_{n,ij}$ and a negative difference $S_{n,ij}$ with the same absolute value would identically reduce the probability of CEO j being chosen as a peer of CEO i . Hence, the pair of asymmetric measures, $S_{n,ij}^+$ and $S_{n,ij}^-$, would allow us to identify possible peer selection biases by examining whether the sign of $S_{n,ij}$ differentially affects the choice of peers.

The size of peer group differs across different CEOs. Thus, the unconditional probability of a potential CEO j being selected as a peer for a particular CEO i would depend on the size of CEO i 's peer group. Our regressions include reference-CEO fixed-effects to account for this difference and others.

Table 4 presents the coefficient estimates. We report p -values in parentheses and the marginal effects in brackets. Table 4 shows that nearly all of the coefficient estimates are statistically significant. The coefficient estimates on firm characteristics indicate that firms tend to select CEO compensation peers from the same industry and from firms with similar size, accounting performance, market-to-book ratio, credit rating, and membership in the S&P 500. Moreover, the estimates on firm characteristics also show asymmetric effects for relative firm size and firm performance on peer selection. This type of bias in peer selection confirms the main findings in BLNg (2011).

The main new findings from our regressions are the coefficient estimates on CEO characteristics. From Model 2 in Table 4, the coefficient estimates on the *General Ability Index* (GAI) are statistically and economically significant. Conditional on the potential peer CEO's GAI being smaller than the firm CEO's GAI, a one standard deviation increase in relative GAI decreases the probability of the CEO being chosen as a compensation peer by 5.4% (Table 4, coefficient α_{12}). Conditional on the potential peer CEO's GAI being higher than the firm CEO's GAI, however, a one standard deviation increase in relative GAI decreases the probability of being chosen by 0.6% (Table 4, estimated α_{11}). The effects of relative GAI on peer selection are asymmetric.

An alternative approach is to classify each CEO as either a generalist CEO or a specialist CEO according to the median of the GAI distribution in each year. We define two dummy variables. The first indicator variable takes a value of one if a specialist CEO is chosen as a peer for a generalist CEO, and zero otherwise. The second dummy variable takes a value of one if a generalist CEO is chosen as a peer for a specialist CEO, and zero otherwise. In Model 3 in Table 4, we present the regression estimates after replacing the positive and negative GAI differences with the two dummy variables. The dummy coefficients are both significant, but the coefficient estimate on the second dummy (Table 4, α_{14}) has a positive sign rather than a negative sign. All else equal, a specialist CEO is 7.8% less likely to be chosen as a compensation peer for a generalist CEO (Table 4, α_{13}), but a generalist CEO is 2.4% more likely to be chosen as a compensation peer for a specialist CEO (Table 4, α_{14}). This one-sided preference to generalist CEOs indicate that specialist firms tend to choose peer CEOs with higher general managerial ability.

The evidence here and below appears to be the first to connect the importance of

managerial capital in the formation of compensation peer groups. Moreover, we are the first to show that there is a bias in selection of compensation peers towards more general managerial capital. Are these newly documented peer-selection biases economically significant? As shown in Table 4 in Model 3, the marginal probability is 2.4% (Table 4, α_{14}) for a specialist choosing a generalist, versus a marginal probability -7.8% (Table 4, α_{13}) for a generalist choosing a specialist. To balance this asymmetry, the marginal probability for a specialist choosing a generalist would need to be lower by 10.2%. From our estimates in Table 3 (Section 3.1), a generalist earns about 20.4% more than a specialist. Accordingly, a 10.2% reduction in the marginal probability for a specialist choosing a generalist would lead to an about 2.1% reduction in CEO pay. At first glance, a 2.1% bias in CEO pay may seem not very economically large. Nevertheless, because firms need to select peers to construct compensation peer groups every year, even a modest systematic bias in each year can lead to an accumulation of CEO pay that considerably inflates CEO pay in the long run. For example, over a period of 30 years, a 2.1% annual upward bias in pay would eventually accumulate to nearly 87% higher CEO compensation.

Per Model 1 of Table 4, the proxies for the disaggregated components of managerial capital matter for compensation peer group selection. Furthermore, the asymmetric effects in the GAI also appear for the individual variables that construct the index (coefficients α_{15} - α_{23}). For example, conditional on the count of a potential peer CEO j 's prior professional positions being less than CEO i 's count, all else equal a one standard deviation increase of the relative difference in worked positions decreases the marginal probability of the CEO j being chosen as a compensation peer by 7.5%. However, conditional on the count of a potential peer CEO j 's prior professional positions being more than a CEO i 's, a one standard deviation increase of the relative difference in worked positions increases, rather than decreases, the marginal probability of the CEO j being chosen by 0.8%. Again, conditional on a potential peer CEO j 's multi-industry experience being less than that of the reference CEO i , a one standard deviation increase of the relative difference in worked industries decreases the marginal probability of the CEO j being chosen as a peer by 2.2%. In contrast, conditional on a potential peer CEO j 's industries being more than the count for CEO i , all else equal a one standard deviation increase of the relative difference in count of industries increases, rather than decreases, the marginal probability of the CEO j being chosen by 0.6%. The differences in coefficients imply asymmetric effects on peer

selection. The asymmetry indicates that firms prefer to select peer CEOs with more position experience and more industry experience.

Other noteworthy findings are that a CEO holding the chairman position is 9% more likely to be chosen as a compensation peer for a chairman CEO (Table 4, Column 2, α_{27}). However, a non-chairman CEO is not more likely to be chosen as a peer for another non-chairman CEO and that coefficient estimate is statistically insignificant (Table 4, Column 2, α_{28}). After controlling for general ability, positive and negative age differences show nearly symmetric effects on decreasing the probability of being chosen as peer. All else equal, a one standard deviation change in relative age when the potential peer CEO j is elder (younger) than the CEO i decreases the marginal probability of the potential CEO j being chosen as a peer by 3.4% (3.0%) (Table 4, α_{21} , α_{22}). Moreover, a CEO who doesn't have conglomerate experience is more likely to be chosen as compensation peer for another CEO without conglomerate experience (α_{22}). A CEO who has no previous CEO experience is more likely to be chosen as compensation peer for another CEO with no previous CEO experience (α_{24}). A CEO who earned the MBA degree is more likely to be chosen as compensation peers for another CEO holding and MBA (α_{29}). A CEO who graduated from an Ivy League school is more likely to be chosen as a compensation peer for a reference CEO with an Ivy League degree (α_{30}).

We also estimate the regressions for the subsample in each year from 2006 to 2016, rather than for the full sample. This allows us to test for the importance of managerial capital in peer group formation through time and to assess whether enhanced disclosure diminishes apparently-opportunistic bias. The SEC disclosure rules require that firms report the peer groups they use to determine executives' compensation. The rule was implemented at the end of 2006. Every year thereafter firms constructed their peer groups while aware of the new disclosure rule. In addition to biases in managerial capital, prior studies, such as Bizjak, Lemmon, and Nguyen (2008, 2011), document peer selection biases in firm characteristics. These changes in disclosure requirements may raise a question as to whether the increasing transparency and awareness arising from the 2006 change does much of anything to mitigate biases in compensation peer selection. Table 5 and Figure 1 present the time series of two representative peer-selection biases (α_5 , α_6 and α_{13} , α_{14} , Model 3 of Table 4) over 2006-2016. We find that although peer selection biases show up for each year from 2006 to 2016, the biases of mismatches in firm characteristics diminish over

the years. Figure 1.A shows a clear downward trend of the effect of mismatches in firm size. For example, in 2006 a one standard deviation of the positive difference in peer-firm size (measured as log sales) decreases the marginal probability of being chosen as a peer by 31.1%, while a one standard deviation of negative difference in peer-firm size decreases the marginal probability of being chosen by 48.5%. There is an asymmetry of 17.4% in the marginal probability in 2006. As a basis for comparison, in 2016 a one standard deviation of the positive difference in peer-firm size decreases the marginal probability of being chosen by 43.1%, while a one standard deviation of negative difference in peer-firm size decreases the marginal probability of being chosen by 49.6%. This gives an asymmetry of 6.5% in marginal probability in 2016, which is less than half of that in 2006. One possible reason for this decline is the appearance of research papers which report peer selection biases.

In contrast, for the selection bias in CEOs' general ability (α_{13}, α_{14}), we find no clear downward trend over 2006-2016. For example, in 2006, there is a marginal probability of 3.1% for a generalist being chosen by a specialist, versus marginal probability -8.0% for a specialist being chosen by a generalist. We observe an asymmetry of 11.1% in marginal probability. In 2016, the marginal probability is 3.8% for a generalist being chosen by a specialist, versus a marginal probability -5.7% for a specialist being chosen by a generalist. There is an asymmetry of 9.6% in marginal probability, which is only slightly smaller than that in 2006. We attribute the persistence of the bias in some part to the fact that no prior studies have documented this type of peer-selection biases, and shareholders' unawareness of it persists.

Following BLNg (2011), we assess whether the effects of and biases in general managerial capital are more or less prominent in large or smaller firms.. Table 6 reports results separately for S&P 500 firms versus non-S&P 500 firms. The asymmetric effects of relative CEO characteristics $S_{n,ij}^+$ and $S_{n,ij}^-$ on peer selections are present for both groups of firms. For example, for S&P500 firms, conditional on the potential peer CEO's GAI being larger than the firm CEO's, one standard deviation increase in relative GAI actually increases, rather than decreases, the probability of the CEO being chosen as a peer by 0.5%. Conditional on the potential peer CEO's GAI being smaller than the reference firm CEO's GAI, a one standard deviation decrease in relative GAI actually decreases the probability of the CEO being chosen as a peer by 3.8% (per coefficients α_{13}, α_{14} , Table 6, Model 2). For non-S&P 500 firms,

conditional on the potential peer CEO's GAI being larger (smaller) than the firm CEO's GAI, a one standard deviation difference in relative GAI decreases the probability of the CEO being chosen as a peer by 1.6% (6.8%). For example, among S&P 500 firms, there is a marginal probability of 4.6% for a generalist being chosen by a specialist, versus a marginal probability or -7.0% for a specialist being chosen by a generalist. This implies an asymmetry of 11.6% in marginal probability. Among non-S&P 500 firms, the marginal probability is 1.0% for a generalist being chosen by a specialist, versus a marginal probability -8.5% for a specialist being chosen by a generalist, which implies an asymmetry of 10.5% in marginal probability. Generally, the biases, as measured by the asymmetry in effects of GAI, are statistically and economically significant and alike for both non-S&P 500 firms and S&P 500 firms.

We also separately estimate the regressions for some subgroups of CEOs. In unreported results, we find similar the asymmetric effects for chairman CEOs versus non-chairman CEOs and for externally-hired CEOs as compared to internally-promoted CEOs. Aside from firm size and managerial capital measures, we find no other empirical evidence that peer selection biases are driven by a particular type of CEO or firm.

Overall, the multivariate analysis indicates that the characteristics of firms and the characteristics of CEO lifetime experiences are both significant determinants of peer choice. Firms construct compensation peer groups largely by selecting peer CEOs based on similarity of marketable managerial capital to that of the reference CEO. Nevertheless, the asymmetric effects indicate some opportunistic behavior in peer selection. In addition to the diminishing bias based on firm size, firms tend to opportunistically select compensation peer members with more general, marketable managerial capital than we would expect otherwise.

In summary, to the best of our knowledge, this paper is the first to hypothesize and document the importance of managerial capital in the formation of compensation peer groups. Moreover, we are the first to show that there is a bias in selection of compensation peers towards more general managerial capital. This type of bias in compensation peer group formation is orthogonal to the biases documented in prior papers, biases which arise from mismatches in firm characteristics.

3.3. Reference CEOs versus the Peer Group Median

We further investigate compensation biases by comparing the characteristics of a sample

firm sitting CEO with the median characteristics of his/her peer CEOs. Upward bias in pay can come from constructing a peer group with chosen characteristics, such as firm size or GAI, that are related to peer-CEO pay. Such bias also can come from how a firm ranks the CEO relative to peers. When determining CEO pay based on a compensation peer group, it often is the case that those implementing the process assign a percentile to the CEO in question. Bizjak, Lemmon, and Naveen (2008) report that the majority of firms that use peer groups target pay levels at or above the 50th percentile of the peer group. Firms that do not do so almost always seek pay levels the peer group median, for example at the 75th or even 90th percentile.⁶ For a given characteristic, comparing the median of the difference between the value for a reference CEO and the peer group median excludes the second source of pay bias. Thus, the calculation serves as a lower bound on the scale of the bias in a characteristic that would cause an upward bias in pay. This comparison also is a robustness check for our main findings in section 3.2.

Table 7 reports the median value of the differences between the reference CEOs and their peer CEO medians. The characteristics of interest include firm size, firm accounting performance, the General Ability Index, the number of positions worked, the number of employing firms, and industry experience (the number of industries). Each of these measures is normalized. We report results for all sample CEOs, as well as for reference CEOs from S&P 500 firms and non-S&P 500 firms separately. Overall, we find that the peer-group-median firms are larger and perform better. The peer-group-median firm is 2.3% bigger than the sample CEO's firm. The accounting performance of peer-group-median firm is marginally (0.7%) better than the performance of the sample CEO's firm. Table 7 also shows that the peer-group-median CEO has higher general managerial ability than the sample CEO. The median GAI of peer CEOs is 5.9% higher than a sample CEO. These mismatches are consistent with the biases in peer selection that we document in Section 3.2.

Table 7 indicates that the mismatches are much larger for non-S&P 500 firms. For non-S&P 500 firm, the peer-group-median firm is 7.8% bigger (in normalized log sales) than the sample CEO's firm, and the peer-group-median CEO has a 10.4% higher GAI than the sample CEO.

⁶ For example, BLNg (2011) report that among their sample firms disclosing a specific pay target, 71.5% of them target at the 50th percentile of peer pays, 28.5% of them target above the 50th percentile, and 0% of them targets below the 50th percentile.

From Section 3.1, the loading of log CEO pay on log firm sales is 0.389, and the loading of log CEO pay on GAI is 0.106.⁷ Accordingly, a 7.8% bias in firm size would lead to about a 3.0% increment in CEO pay, and a 10.4% bias in GAI would lead to about a 1.1% increment in CEO pay. The biases of 3.0% and 1.1% may seem modest. Nevertheless, the mismatches suggest only the lower limit of actual compensation biases. Moreover, because firms perform peer selection and percentile determination every fiscal year, even small systematic biases in each can accumulate over time to considerably inflate CEO pay in the long run.

4. Conclusion

Top executive pay is often set based on a benchmark comparison to the pay of similarly-situated executives. Prior evidence, including that reported in Bizjak, Lemmon, and Naveen (2008, BLN), Bizjak, Lemmon, and Nguyen (2011, BLN), Faulkender and Yang (2010, 2013, FY), and Cadman and Carter (2013), indicates that the firms in the compensation peer group appear to be selected based at least in part on similarity in firm characteristics, with industry and firm size being particularly important. We extend this notion of comparability to argue that a CEO's compensation peer is another CEO, not a firm, and that a compensation peer group is a group of other CEOs, not a group of firms.

Our focus on the person rather than the firm leads us to consider managerial capital as a likely important determinant of peer group formation. Becker (1962) and Murphy and Zabojnik (2004, 2007) distinguish between general versus firm-specific managerial capital. If general managerial skills are important to many firms and firm-specific to a very few firms, then in an active managerial labor executives with general capital will receive higher pay and specialist CEOs, with little bargaining power, will not. Custodio, Ferreira, and Matos (2013) report empirical evidence that CEOs with general skills receive significantly higher pay.

A competitive labor market should generate similar compensation for CEOs with similar transferable managerial capital. One mechanism facilitating such an outcome would be the use of compensation peer groups based on similarity of managerial capital. Our primary prediction is that, as a firm assembles its compensation peer group, it does so at least in part by identifying

⁷ As a basis for comparison, in Gabaix, Landier, and Sauvagnat (2014), the loading of log CEO pay on log firm sales is 0.364. In CFM (2013), the loading of log CEO pay on GAI is 0.117.

CEOs in other firms with marketable managerial capital that is similar to that of the CEO in place.

Because a sitting CEO has managerial capital that is a suitable match for the firm's product markets and assets, we control for firm characteristics used in prior studies. Controlling for firm industry, size, performance, market-to-book, and other characteristics, we find that similarity of the CFM (2013) index of general human capital of a potential peer group member to the GAI of the reference CEO is associated with an economically and statistically significant increase in the likelihood of selection to the CEO's compensation peer group. The evidence is similar and strong for individual dimensions of work history and education. Those dimensions include: age; prior work positions held; experience in a conglomerate firm; service as a board chairman; and educational background. Our main conclusion is that firms match on managerial human capital to construct compensation peer groups.

We also find that variables used in prior studies continue to have explanatory power for peer selection. After controlling for the nature of managerial capital, we confirm prior evidence that firms tend to choose peer CEOs from firms in the same industry and firms that are similar in size, performance, and asset tangibility. Finally, we extend the work on biases in peer selection, biases that would likely increase CEO pay. We find that there is a bias towards peers with high general human capital that are employed in large firms. Such peers impart an upward pressure to benchmark compensation. We note that this second bias, in firm size, has diminished through time, though the bias towards high general managerial capital has not.

The dramatic explosion in availability of data on executives has been an exciting development. Such data allow us to supplement work based on firm characteristics with a theoretical and empirical focus on the personal characteristics of executives and how those attributes: match managers to assets; determine contract design for employees; and determine the decisions, productivity, and compensation of managers.

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Table A Variable Definitions

Variable	Description and Data Source
Panel A: CEO Compensation	
Total Compensation	Total Compensation in thousands \$ = (Salary + Bonus + Other annual + Restricted Stock Grants + LTIP Payouts + All Other + Value of Options Granted for 2005 fiscal year; and Salary + Bonus+ Non-Equity Incentive Plan Compensation + Value of Options Granted + Grant-Date Fair Value of Stock Awards + Deferred Compensation Earnings Reported as Compensation + Other Compensation for 2006 fiscal year), (Execucomp).
Panel B: CEO Characteristics	
Number of Positions	Number of positions CEO has had based on past work experience in publicly traded firms (BoardEx).
Number of Firms	Number of firms where CEO has worked based on past work experience in publicly traded firms (BoardEx).
Number of Industries	Number of industries (four-digit SIC) where CEO has worked based on past work experience in publicly traded firms (BoardEx).
Prior Top-Manager Experience	Dummy variable that takes a value of one if CEO held a CEO position at another company based on past work experience in publicly traded firms, and zero otherwise (BoardEx).
Conglomerate Experience	Dummy variable that takes a value of one if CEO worked at multi-segment company based on past work experience in publicly traded firms, and zero otherwise (BoardEx).
External Hiring	Dummy variable that takes a value of one if CEO was hired from outside the firm, and zero otherwise (BoardEx).
CEO Age	Age of CEO in years (BoardEx).
CEO Tenure	Number of years as CEO in the current position (BoardEx)
CEO-Chair Dummy	Dummy variable that takes a value of one if CEO is also chair of the board, and zero otherwise (BoardEx).
First Year as CEO Dummy	Dummy variable that takes a value of one if CEO is in the first year of the job, and zero otherwise (BoardEx).
MBA Dummy	Dummy variable that takes a value of one if CEO has a MBA degree, and zero otherwise (BoardEx).
IVY League Dummy	Dummy variable that takes a value of one if CEO attended an Ivy League school (Brown University, Columbia University, Cornell University, Dartmouth College, Harvard University, Princeton University, University of Pennsylvania, and Yale University) at any academic level, and zero otherwise (BoardEx).
Panel C: Firm Characteristics	
Sale	Sales (Compustat)
Log (Sale)	Log (Sales Revenue)
ROA	Income Before Extraordinary Items / total assets (Compustat)
Volatility	Annualized standard deviation of monthly stock returns (CRSP)
Firm Age	Number of years since a firm listed its shares (CRSP).
Diversification Dummy	Dummy variable that takes a value of one if a firm has more than one business segment, and zero otherwise (Compustat).
Market-To-Book	(market equity + total debt + preferred stock liquidating value – deferred taxes and investment tax credits)/ book assets (Compustat).
Credit Rating	Dummy variable that takes a value of one if S&P Domestic Long Term Issuer Credit Rating is between BBB- and AAA, two if the credit rating is between CC and BB+, three if the credit rating is D or SD, and four if the credit rating is missing (Compustat).

Table A Variable Definitions (continued)

Panel D: Dependent Variables (Logit Regression)

General ability index difference (positive)	= (the GAI of Peer CEO firm – the GAI of sample CEO firm) if the GAI of Peer CEO firm > the GAI of sample CEO firm; = 0 otherwise
General ability index difference (negative)	= (the GAI of Peer CEO firm – the GAI of sample CEO firm) if the GAI of Peer CEO firm < the GAI of sample CEO firm; = 0 otherwise
Generalist being chosen for specialist	Dummy equal to one if a generalist CEO is chosen as peer for a specialist CEO, zero otherwise.
Specialist being chosen for generalist	Dummy equal to one if a specialist CEO is chosen as peer for a generalist CEO, zero otherwise.
Num. of positions difference (positive)	= (the number of positions of Peer CEO – the number of positions of sample CEO) if the number of positions of Peer CEO > the number of positions of sample CEO; = 0 otherwise
Num. of positions difference (negative)	= (the number of positions of Peer CEO – the number of positions of sample CEO) if the number of positions of Peer CEO < the number of positions of sample CEO; = 0 otherwise
Num. of industries difference (positive)	= (the number of industries of Peer CEO – the number of industries of sample CEO) if the number of industries of Peer CEO > the number of industries of sample CEO; = 0 otherwise
Num. of industries difference (negative)	= (the number of industries of Peer CEO – the number of industries of sample CEO) if the number of industries of Peer CEO < the number of industries of sample CEO; = 0 otherwise
Num. of firms difference (positive)	= (the number of firms of Peer CEO – the number of firms of sample CEO) if the number of firms of Peer CEO > the number of firms of sample CEO; = 0 otherwise
Num. of firms difference (negative)	= (the number of firms of Peer CEO – the number of firms of sample CEO) if the number of firms of Peer CEO < the number of firms of sample CEO; = 0 otherwise
Age difference (positive)	= (the age Peer CEO – the age sample CEO) if the age of Peer CEO > the age of sample CEO; = 0 otherwise
Age difference (negative)	= (the age Peer CEO – the age sample CEO) if the age of Peer CEO < the age of sample CEO; = 0 otherwise
CEO-Chair	Dummy equal to one if both sample CEO and peer CEO are chairman of the board of directors
Not CEO-Chair	Dummy equal to one if both sample CEO and peer CEO are not chairman of the board of directors
Conglomerate experience	Dummy equal to one if both sample CEO and peer CEO have conglomerate experience
No conglomerate experience	Dummy equal to one if both sample CEO and peer CEO have no conglomerate experience
CEO experience	Dummy equal to one if both sample CEO and peer CEO had CEO experience at another firm
No CEO experience	Dummy equal to one if both sample CEO and peer CEO had no CEO experience at another firm
MBA degree	Dummy equal to one if both sample CEO and peer CEO have a MBA degree
IVY League	Dummy equal to one if both sample CEO and peer CEO graduated from an IVY league school
Same Industry	Dummy equal to one if both CEO and peer are in the same FF-49 industry
Industry return correlation	Correlation between CEO's industry return and potential peer CEO's industry return
Sale difference (positive)	= (the sale of Peer CEO firm – the sale of sample CEO firm) if the sale of Peer CEO firm > the sale of sample CEO firm; = 0 otherwise
Sale difference (negative)	= (the sale of Peer CEO firm – the sale of sample CEO firm) if the sale of Peer CEO firm < the sale of sample CEO firm; = 0 otherwise
ROA difference (positive)	= (the ROA of Peer CEO firm – the ROA of sample CEO firm) if the ROA of Peer CEO firm > the ROA of sample CEO firm; = 0 otherwise
ROA difference (negative)	= (the ROA of Peer CEO firm – the ROA of sample CEO firm) if the ROA of Peer CEO firm < the ROA of sample CEO firm; = 0 otherwise
ME/BE difference (positive)	= (the ME/BE of Peer CEO firm – the ME/BE of sample CEO firm) if the ME/BE of Peer CEO firm > the ME/BE of sample CEO firm; = 0 otherwise
ME/BE difference (negative)	= (the ME/BE of Peer CEO firm – the ME/BE of sample CEO firm) if the ME/BE of Peer CEO firm < the ME/BE of sample CEO firm; = 0 otherwise

Figure 1

Peer Selection Biases over 2006-2016

The figures show the peer selection biases over 2006-2016, as presented in Table 6. Δ_{Prob} measures the asymmetry in the marginal selecting probabilities on symmetric variables, which indicates peer selection biases. Specifically, in Figure 1.A, Δ_{Prob} is the difference in the marginal selecting probabilities between positive firm-size difference and negative firm-size difference. In Figure 1.B, Δ_{Prob} is the difference in marginal selecting probabilities between the dummy of a generalist being chosen by a specialist, and the dummy of a specialist being chosen as peer by a generalist. Detailed variable definitions are provided in Table A.

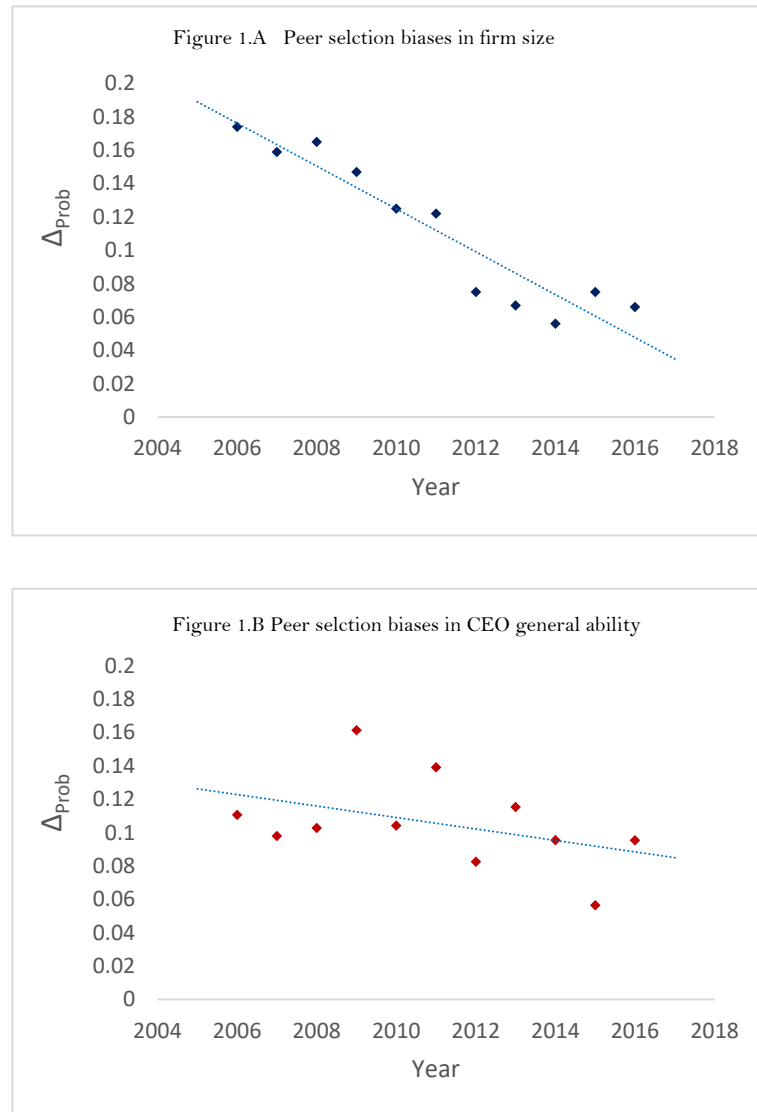


Table 1**Summary Statistics for the Size of Compensation Peer Groups**

Compensation peer group data comes from the Incentive Lab Compensation and Metrics Data. The sample covers the S&P1500 firms that reported their compensation peer groups in the fiscal years 2006 through 2017. This table presents the number of S&P1500 firms that reported peer groups, as well as descriptive statistics for the number of peers in each reported peer group. The numbers are reported for the entire sample, as well as for the subsample in each fiscal year.

Year	Firms	Number of Peers								
		Mean	Std.	1 st	5 th	25 th	50 th	75 th	95 th	99 th
2006	1436	11.7	11.8	1	1	1	11	18	30	51
2007	1424	17.5	23.1	1	1	9	14	21	43	106
2008	1384	18.6	26.2	1	1	9	15	21	45	141
2009	1361	20.6	48.6	1	1	10	15	21	47	141
2010	1344	20.5	41.2	1	1	11	16	21	44	142
2011	1315	21.1	45.4	1	1	11	16	21	43	154
2012	1307	18.9	29.2	1	1	12	16	20	40	110
2013	1288	17.9	20.8	1	1	12	16	20	36	106
2014	1267	16.4	17.8	1	1	11	16	19	30	78
2015	1189	16.8	12.0	1	1	12	16	20	33	65
2016	1111	14.1	7.9	1	1	11	15	18	25	38
2017	3 ⁸	22.0	6.2	15	15	15	24	27	27	27
All	14429	17.7	29.5	1	1	10	15	20	38	103

⁸ As of the date of our data feed, the 2017 data are incomplete..

Table 2**Summary Statistics for Proxy Variables**

The variables are proxy variables for the marketable managerial human capital of CEOs. The variables belong to two categories: the characteristics of a CEO's current employer firm, and the characteristics of a CEO's lifetime work and education experiences. We compute the summary statistics both for our sample firm-CEOs and for all observations of selected peer-CEOs. In addition, the general ability index (*GAI*) is also presented. The sample covers fiscal years 2006 to 2017. CEO characteristics data are from BoardEx. Firm characteristics data are from Compustat. Variable definitions are provided in Table A.

	Firm CEOs			Peer CEOs		
	Mean	Median	Std.	Mean	Median	Std.
CEO characteristics:						
Number of positions worked	7.3	7	3.9	7.7	9	6.6
Number of firms worked for	3.1	3	2.1	3.1	3	2.1
Number of industries worked	2.1	2	1.2	2.1	2	1.2
Prior CEO experience	14.7%	-	-	12.9%	-	-
Conglomerate experience	39.0%	-	-	39.2%	-	-
CEO-Chair	77.6%	-	-	79.2%	-	-
MBA degree	36.9%	-	-	38.1%	-	-
IVY league degree	25.5%	-	-	25.9%	-	-
Age	56.2	56	7.0	56.5	56	6.6
General Ability Index (GAI)	0.144	-0.037	1.023	0.226	0.066	0.996
Firm characteristics:						
Sale (\$B)	9.9	3.0	25.5	13.5	4.1	31.6
ROA	3.55%	4.05%	14.17%	3.94%	4.49%	13.41%
Market-to-book	1.60	1.21	1.56	1.50	1.20	1.24
Credit rating b/w BBB- and AAA	64.5%	-	-	75.1%	-	-
S&P 500	38.8%	-	-	50.9%	-	-

Table 3**CEO Pay and General Managerial Ability**

The panel regressions of the logarithm of CEO total pay on firm and CEO control variables, as well as the *General Ability Index* and the general ability index dummy which takes the value of one if the index is above the annual median. The regressions include year and industry (two-digit SIC codes) fixed effect. Model (1), (2), (3) and (5) present OLS regressions. Model (4) and (6) include firm fixed effects. The test sample consists of a pool of CEOs and peer CEOs for which compensation data are available from EXECUCOMP in the 2006-2016 period. Heteroskedasticity-robust t-statistics are adjusted for firm level clustering. ***, ** and * denote significance at 1%, 5% and 10% levels.

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	Firm fixed effects	OLS	Firm fixed effects
Number of Positions		-0.004				
Number of Firms		0.048***				
Number of industries		0.008				
Prior Top-Manager Experience		-0.024				
Conglomerate experience		0.059**				
General Ability Index			0.106***	0.036**		
General Ability Index Dummy					0.204***	0.065***
CEO Tenure	-0.006	-0.004	-0.003	0.006**	-0.004	0.006**
MBA Dummy	0.057**	0.034	0.038	0.045	0.032	0.041
First Year As CEO Dummy	-0.081***	-0.068***	-0.072***	-0.013	-0.075***	-0.014
CEO-Chair Dummy	0.028	0.030	0.019	-0.033	0.017	-0.034
CEO Age	-0.000	-0.003	-0.003	-0.000	-0.002	0.000
Stock Return	0.010	0.011	0.011	0.011	0.010	0.011

Stock Return (t-1)	0.000*	0.000	0.000	0.000	0.000	0.000
Firm Age	0.001	0.001	0.000	0.032***	0.000	0.032***
Log(Sale)	0.406***	0.394***	0.389***	0.358***	0.392***	0.357***
Market to Book	0.058***	0.058***	0.058***	0.042***	0.059***	0.042***
ROA	-0.135	-0.114	-0.112	0.147*	-0.113	0.147*
ROA (t-1)	-0.248**	-0.205**	-0.215**	-0.003	-0.219**	-0.004
Diversification Dummy	0.002	0.009	0.007	-0.029	0.011	-0.029
Volatility	-0.389***	-0.408***	-0.407***	-0.282***	-0.405***	-0.282***
Observations	17,627	17,627	17,627	17,627	17,627	17,627
R-squared	0.420	0.429	0.428	0.770	0.428	0.770

Table 4**Logit Analysis of Peer Selection**

The dependent variable is one if a potential peer CEO is chosen as a peer by the sample firm and zero otherwise. In each year, the set of potential peer-CEOs includes the union of sample firm-CEOs and the chosen peer-CEOs. The logit regression contains all the sample years 2006-2016. P-values are given in parentheses and marginal probability are given in brackets. Non-dummy variables are normalized. Regression Model 1 includes CEO characteristics as dependent variables. Regression Model 2 adopts the CEO general ability index (GAI) as a dependent variable. Detailed variable definitions are provided in the Table A.

		Dependent variable is one if a potential peer-CEO is chosen as a peer by the sample firm, and zero otherwise		
		Model 1	Model 2	Model 3
<i>Firm characteristics</i>				
α_1	Dummy equal to one if both firm-CEO and peer-CEO are in the same Fama-French industry	3.821 (0.000) [0.500]	3.818 (0.000) [0.500]	3.817 (0.000) [0.944]
α_2	Dummy equal to one if both firm-CEO and peer-CEO work for firms with the same credit rating	0.389 (0.000) [0.151]	0.393 (0.000) [0.153]	0.394 (0.000) [0.153]
α_3	Dummy equal to one if both firm-CEO and peer-CEO work for S&P 500 firms	1.168 (0.000) [0.379]	1.188 (0.000) [0.383]	1.186 (0.000) [0.382]
α_4	Dummy equal to one if both firm-CEO and peer-CEO don't work for S&P 500 firms	-0.311 (0.000) [-0.122]	-0.324 (0.000) [-0.127]	-0.320 (0.000) [-0.126]
α_5	Log peer sales – Log firm sales when peer sales > firm sales, =0 otherwise	-1.197 (0.000) [-0.384]	-1.188 (0.000) [-0.383]	-1.190 (0.000) [-0.383]
α_6	Log peer sales – Log firm sales when peer sales < firm sales, =0 otherwise	2.490 (0.000) [-0.494]	2.502 (0.000) [-0.494]	2.500 (0.000) [-0.494]
α_7	Peer ROA – firm ROA when peer ROA > firm ROA, =0 otherwise	-0.200 (0.000) [-0.079]	-0.192 (0.000) [-0.076]	-0.190 (0.000) [-0.076]
α_8	Peer ROA – firm ROA when peer ROA < firm ROA, =0 otherwise	0.082 (0.000) [-0.033]	0.092 (0.000) [-0.037]	0.096 (0.000) [-0.038]
α_9	Peer MTB – firm MTB when peer MTB > firm MTB, =0 otherwise	-0.087 (0.000) [-0.035]	-0.091 (0.000) [-0.036]	-0.092 (0.000) [-0.036]

Table 4 (continued)

Dependent variable is one if a potential peer-CEO is chosen as a peer by the sample firm, and zero otherwise

		Model 1	Model 2	Model 3
<i>CEO characteristics</i>				
α_{10}	Peer MTB – firm MTB when peer MTB < firm MTB, =0 otherwise	0.996 (0.000) [-0.340]	0.996 (0.000) [-0.340]	0.997 (0.000) [-0.341]
α_{11}	Peer-CEO's GAI – firm-CEO's GAI when peer-CEO's GAI > firm-CEO's GAI, =0 otherwise		-0.015 (0.000) [-0.006]	
α_{12}	Peer-CEO's GAI – firm-CEO's GAI when peer-CEO's GAI < firm-CEO's GAI, =0 otherwise		0.135 (0.000) [-0.054]	
α_{13}	Dummy equal to one if a specialist CEO is chosen as a peer for a generalist CEO, =0 otherwise			-0.196 (0.000) [-0.078]
α_{14}	Dummy equal to one if a generalist CEO is chosen as a peer for a specialist CEO, =0 otherwise			0.061 (0.000) [0.024]
α_{15}	Peer-CEO's positions – firm-CEO's positions when peer-CEO's positions > firm-CEO's positions, =0 otherwise	0.020 (0.025) [0.008]		
α_{16}	Peer-CEO's positions – firm-CEO's positions when peer-CEO's positions < firm-CEO's positions, =0 otherwise	0.189 (0.000) [-0.075]		
α_{17}	Peer-CEO's firms – firm-CEO's firms when peer-CEO's firms > firm-CEO's firms, =0 otherwise	-0.043 (0.000) [-0.017]		
α_{18}	Peer-CEO's firms – firm-CEO's firms when peer-CEO's firms < firm-CEO's firms, =0 otherwise	0.004 (0.664) [-0.002]		
α_{19}	Peer-CEO's industries – firm-CEO's industries when peer-CEO's industries > firm-CEO's industries, =0 otherwise	0.016 (0.000) [0.006]		
α_{20}	Peer-CEO's industries – firm-CEO's industries when peer-CEO's industries < firm-CEO's industries, =0 otherwise	0.055 (0.000) [-0.022]		
α_{21}	Dummy equal to one if both firm-CEO and peer-CEO have conglomerate experience, =0 otherwise	0.012 (0.171) [0.005]		

Table 4 (continued)

		Dependent variable is one if a potential peer-CEO is chosen as a peer by the sample firm, and zero otherwise		
		Model 1	Model 2	Model 3
<i>CEO characteristics (continued)</i>				
α_{22}	Dummy equal to one if both firm-CEO and peer-CEO don't have conglomerate experience, =0 otherwise	0.061 (0.000) [0.024]		
α_{23}	Dummy equal to one if both firm-CEO and peer-CEO have previous experience as CEO, =0 otherwise	-0.076 (0.052) [-0.030]		
α_{24}	Dummy equal to one if both firm-CEO and peer-CEO don't have previous experience as CEO, =0 otherwise	0.095 (0.000) [0.038]		
α_{25}	Peer-CEO's age – firm-CEO's age when peer-CEO's age > firm-CEO's age, =0 otherwise	-0.081 (0.000) [-0.032]	-0.086 (0.000) [-0.034]	-0.088 (0.000) [-0.035]
α_{26}	Peer-CEO's age – firm-CEO's age when peer-CEO's age < firm-CEO's age, =0 otherwise	0.072 (0.000) [-0.029]	0.076 (0.000) [-0.030]	0.077 (0.000) [-0.031]
α_{27}	Dummy equal to one if both firm-CEO and peer-CEO hold chairman positions, =0 otherwise	0.207 (0.000) [0.083]	0.228 (0.000) [0.090]	0.224 (0.000) [0.089]
α_{28}	Dummy equal to one if both firm-CEO and peer-CEO don't hold chairman positions, =0 otherwise	-0.018 (0.028) [-0.007]	-0.032 (0.072) [-0.013]	-0.025 (0.047) [-0.010]
α_{29}	Dummy equal to one if both firm-CEO and peer-CEO have MBA degrees, =0 otherwise	0.055 (0.000) [0.022]	0.060 (0.000) [0.024]	0.057 (0.000) [0.023]
α_{30}	Dummy equal to one if both firm-CEO and peer-CEO attended Ivy League schools, =0 otherwise	0.046 (0.000) [0.019]	0.045 (0.000) [0.018]	0.045 (0.000) [0.018]

Table 5**Yearly Peer Selection Biases over 2006-2016**

Logit regressions of the proxy variables for CEOs' marketable managerial capital. The dependent variable is one if a potential peer CEO is chosen as a peer by a sample firm and zero otherwise. In each year, the set of potential peer-CEOs includes the union of sample firm-CEOs and the chosen peer-CEOs. The logit regression (Model 3 of Table 4) is reestimated for each year 2006-2016. α_5 and α_6 are the regression coefficients on the positive and negative differences in firm sizes. α_{13} is the regression coefficients on the dummy of a generalist being chosen as peer by a specialist, and α_{14} is the regression coefficients on the dummy of a specialist being chosen as peer by a generalist. Marginal probability are given in brackets. Δ_{Prob} is the difference in the marginal probabilities on the symmetric variables. Δ_{Prob} indicates peer selection biases. Detailed variable definitions are provided in the Table A.

Year											
2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
<i>Selection Biases in Firm Size</i>											
α_5	-0.880 [-0.311]	-0.953 [-0.330]	-0.935 [-0.325]	-1.019 [-0.346]	-1.118 [-0.368]	-1.145 [-0.374]	-1.417 [-0.422]	-1.482 [-0.431]	-1.546 [-0.439]	-1.408 [-0.420]	-1.481 [-0.431]
α_6	2.170 [-0.485]	2.281 [-0.489]	2.334 [-0.490]	2.431 [-0.492]	2.459 [-0.493]	2.609 [-0.495]	2.687 [-0.496]	2.799 [-0.497]	2.576 [-0.495]	2.612 [-0.495]	2.674 [-0.496]
Δ_{Prob}	[0.174]	[0.159]	[0.165]	[0.147]	[0.125]	[0.122]	[0.075]	[0.067]	[0.056]	[0.075]	[0.066]
<i>Selection Biases in CEO's general ability</i>											
α_{13}	-0.202 [-0.080]	-0.190 [-0.075]	-0.194 [-0.077]	-0.293 [-0.115]	-0.215 [-0.085]	-0.222 [-0.088]	-0.174 [-0.069]	-0.218 [-0.086]	-0.211 [-0.084]	-0.118 [-0.047]	-0.144 [-0.057]
α_{14}	0.077 [0.031]	0.057 [0.023]	0.065 [0.026]	0.116 [0.046]	0.048 [0.019]	0.129 [0.051]	0.034 [0.014]	0.073 [0.029]	0.030 [0.012]	0.024 [0.010]	0.096 [0.038]
Δ_{Prob}	[0.111]	[0.098]	[0.103]	[0.161]	[0.104]	[0.139]	[0.083]	[0.115]	[0.096]	[0.057]	[0.095]

Table 6**Comparing Compensation Peer Group Formation for S&P 500 Firms and Non-S&P 500 firms**

Logit regressions of the proxy variables for CEOs' marketable managerial capital for SP500 firms and Non-SP500 firms. The dependent variable is one if a potential peer CEO is chosen as a peer by the sample firm and zero otherwise. In each year, the set of potential peer-CEOs includes the union of sample firm-CEOs and the chosen peer-CEOs. The logit regression contains all the sample years 2006-2012. P-values are given in parentheses and p-values for symmetry tests on each pair of coefficients are in brackets. Non-dummy variables are normalized. Detailed variable definitions are provided in the Table A.

		Regression Model (1)		Regression Model (2)		Regression Model (3)	
		SP500	Non-SP500	SP500	Non-SP500	SP500	Non-SP500
<i>Firm characteristics</i>							
α_1	Dummy equal to one if in the same Fama-French industry	3.833 (0.000) [0.500]	3.829 (0.000) [0.500]	3.826 (0.000) [0.500]	3.829 (0.000) [0.500]	3.826 (0.000) [0.500]	3.829 (0.000) [0.500]
α_2	Dummy equal to one if with the same credit rating	0.459 (0.000) [0.177]	0.320 (0.000) [0.125]	0.469 (0.000) [0.180]	0.319 (0.000) [0.125]	0.469 (0.000) [0.180]	0.320 (0.000) [0.125]
α_3	Dummy equal to one if both S&P 500 firms	1.075 (0.000) [0.359]	-	1.094 (0.000) [0.363]	-	1.088 (0.000) [0.362]	-
α_4	Dummy equal to one if both not S&P 500 firms	-	-0.427 (0.000) [-0.165]	-	-0.443 (0.000) [-0.171]	-	-0.441 (0.000) [-0.170]
α_5	Log peer sales – Log firm sales if peer sales > firm sales, or=0	-1.112 (0.000) [-0.367]	-1.265 (0.000) [-0.397]	-1.102 (0.000) [-0.365]	-1.260 (0.000) [-0.396]	-1.102 (0.000) [-0.365]	-1.263 (0.000) [-0.397]
α_6	Log peer sales – Log firm sales when peer sales < firm sales, or=0	2.659 (0.000) [-0.496]	2.228 (0.000) [-0.487]	2.671 (0.000) [-0.496]	2.236 (0.000) [-0.487]	2.670 (0.000) [-0.496]	2.233 (0.000) [-0.487]
α_7	Peer ROA – firm ROA when peer ROA > firm ROA, =0 otherwise	-0.162 (0.000) [-0.064]	-0.214 (0.000) [-0.085]	-0.151 (0.000) [-0.060]	-0.208 (0.000) [-0.082]	-0.150 (0.000) [-0.060]	-0.206 (0.000) [-0.082]
α_8	Peer ROA – firm ROA when peer ROA < firm ROA, =0 otherwise	0.128 (0.000) [-0.051]	0.068 (0.000) [-0.027]	0.144 (0.000) [-0.057]	0.074 (0.000) [-0.030]	0.147 (0.000) [-0.059]	0.078 (0.000) [-0.031]

Table 6 (continued)

		Regression Model (1)		Regression Model (2)		Regression Model (3)	
		SP500	Non-SP500	SP500	Non-SP500	SP500	Non-SP500
<i>CEO characteristics</i>							
α_9	Peer MTB – firm MTB when peer MTB > firm MTB, =0 otherwise	-0.089 (0.000) [-0.035]	-0.098 (0.000) [-0.039]	-0.092 (0.000) [-0.037]	-0.101 (0.000) [-0.040]	-0.092 (0.000) [-0.037]	-0.102 (0.000) [-0.041]
α_{10}	Peer MTB – firm MTB when peer MTB < firm MTB, =0 otherwise	1.175 (0.000) [-0.38]	0.857 (0.000) [-0.304]	1.176 (0.000) [-0.380]	0.855 (0.000) [-0.304]	1.177 (0.000) [-0.380]	0.855 (0.000) [-0.304]
α_{11}	Peer GAI – firm GAI when peer GAI > firm GAI, =0 otherwise			0.013 (0.010) [0.005]	-0.039 (0.000) [-0.016]		
α_{12}	Peer GAI – firm GAI when peer GAI < firm GAI, =0 otherwise			0.096 (0.000) [-0.038]	0.172 (0.000) [-0.068]		
α_{13}	Dummy equal to one if a specialist CEO is chosen for a generalist CEO, =0 otherwise					-0.176 (0.000) [-0.070]	-0.215 (0.000) [-0.085]
α_{14}	Dummy equal to one if a generalist CEO is chosen for a specialist CEO, =0 otherwise					0.115 (0.000) [0.046]	0.026 (0.023) [0.010]
α_{15}	Peer-CEO's positions – firm-CEO's positions when the difference is positive, =0 otherwise	0.023 (0.000) [0.009]	0.012 (0.041) [0.005]				
α_{16}	Peer-CEO's positions – firm-CEO's positions when the difference is negative, =0 otherwise	0.167 (0.000) [-0.066]	0.211 (0.000) [-0.084]				
α_{17}	Peer-CEO's firms – firm-CEO's firms when the difference is positive, =0 otherwise	-0.057 (0.000) [-0.023]	-0.022 (0.002) [-0.009]				

Table 6 (continued)

		Regression Model (1)		Regression Model (2)		Regression Model (3)	
		SP500	Non-SP500	SP500	Non-SP500	SP500	Non-SP500
<i>CEO characteristics</i>							
α_{18}	Peer-CEO's firms – firm-CEO's firms when the difference is negative, =0 otherwise	0.048 (0.000) [-0.019]	0.062 (0.000) [-0.025]				
α_{19}	Peer-CEO's industries – firm-CEO's industries when the difference is positive, =0 otherwise	0.047 (0.000) [0.019]	-0.019 (0.001) [-0.008]				
α_{20}	Peer-CEO's industries – firm-CEO's industries when the difference is negative, =0 otherwise	0.061 (0.000) [-0.024]	0.037 (0.000) [-0.015]				
α_{21}	Dummy equal to one if both have conglomerate experience, =0 otherwise	0.017 (0.180) [0.007]	0.021 (0.094) [0.008]				
α_{22}	Dummy equal to one if both no conglomerate experience, =0 otherwise	-0.022 (0.059) [-0.009]	0.086 (0.000) [0.034]				
α_{23}	Dummy equal to one if both have previous experience as a CEO, =0 otherwise	-0.059 (0.059) [0.024]	-0.096 (0.001) [-0.038]				
α_{24}	Dummy equal to one if both don't have previous experience as a CEO, =0 otherwise	0.078 (0.000) [0.031]	0.116 (0.000) [0.046]				
α_{25}	Peer-CEO's age – firm-CEO's age when the difference is positive, =0 otherwise	-0.084 (0.000) [-0.034]	-0.077 (0.000) [-0.031]	-0.092 (0.000) [-0.037]	-0.081 (0.000) [-0.032]	-0.090 (0.000) [-0.036]	-0.084 (0.000) [-0.034]

Table 6 (continued)

		Regression Model (1)		Regression Model (2)		Regression Model (3)	
		SP500	Non-SP500	SP500	Non-SP500	SP500	Non-SP500
<i>CEO characteristics</i>							
α_{26}	Peer-CEO's age – firm-CEO's age when the difference is negative, =0 otherwise	0.051 (0.000) [-0.020]	0.092 (0.000) [-0.037]	0.057 (0.000) [-0.023]	0.096 (0.000) [-0.038]	0.059 (0.000) [-0.023]	0.095 (0.000) [-0.038]
α_{27}	Dummy equal to one if both hold chairman positions, =0 otherwise	0.237 (0.000) [0.093]	0.174 (0.000) [0.069]	0.259 (0.000) [0.102]	0.190 (0.000) [0.075]	0.255 (0.000) [0.101]	0.186 (0.000) [0.074]
α_{28}	Dummy equal to one if both don't hold chairman positions, =0 otherwise	-0.006 (0.637) [-0.002]	-0.023 (0.040) [-0.009]	-0.022 (0.084) [-0.009]	-0.033 (0.002) [-0.013]	-0.013 (0.297) [-0.005]	-0.027 (0.014) [-0.011]
α_{29}	Dummy equal to one if both have MBA degrees, =0 otherwise	0.101 (0.000) [0.040]	0.003 (0.822) [0.001]	0.109 (0.000) [0.043]	-0.005 (0.733) [-0.002]	0.105 (0.000) [0.042]	0.002 (0.869) [0.001]
α_{30}	Dummy equal to one if both attended Ivy League schools, =0 otherwise	0.039 (0.023) [0.015]	0.059 (0.001) [0.024]	0.039 (0.023) [0.015]	0.057 (0.001) [0.023]	0.038 (0.024) [0.015]	0.056 (0.002) [0.022]

Table 7**Firm CEO and the Median of Peer Group**

The table compares size, accounting performance, general ability index (GAI), worked positions, worked firms, and worked industries between the sample CEOs and the median of their peer groups. The table then reports the median value of the differences between sample CEOs and their peer medians. The three columns report the difference across all sample firms, S&P 500 sample firms, and non-S&P 500 sample firms respectively. The Wilcoxon signed rank test is used in testing the differences. **, * indicate significance at 1% and 5% confidence levels. Firm size is measured by log of sales revenue. Firm performance is measured by ROA. CEO experience variables includes general ability index (GAI), a CEO's worked positions, a CEO's worked firms, and a CEO's worked industries. All variables are normalized.

	Peer Group Median Minus Sample CEO (Non-S&P 500 Firms)	Peer Group Median Minus Sample CEO (S&P 500 Firms)	Peer Group Median Minus Sample CEO (All Sample Firms)
Size(log sale)	0.078**	0.005	0.023**
ROA	0.005*	0.008	0.007**
GAI	0.104**	0.009	0.059
Positions	0.113**	0.055	0.110**
Firms	-0.000	-0.000*	-0.000*
Industries	-0.000**	-0.000**	-0.000**