Managerial Attributes and Executive Compensation

John R. Graham[a], Si Li[b], Jiaping Qiu[c*]

[a] *Fuqua School of Business, Duke University, Durham, NC 27708, USA; and NBER*
[b] *School of Business and Economics, Wilfrid Laurier University, Waterloo, ON, N2L 3C5, Canada*
[c] *DeGroote School of Business, McMaster University, Hamilton, ON, L8S 4M4, Canada*

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Abstract

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JEL Classification: G3, G32, J24, J31, J33, C23
Keywords: Executive compensation, CEO pay, latent managerial ability, human capital, fixed effects, manager fixed effects, capital structure

*Please address correspondence to John Graham (john.graham@duke.edu), Fuqua School of Business, Duke University, Durham NC 27708-0120, phone: (919) 660-7857; fax: (919) 660-8038; or to Si Li (sli@wlu.ca) or Jiaping Qiu (qiu@mcmaster.ca). We thank Alon Brav, Michael Roberts, Ko-Chia Yu, and seminar participants at University of Toronto, University of Waterloo, Wilfrid Laurier University, and York University for helpful comments. Qiu acknowledges financial support from the Social Sciences and Humanities Research Council of Canada and Li acknowledges financial support from the Clarica Financial Services Research Center at Wilfrid Laurier University. The initial version of this paper was titled "Managerial Ability and Executive Compensation."

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We study the role of manager-specific heterogeneity in explaining executive compensation. We decompose the variation in executive compensation into time variant and invariant firm and manager components and find that time invariant manager fixed effects explain a majority of the variation in executive pay. In addition, we show that including manager fixed effects alters coefficients and interpretations of other variables. We also find that firm performance improves after CEOs with larger compensation fixed effects are hired, which is consistent with the fixed effect being associated with innate managerial ability or social capital, which in turn leads to better performance. We further derive managers' excess compensation by purging time variant effects and firm, manager, and year fixed effects, and show that firms with over-paid managers use less debt, consistent with theoretical predictions.

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1. Introduction

Executive compensation is a topic of considerable interest to both the business and academic communities. Of fundamental interest is the identification of the factors that explain the level of executive pay. The extant literature has explored the roles of observable firm characteristics (e.g., firm size and performance) and managerial characteristics (e.g., job tenure and gender). This line of inquiry documents how observable factors partially explain variation in executive pay. However, little is known about the importance of unobservable firm and managerial characteristics, such as latent managerial skills or social capital, in determining executive compensation.

It is commonly known that labor market outcomes are extremely heterogeneous and that observationally equivalent individuals sometimes earn markedly different compensation. For example, the same individual might earn different compensation in two observationally equivalent firms (i.e., same firm size, industry, etc.), perhaps due to the heterogeneity in unobservable firm characteristics, such as corporate culture. Alternatively, two observationally equivalent individuals (i.e., managers with the same gender, tenure, etc.) in the same firm could be paid differently due to the disparity in their unobserved personal characteristics, such as innate abilities, social capital, personalities, effort, etc. Therefore, unobservable firm and manager characteristics could account for a significant part of the variation in executive compensation – but how much is not known.[1]

In addition, to the extent that unobservable person or firm heterogeneity is correlated with the observable characteristics (i.e., the sorting between managers and companies is non-random), empirical methods that do not explicitly account for unobservable manager or firm heterogeneities could produce biased estimates. For example, more skilled managers are more

[1] Unobservable characteristics refer to factors unobservable or unmeasurable by the econometrician.

likely to be paid higher wages and such managers also tend to work in larger firms. In models that do not account for unobservable manager heterogeneity, one concern is that the effect of firm size on executive pay could be inflated.

The primary objective of this paper is to examine the role of unobservable manager heterogeneity (or, loosely speaking, manager fixed effects) in determining executive pay.[2] Specifically, we employ the three-way fixed effect model (Abowd, Kramarz, and Margolis, 1999) to estimate how much of the variation in executive pay is attributed to observable time variant firm effects (e.g., firm size, market to book ratio, firm performance), observable time variant manager effects (e.g., job tenure), time invariant firm fixed effects, time invariant manager fixed effects, and year effects, respectively. We find that manager fixed effects, which can potentially be interpreted as a proxy for latent managerial ability, are important in explaining the level of executive compensation. In addition, we demonstrate that manager fixed effects are significantly correlated with observed firm and manager characteristics, suggesting that ignoring manager fixed effects in estimating the compensation equation could yield biased coefficient estimates.[3] For example, we find that the magnitude of the firm size coefficient decreases by 40-50% when manager fixed effects are included in the specification. We recommend that future researchers control for manager fixed effects when concerns about coefficient bias are important. While we implement a sophisticated three-way model to highlight the importance of manager fixed effects relative to other factors, we show below

[2] Time-invariant or slow moving manager heterogeneity, such as latent managerial ability, will be captured by manager fixed effects. Abowd et al. (1999, 2003) and Iranzo, Schivardi, and Tosetti (2008), for example, use person fixed effects to proxy for employee human capital. However, it is also possible that managers may develop their abilities over time. Time changing managerial ability can be captured by the job tenure variable in our model.

[3] The manager fixed effect model is not without limitations. We discuss caveats at the end of Section 4.2.

that a user who simply wants to control for firm and manager fixed effects can do so by including dummy variables for each unique firm-manager combination.

To better understand the role of unobserved manager heterogeneity, we investigate whether or not high fixed effect executives increase firm performance. In particular, we examine firm performance changes surrounding CEO turnover and find that return on assets and return on equity improve significantly when incoming managers have high manager fixed effects in compensation (relative to the fixed effects of out-going managers). In contrast, there is no significant change in firm performance if incoming managers have lower fixed effects. The result that better paid (i.e., higher fixed effect in compensation) managers increase firm performance is consistent with the manager fixed effect component of executive compensation capturing some unobservable quality or element of managerial human capital. This interpretation could justify, at least partially, the high pay of some CEOs.

Finally, we investigate whether managers who receive excess pay take actions to reduce risk through using less debt, which they might do to minimize the chance they would lose their jobs and excess pay. If managers are paid for their expected wages, it should not be very costly for them to find new jobs at the same wage (e.g., Fama, 1980 and Amihud and Lev, 1981). In contrast, for entrenched managers who are paid more than the expected wage, termination may result in a loss of excess compensation and thus a substantial reduction in pay (e.g., Berger, Ofek, and Yermack, 1997 and Berk, Stanton, Zechner, 2007). Therefore, entrenched managers may play it safe and choose lower leverage to protect their excess compensation. Specifically, we measure excess compensation as the residual from the executive pay equation estimated using the three-way fixed effect model. The residual captures unexpected compensation after purging time variant and invariant firm and manager

effects and year effects. In other words, this residual is the part of compensation that is likely to be lost if the manager changes jobs. Consistent with the above hypothesis, we find that firms that have managers with higher excess compensation maintain significantly lower leverage.

The contributions of this paper are threefold. First, the paper contributes to the executive compensation literature by providing the first empirical study on the role of unobserved managerial heterogeneity in determining executive pay. The literature on executive compensation (Core, Holthausen, and Larcker, 1999, Core, Guay, and Larcker, 2008, Gabaix and Landier, 2007, Rose and Shepard, 1997, among others) has studied how the level of executive pay is affected by observable firm and manager characteristics. Given the importance of latent factors such as innate ability, preferences, risk aversion, personality, non-algorithmic reasoning, analytic or abstract decision-making, people skills, etc. in shaping corporate outcomes, we view incorporating the role of unobservable manager heterogeneities into the determinants of executive pay as a significant step in advancing the literature. Our results suggest that manager fixed effects, which can be interpreted as reflecting managers' latent human capital, are an important factor explaining executive pay.[4] Furthermore, the estimated parameters on observable firm and manager characteristics from a model including manager fixed effects are much less likely to be affected by omitted variable bias.

Second, the paper contributes to the growing literature on how unobservable manager effects affect corporate outcomes. Our paper is the first in this literature to focus on corporate executive compensation. Bertrand and Schoar (2003) find significant managerial fixed effects

[4] Daines, Nair, and Kornhauser (2005) find that highly paid CEOs are more likely to continue good performance and to reverse poor performance. While their result is consistent with a link between CEO pay and skill, note that their paper lacks a measure of managerial ability and thus they cannot directly test for a relation between skill and CEO pay.

in corporate activities such as return on assets, investment, leverage, and cash holdings.[5] A recent study by Frank and Goyal (2007b) focuses on the role of manager fixed effects in determining leverage. They find that adding manager fixed effects to a regression analysis of the determinants of leverage significantly increases model fit and conclude that managers play an important role in setting a firm's capital structure.[6] However, the method used by Frank and Goyal (2007b) does not allow them to disentangle manager from firm fixed effects. As a result, the exact power of manager fixed effects in explaining leverage variation is unclear.

In contrast to this previous research, our paper examines the importance of manager fixed effects in determining executive pay. Importantly, we implement the estimation method of Abowd, Kramarz, and Margolis (1999) to identify firm and manager fixed effects. This method has two important advantages. First, the method can separate firm and manager fixed effects for not only movers (i.e., managers who move across companies) but also non-movers, as long as the non-movers work in firms that have hired at least one mover. Second, this method allows us to separate employer and employee fixed effects when the sample size of employer and employee observations is large. As a comparison, the standard dummy variable approach would be too computer intensive to implement in a large dataset. As a result, compared with the extant literature that uses relatively small samples containing only movers, such as Bertrand and Schoar (2003), our method is less susceptible to potential sample selection bias.[7] The method we use has broad applications in the analysis of various corporate

[5] Bertrand and Schoar (2003) do not investigate managerial fixed effects in compensation, though they do find that managers with higher return on assets fixed effects are associated with greater excess compensation. Note also that their construction of excess compensation does not remove managerial fixed effects.

[6] Lemmon et al. (2008) study the role of firm fixed effects (not manager fixed effects) in determining leverage and find that firm fixed effects are an important factor in explaining leverage.

[7] For example, Bertrand and Schoar (2003) separate firm and manager fixed effects in their study of corporate policies, using the least squares dummy variables (LSDV) approach in a sample of firm managers in which all managers are movers (600 firms with 500 managers who have changed firms). Using the pure dummy variable approach to estimate the three way fixed effect model becomes computationally infeasible in datasets with a

activities in which separately identifying firm and manager effects is desirable.[8] Importantly, we find that corporate performance improves when managers with high compensation fixed effects move to a new firm.

Third, the paper provides a new empirical test of the impact of managers' excess compensation on capital structure choices. A number of papers examine the relation between executive compensation and capital structure in various settings (e.g., Coles, Daniels, and Naveen, 2006, Mehran, 1992, Ortiz-Molina, 2007, etc.). However, to our knowledge, Berger, Ofek, and Yermack (1997) is the only paper that attempts to examine the impact of *excess* managerial compensation on capital structure. Berger et al. (1997) measure excess compensation as the residual from the OLS regressions of the executive compensation equation and then regress leverage on excess compensation. Their results are mixed and vary depending on whether they examine total or cash compensation, as well as on the empirical approach used. Note that Berger et al. (1997) do not consider manager fixed effects when defining excess compensation, which as discussed earlier, could yield biased estimates for both coefficients and residuals. Furthermore, consistent with Abowd et al. (2003) and theoretical predictions, we argue that it is important to separate effects due to portable compensation fixed effects from non-portable (excess) compensation. Managers expect to be compensated for the portable component, while losing the non-portable component (i.e.,

large number of firms and managers because the least squares approach requires inverting the covariate matrix (X'X). This matrix has dimensionality equal to the sum of the number of managers, the number of firms, and that of the other covariates and is 17,000 by 17,000 in our case. Our paper implements the fixed effect least squares dummy variables (FELSDV) approach developed by Abowd et al. (1999). This approach first differences out manager fixed effects, then uses the least squares dummy variable approach to estimate firm and year fixed effects, and finally recovers the manager fixed effect estimates. This method is feasible in larger datasets. As long as a firm has at least one mover, all the managers (no matter whether they move or not) in this company are included in the sample. The identification of firm and manager fixed effects is conducted through "group connection," which is formally derived by Abowd et al. (1999). Andrew et al. (2007) and Cornelissen (2007) further provide a more practical estimation algorithm of the three way fixed effect model.

[8] For example, one may be interested in disentangling mutual fund manager fixed effects from fund company fixed effects in mutual fund performance, or disentangling analyst fixed effects from brokerage firm fixed effects in earnings forecasts.

residual compensation), when they change firms. Our results show that (portable) manager fixed effects in compensation have no impact on leverage, while (non-portable) excess compensation negatively affects leverage.[9] The results provide empirical support for the theoretical prediction that managers reduce leverage to protect their under-diversified human capital.

The rest of the paper proceeds as follows. The next section discusses the empirical methodology. Section 3 describes the data, variables, and summary statistics. Results, implications, and robustness tests are given in Section 4. The last section concludes.

2. Empirical Methodology

2.1 A Three Way Fixed Effect Model

To motivate our empirical specification, first consider a simple model of human capital in the spirit of Becker (1993) and Mincer (1974). Let HC_{it} denote manager i's stock of human capital at time t and U_t denote the time t rental rate of human capital. Hence, the individual's expected full-time, full-period wage rate, y_{it} can be denoted as

$$y_{it} = U_t \times HC_{it} \ . \tag{1}$$

Assume that human capital is reflected in observable firm and manager characteristics, W_{jt} and X_{it}, and latent firm and person specific inputs, φ_j and θ_i. Then the exponential form of production function gives

$$HC_{it} = e^{X_{it}\beta + W_{jt}\gamma + \varphi_j + \theta_i} . \tag{2}$$

[9] We find consistent results for both excess *total* compensation and excess *cash* compensation. In addition, note that although Bertrand and Schoar (2003) and Frank and Goyal (2007b) examine how manager fixed effects in *leverage* explain leverage, we are the first to separately study how manager fixed effects in *compensation* (i.e., portable compensation) and non-portable pay affect leverage.

Combining equations (1) and (2) and taking logarithms yields the standard human capital log wage function

$$Ln(y_{it}) = X_{it}\beta + W_{jt}\gamma + \varphi_j + \theta_i + \mu_t, \quad (3)$$

where $\mu_t = Ln(U_t)$. Adding an error term ε_{it} to the theoretical equation (3) gives the empirically estimable equation

$$Ln(y_{it}) = X_{it}\beta + W_{jt}\gamma + \varphi_j + \theta_i + \mu_t + \varepsilon_{it}. \quad (4)$$

Equation (4) suggests that an executive's expected compensation is the sum of the market valuation of his personal characteristics $X_{it}\beta+\theta_i$ (observable and unobservable), the specific compensation policies $W_{jt}\gamma+\varphi_j$ chosen by his employer (observable and unobservable), and time effects in compensation μ_t. Residual ε_{it} reflects a manager's residual compensation, which captures the compensation that is not priced in the labor market given a manager's observable and unobservable human capital. This model assumes that for any given manager i, θ_i is constant over time, whether the manager stays in the same company or moves to a different company. Consistent with Murphy and Zabojnik (2004, 2007), θ_i can be interpreted as managerial ability or managers' general skills and is transferable across companies. Managers may also possess firm specific skills that are valued by certain companies only. Such firm-specific human capital is not transferable and will be captured by unobserved firm effects φ_j.

Equation (4) contains time-variant and time-invariant information about employees and employers.[10] Models that do not account for firm or manager fixed effects will suffer from omitted variable bias if unobservable firm and manager effects are correlated with

[10] Unobservable managerial effort may affect executive pay. Our manager fixed effect variables will capture the time constant dimension of effort. The time variant dimension of effort will be captured by observable performance variables (to the extent that effort is reflected in firm performance) and the residual (unobservable time variant effort not reflected in firm performance).

observable characteristics. For example, if executives with advantageous unobservable managerial characteristics are hired by firms with larger firm fixed effects or observable company characteristics such as larger firm size, parameter estimates will be biased and inconsistent unless one controls for both firm and manager heterogeneities.[11]

In model (4), there are three fixed effects: manager fixed effect θ_i, firm fixed effect φ_j, and year fixed effect μ_t. This three way fixed effect model is our main specification throughout the paper. Schank, Schnabel and Wagner (2008), for example, use the model to examine the wage differential between exporting and non-exporting firms. Iranzo, Schivardi, and Tosetti (2008) examine the relation between the dispersion of workers' skills (measured by individual fixed effects in the wage equation) and firm productivity.

2.2 Separation of Manager and Firm Fixed Effects

For our purposes, we are interested in not only controlling for unobserved manager θ_i and firm φ_j fixed effects but also in estimating the magnitudes of each fixed effect separately. The main difficulty with separating the two effects is that some underlying unobservable factors that contribute to different firm-specific executive compensation practices may at the same time be correlated with managers' individual impacts on compensation. In other words, firm fixed effects may be correlated with manager fixed effects and thus it may be difficult to separate the two. Intuitively, if a firm has no managerial turnover during the sample period, the firm's fixed effect cannot be disentangled from the fixed effects of its managers because the two effects are perfectly collinear. Therefore, the separation of manager fixed effects from

[11] If the heterogeneity terms φ_j and θ_i are correlated with observables terms, the fixed effect method is appropriate but not the random effect method, which requires zero correlation between random effects and observable characteristics. For our sample, a Hausman specification test of fixed effect versus random effect estimators rejects the hypothesis of zero correlation at the 1% level.

firm fixed effects is only possible when the firm has at least one manager who switches companies.

The movements of managers across firms allow the separation of manager and firm fixed effects through *group connection*, which is defined as follows. Start with an arbitrary individual and include all the firms for which he or she has ever worked. Next, add all individuals who have ever worked in any of those companies. Continue adding all additional firms for which any of these individuals has ever worked and all additional individuals in any of those firms until no more individuals or firms can be added to the current group. Repeat for the next group and continue until all data are exhausted. Hence, every person and firm belongs to exactly one group and within every group all the persons and firms are connected somehow. Connectedness is related to, but is not the same as, mobility. A manager who has never moved can be connected to another company as long as at least one other manager in his or her firm has worked at the other company. Therefore, a small amount of mobility can generate a large amount of connectedness. Within each group, there is person mobility and such mobility connects persons and firms in this group. Between groups, there is no mobility.

Within each group, all person and firm effects are identified up to a scale. Specifically, suppose there are J firms and I managers in one group. Then J+I-1 firm and manager effects will be identified in this group because one firm or manager effect must be taken as the benchmark: all the J+I-1 fixed effects are expressed as differences from the reference fixed effect in the group. Overall, exactly $M + N - G$ total person and firm effects are identified, where M, N, and G are the total number of persons, firms, and groups in the sample. Therefore, although only a moderate proportion of managers have changed firms in our

sample, these turnovers allow us to separate a large number of manager and firm fixed effects through group connection.[12]

Finally, because manager and firm fixed effects are identified relative to a benchmark within each group, and each group has its own benchmark, the estimated firm and manager effects are directly comparable only within the same group, but not across groups. To deal with this comparison issue, we follow the normalization procedure suggested by Abowd, Kramarz, and Margolis (1999) and Abowd, Kramarz, and Roux (2006) to ensure that the fixed effects across groups can be compared. This procedure normalizes the mean manager fixed effects for each group to the same value.[13] To check the robustness of our results with respect to the normalization procedure, we re-estimate all our regressions using only the largest group (so normalization is not necessary), which is composed of around 60% of the final sample, and we find similar qualitative results.

We conclude this section with a simplified example that illustrates how group connection aids identification of fixed effects. Suppose there are three managers and two companies. Manager A works for company X and has total compensation of $0.5 million. Manager C works for company Y with $2 million compensation. Manager B works for company X first with $1 million pay and then moves to company Y with $1.5 million pay. Managers A, B, and C and firms X and Y are all treated as one group through group connection. The identification of fixed effects starts from the manager who moves between firms. Manager B earns $0.5 million more when she moves to firm Y, suggesting that all else

[12] For technical details, see Abowd, Kramarz, and Margolis (1999), who formally prove that connectedness of workers across firms is necessary and sufficient for the separate identification of person and firm fixed effects.

[13] Formally, the normalization procedure is as follows: First, for each group, we normalize all the manager fixed effects so that the within-group average of manager fixed effects is zero. Then, we normalize the grand mean of firm fixed effects to zero. This procedure implicitly assumes that each group has the same average manager fixed effect.

being equal, firm Y has a $0.5 million higher firm fixed effect than firm X. If firm X's fixed effect is the benchmark and is set to zero, firm Y's fixed effect is $0.5 million. A's and B's manager fixed effects can then be obtained by subtracting firm X's fixed effect ($0 million) from A's and B's compensation in firm X, and therefore are equal to $0.5 million and $1 million, respectively. (This example assumes that manager compensation is net of all observable determinants.) Similarly, subtracting firm Y's fixed effect ($0.5 million) gives manager C's personal fixed effect, $1.5 million (2-0.5).[14]

Intuitively, using the pay differential of the manager who has worked in different companies, we can determine the fixed effects for all the firms at which he has been employed (with one firm fixed effect being the benchmark). Once the firm fixed effect is identified, the personal fixed effects for all the managers (including movers and non-movers) in the company can be determined by subtracting the observable determinants and firm fixed effect from the pay earned by the manager.[15]

3. Data

3.1 Sample Selection

Our sample consists of a manager-firm matched panel dataset from 1992 to 2006, which is constructed from ExecuComp and Compustat. This matched dataset allows us to track through time the highest paid executives in firms covered by ExecuComp. ExecuComp contains over 2,500 companies and its universe is the S&P 1500 U.S. public companies,

[14] There are two points to be noted here. First, this example illustrates the case when there is only one movement between two companies. When there are multiple manager movements between two companies, the firm fixed effects are estimated to be the average pay differentials for all the movements associated with the two companies. Second, using different benchmarks in estimation does not change our results because the analysis in the paper depends on relative (not absolute) values of fixed effects.

[15] As in Abowd et al. (1999), Bertrand and Schoar (2003), and Iranzo et al. (2008), our study assumes exogenous executive mobility conditional on the observables and fixed effects (technically, $E(\varepsilon_{it} | X_{it},\ldots, X_{iT}, W_{jt},\ldots, W_{jT}, \varphi_j, \theta_i) = 0$). Dismissing the exogenous mobility assumption would require setting up a two step selection model, a computationally infeasible problem.

including companies that were once part of the S&P 1500 index, as well as some client requests. Execucomp contains manager-level data for up to nine executives for a given year, though most companies only report the top five highest paid executives. We merge the manager-level ExecuComp data with firm-level annual accounting variables from Compustat and firm-level stock returns from CRSP. We then remove the observations with incomplete data. Our full sample includes 25,586 unique managers who have worked for 2,344 unique firms.

Because managerial mobility and connectedness are necessary to permit the separation of manager fixed effects from firm fixed effects, in Table 1, we present information on the movers and stayers among all the managers in our sample. Panel A of Table 1 shows that during the sample period from 1992 through 2006, 95.1% of sample managers worked in only one sample firm as top managers, about 4.6% of managers worked for two different sample companies as top managers, and about 0.4% of managers worked in more than two sample companies. Panel B aggregates the information in Panel A and shows that 4.9% or 1,256 managers are movers that worked in more than one sample company as top executives, while the rest are non-movers.[16] [17]

[Table 1 about here]

Panel C provides information on the proportion of companies that have a given number of top managers move during the sample period. About 45% of the sample firms do not have any managers move across companies, while the rest 55% (1,272 firms) have

[16] Note that we are only able to capture managers' movements within firms in the sample. It is possible that a manager moves to a firm that is not in the sample and we are unable to trace such movements due to data limitations.

[17] As demonstrated in Abowd et al. (1999), a small amount of mobility generates a large amount of connectedness, which allows firm and manager fixed effects to be separately identified. We obtain similar results when employing a sample that has a large amount of mobility. For example, our results do not change qualitatively when we conduct the empirical analysis using a sample that contains only moving managers.

manager switchers. We are able to identify fixed effects for all the managers who are or were in these 1,272 firms, no matter whether these managers are movers or not. Most of the analysis in the paper requires us to separately identify manager fixed effects from firm fixed effects. Therefore, we perform our analysis on the subsample of the firms (i.e., 55% of the full sample) in which there are movers, and therefore manager and firm effects can be separated from each other. This "someone at the firm moved" sample (hereafter, mover sample) includes 15,352 unique managers who have worked for 1,272 unique firms.

In Table 2, we follow the methodology in Brav et al. (2005) and investigate whether the sample that includes only firms with movers is representative of the original full sample. Panel A summarizes the representativeness of the continuous variables used in the study.[18] We first compare the overall averages and medians of each variable for the mover sample to the full ExecuComp sample (i.e., the universe of ExecuComp firms with valid data). We then sort the full sample into quintiles and record the corresponding breakpoints. We report the quintile mean for each variable. We then report the mean and the percentage of the mover sample firms that fall into each quintile, based on full sample quintile breakpoints for each variable. The reported percentages can then be compared with the benchmark 20%. In Panel B, which contains representativeness of indicator variables, we report the mover sample and full sample percentages of each dummy variable that falls in each binary category, rather than quintiles. The sample representativeness analyses allow us to infer whether our final mover sample is representative of the universe of ExecuComp firms and, if so, in which dimensions.

[Table 2 about here]

The analyses show that the mover sample is fairly representative of the full sample in all dimensions except that the mover sample firms are somewhat larger and executives in such

[18] The definitions of the variables used in our analysis are reported in the data Appendix.

firms are somewhat better paid. In unreported analysis, we compare the final sample firms to the top four size quintiles of the full sample (i.e., we remove the bottom quintile of firms in terms of total assets). We find that controlling for firm size, the sample firms are representative in all the other dimensions, and thus we conclude that the difference in pay in the two samples is related to firm size. We, therefore, control for firm size in all our regression analysis.

3.2 Sample Description

Table 3 provides summary statistics on the variables we use in our analysis of the mover sample. The managers in the sample receive average total compensation of $2.2 million and median compensation of $1.1 million. This implies a large positive skewness in the level of executive pay. The average (median) salary plus bonus paid to these managers is $0.7 ($0.5) million, and the average (median) option compensation is $0.9 ($0.3) million. The firms in the sample have an average (median) book leverage ratio of 0.22 (0.21), average (median) total assets of $9.6 ($1.8) million, market to book of 2.0 (1.5), and tangibility, i.e., the amount of tangible assets as a fraction of total assets, of 0.29 (0.23). In addition, annual stock returns are 18% (11%), stock return volatility is 44% (38%), and the return on assets is 4.7% (4.6%). Furthermore, out of the final sample, about 59% of firm-years pay dividends and 68% of firm-years have CEOs who simultaneously serve as chairman of the board. Finally, the average (median) managerial tenure is around 10 (8) years, about 17% of sample managers are CEOs, and 4.5% are women.

[Table 3 about here]

4. Empirical Results

4.1 The Economic Importance of Unobserved Manager Heterogeneity

4.1.1 Determinants of Executive Compensation

In this section we analyze how manager effects are related to compensation. We follow prior research in selecting the observable characteristics that determine the level of executive compensation (see, for example, Core, Guay, and Larcker, 2008, Core, Holthausen, and Larcker, 1999, Murphy, 1999, and Rose and Shepard, 1997). Specifically, we regress the logarithm of total compensation on the firm-level variables such as stock returns, return volatility, accounting returns, firm size, growth opportunities, and whether or not the CEO of the company is also the board chair, and on manager-level variables such as managerial tenure, whether or not the manager is a CEO, and whether or not the manager is female. Year fixed effects are also included in all the specifications to capture the effects of economic booms and recessions as well as other potential year differences on pay level.[19]

Table 4 reports the regression results using ln(total compensation) as dependent variable. Regression (1) is a pooled OLS regression without firm or manager fixed effects. The adjusted R-squared for this regression is 49%, which is similar to the adjusted R-squared found in previous studies such as Core, Holthausen, and Larcker (1999). In regression (2), we add firm fixed effects to account for unobservable differences across firms (such as firm quality, firm culture about compensation practice, etc.). The adjusted R-squared in this specification increases to 64%. This indicates that unobservable firm heterogeneity plays a significant role in explaining executive pay. In regression (3), we add manager fixed effects instead of firm fixed effects. The adjusted R-squared increases to 73%, which is a 24% absolute increase compared with the pooled OLS specification (1), and a 9% increase over the firm fixed effect specification (2). This suggests that unobservable managerial traits (such as

[19] Executive pay could be abnormally high (due to signing bonus, severance pay, etc.) during the years when managers join or leave a company. In robustness analysis, we add a dummy variable which equals one for the year that a manager joined or left a company. The results are essentially the same.

leadership styles, personalities, abilities, etc.) have more explanatory power than firm level unobservable factors in determining managers' compensation. In regression (4), we control for both unobservable firm-level and manager-level differences and the adjusted R-squared increases to 75%.

[Table 4 about here]

A comparison of specifications (2) through (4) indicates that adding manager fixed effects to a model that has accounted for firm fixed effects improves the adjusted R-squared by 11% (from 64% to 75%), while adding firm fixed effect to a model that has accounted for manager fixed effects only increases the adjusted R-squared by 2% (from 73% to 75%). This implies that manager heterogeneities have more incremental explanatory power beyond what could be explained by firm heterogeneities than vice versa. To explore this issue further, we regress the residual from the pooled OLS regression (i.e., column 1) on manager (firm) fixed effects and find an adjusted R-squared of 43% (28%). If we regress residuals from the firm fixed effect regression (i.e., column 2) on manager fixed effects, the adjusted R-squared is 47%. In contrast, when residuals from the manager fixed effects specification (i.e., column 3) are regressed on firm fixed effects, the R-squared is 1%. These results suggest that manager fixed effects explain approximately one half of the variation in residuals of both the OLS and firm fixed effect models, while firm fixed effects explain less than one third of the OLS residuals and have very little power to explain the residuals from the manager fixed effect model. This confirms that manager fixed effects have significant incremental explanatory power beyond what can be explained by firm level factors in our sample. Finally, in specifications (2) through (4), F tests suggest that these firm/manager fixed effects are jointly significantly different from zero.

[Table 5 about here]

[Table 6 about here]

Tables 5 and 6 conduct the same regressions as those in Table 4, with Table 5 using log(salary plus bonus) and Table 6 using log(option compensation) as respective dependent variables.[20] In general, these two tables generate implications similar to those in Table 4 about the importance of managerial heterogeneities. A comparison of various specifications in Table 5 indicates that adding manager fixed effects to a model that has accounted for firm fixed effects improves the adjusted R-squared by 14 percentage points (from 66% to 80%), while adding firm fixed effects to a model that has accounted for manager fixed effects only increases the adjusted R-squared by 2% (from 78% to 80%). In Table 6, including firm fixed effects increases adjusted R-squared from 13% in the pooled OLS model to 33%. Adding manager fixed effects to this model improves the adjusted R-squared by another 5% (from 33% to 38%). In contrast, adding firm fixed effect to a model that has accounted for manager fixed effects only increases the adjusted R-squared by 2% (from 36% to 38%).

The significant improvement in the adjusted R-square in the three way fixed effect regression indicates that unobservable differences in managerial human capital play an important role in explaining executive pay. Nevertheless, we note that the goal of empirical research is not to increase R-square *per se*. Ultimately, one of our goals is to understand the implications for empirical executive compensation research of including (or excluding) unobservable managerial characteristics. We explore this issue in detail in section 4.2.

[20] According to ExecuComp, an executive's total compensation includes salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted, long-term incentive payouts, and all other total. For the universe of ExecuComp companies, salary plus bonus equals about 55% of total compensation, options equal 30%, restricted stock equals about 5%, and the remaining 10% are other kinds of compensation.

Thus far, we have shown that manager fixed effects and firm fixed effects are important factors in determining executive compensations using the mover sample. However, if one just wants to control the combined manager and firm fixed effects without disentangling manager fixed effects from firm fixed effects, one could use the full sample and it would not be necessary to restrict the estimation to the mover sample. This can be seen as follows: to control for combined firm and manager fixed effects, one could first create a dummy variable, V_s, for each unique combination of manager i and firm j. Then, $V_s = \varphi_j + \theta_i$, where φ_j is firm j's fixed effect and θ_i is manager i's fixed effect, and equation (4) can be rewritten as $Ln(y_{it}) = X_{it}\,\beta + W_{jt}\,\gamma + V_s + \mu_t + \varepsilon_{it}$. Thereby, the model is reduced to a standard two way fixed effect model and can be estimated using a standard fixed effect approach on the full sample. In summary, if one wants to control for manager and firm fixed effects in a manner that addresses omitted variable bias, one can do so by including dummy variables for each unique firm-manager combination, and this can easily be done on the full sample. However, using this approach, one can only estimate the joint manager and firm effects V_s and cannot separately identify φ_j and θ_i. To separate the firm from manager fixed effects, we must use the mover sample to estimate the three-way fixed effect model. We use the mover sample in tables 4 to 6 because we want to be consistent with the analyses that follow, which require the mover sample to separately identify manager and firm fixed effects. In untabulated tests, we rerun all regressions in tables 4 to 6 using unique firm-manager dummies and the full data sample and find similar results for the estimated coefficients on the other variables.

4.1.2 Variance Decomposition of Executive Compensation and Magnitude of Manager Fixed Effects

To further explore the relative economic importance of time-invariant managerial differences and other factors, we follow Lemmon et al. (2008) and use analysis of variance (ANOVA). We first obtain partial sum of squares (also called Type III sum of squares) for each factor. The Type III sum of squares for a particular variable is the increase in model sum of squares due to adding the variable to a model that already contains all the other variables in the model. Partial sums of squares, therefore, do not depend on the order in which the explanatory variables are entered into the model. We then divide the partial sum for each factor by the total Type III partial sum of squares over all factors for a particular model. This normalization procedure allows us to understand the relative importance of each factor in determining executive compensation. Type III partial sum of squares do not add up to the regression sum of squares unless all the independent variables are orthogonal to each other. Therefore, the normalized partial sum of squares should not be interpreted as the exact share of the model R-square; rather, it represents the relative power of each factor in reducing the residual sum of squares given that all the other factors have been included in the model.

[Table 7 about here]

Table 7 reports the relative importance of each component in explaining the variation in log(compensation) for various model specifications. Panel A decomposes the variance of log(total compensation). Column (1) presents a regression that contains firm fixed effects only. Because there is only one effect in the model, the normalized partial sum of squares from firm fixed effects is exactly equal to 1. This is similar for column (2), a regression containing manager fixed effects only. We can see that in the models that contain manager fixed effects (specifications 3, 5, 6, 9, and 10), the normalized partial sum of squares for manager fixed effects is about 80-90%. In addition, the normalized partial sum of squares for firm fixed

effects is more than 50% in models without manager fixed effects (columns 4 and 8), but is much smaller (5-10%) when manager fixed effects are included (columns 3, 6, and 10). This suggests that without including manager fixed effects, the contribution of firm fixed effects could be overstated.

We also find that firm size (log(assets)) explains about half of the variation in the model without firm or manager fixed effects (column 7). After firm or manager fixed effects are included, the explanatory power attributable to firm size drops dramatically to less than 5%. Also, the normalized partial sum of squares for CEO dummy is approximately 25-30% in the model without manager fixed effects (columns 7 and 8). Once manager fixed effects are added (columns 9 and 10), the relative importance of CEO dummy drops to about 1%, indicating that most of what initially appeared to be a CEO indicator effect is a manager fixed effect. Finally, a comparison of adjusted R-squared from columns (1) and (3) indicates that adding manager fixed effects to a model with just firm fixed effects increases adjusted R-squared from 43% to 66% (more than a 50% relative increase), while adding firm fixed effects to a model with just manager fixed effects increases the adjusted R-squared slightly from 63% to 66%.

Panels B and C of Table 7 perform similar analyses to that in panel A, decomposing the variance of cash compensation (salary plus bonus) and the variance of option compensation, respectively. The results generate essentially the same implications: manager fixed effects are the most important factor in explaining the variation of option compensation and salary plus bonus.[21] The results are consistent with those of Abowd, Creecy, and Kramarz

[21] Besides the level of pay, in unreported analysis we examine the mix of pay. We conduct the same regressions as those in Table 4 and the same decompositions of the variance of the pay as in Table 7, using two separate dependent variables: the ratio of salary plus bonus to total compensation, and the ratio of option compensation to

(2002) and Cornelissen and Hübler (2007), who find that personal fixed effects explain the bulk of wage variation for U.S. and German workers, respectively. Taken together, these results suggest that a personal fixed effect is an important factor in the determination of compensation for top executives, as well as workers in general.

The variance decomposition results show that unobserved executive-specific heterogeneity is an important component in executive pay and this component has significant incremental explanatory power beyond what is explained by extant determinants. Nevertheless, it is worth highlighting that the above analysis does not imply that observable characteristics have little power to explain executive pay variation. First, because the numbers in Table 7 are normalized, the low proportions explained by observable determinants only suggest that the explanatory power of observable determinants is *relatively* low, compared with the explanatory power of manager fixed effects. It can be seen from Table 4 that most of observable variables have significant effects in determining executive pay. For example, stock returns are significantly related to executive compensation even when manager fixed effects are controlled. Second, if the variation in observable characteristics is largely cross-sectional, including fixed effects in the regression will decrease the proportion of the variation explained by observable determinants because fixed effects will absorb the cross-sectional variation. For example, the model that contains observable determinants alone has an adjusted R-square 49%. In contrast, these observable determinants (for example, firm size and CEO dummy) have a much lower explanatory power in the manager fixed effect model (columns 9 and 10 of Table 7, Panel A). Thus when employing the fixed effect model one should interpret

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total compensation. In general, these regressions and the corresponding decompositions generate similar implications about the importance of manager fixed effects.

estimation results with this in mind, especially for variables of interest that mainly vary cross-sectionally and are highly time persistent.

[Figure 1 about here]

Lastly in this section, we examine the economic magnitudes of manager fixed effects ($\hat{\theta}_i$). Figure 1 presents the distribution of estimated manager fixed effects. Since fixed effects are estimated relative to a benchmark, the mean and the location of the estimated fixed effects may change when different benchmarks are used. However, the shape of the distribution function and the standard deviation of fixed effects do not depend on benchmarks. It can be seen from the graph that the estimated manager fixed effects are roughly normally distributed, with a standard deviation of 1.13.[22] Considering the components of manager fixed effects ($\hat{\theta}_i$), firm fixed effects ($\hat{\varphi}_j$), year effects ($\hat{\mu}_t$), observable time-variant firm characteristics ($W_{jt}\hat{\gamma}$), and observable time-variant manager characteristics ($X_{it}\hat{\beta}$), manager fixed effects have the highest standard deviation and the magnitude of the standard deviation is of similar order to that of log(compensation). This indicates that one standard deviation change of manager fixed effects will result in roughly a one standard deviation change in log(compensation). More specifically, when manager fixed effects increase by one standard deviation of 1.13, log(compensation) changes from the average level of 7.08 to 8.21 (7.08+1.13), which can be translated into a change in total compensation from \$1.2 million to \$3.7 million.[23] In other words, a one standard deviation increase in manager fixed effects will increase executive compensation by \$2.5 million on average, which is economically important.

4.2 Implications for Empirical Executive Compensation Research

[22] To the extent that manager fixed effects can be interpreted as a measure of ability, this standard deviation suggests that there is a fair amount of variation in managerial ability across managers.
[23] Exp(7.08)=\$1,188 thousand, or \$1.2 million, and exp(8.21)=\$3,678 thousand, or \$3.7 million.

As mentioned earlier, if unobservable person or firm heterogeneity is correlated with the observable characteristics, empirical methods that do not explicitly account for unobservable manager or firm heterogeneities could be misspecified, resulting in omitted-variable bias. To further shed some light on this issue, we examine how including manager fixed effects alters the coefficient estimates on observable determinants, by comparing the OLS model with the three way fixed effect model. We focus on the results in Table 4 to facilitate the discussion.[24]

An inspection of Columns (1) and (4) in Table 4 reveals that the signs of the coefficients are similar in both specifications, but the magnitudes of the coefficients are sensitive to the specification. The average decline in coefficient magnitude in the three way fixed effect model relative to the OLS model is 30%. A Hausman test that compares the two specifications cannot reject the hypothesis that the OLS estimates are inconsistent at the 1% level. The Hausman test result also indicates that the hypothesis that fixed effects are uncorrelated with the observable determinants is rejected.[25]

Specifically, Log(assets), a proxy for firm size, is positively related to executive compensation with coefficients of 0.37 and 0.21 in the OLS and the three-way fixed effect models, respectively. The coefficient of 0.37 in the OLS model indicates that when log(assets) increases by a one standard deviation of 1.76, executive pay increases by 92%

[24] When we add more variables to a regression, the increase in R-squared comes at a cost: the parameter estimates become progressively less precise (i.e., have higher standard errors). In addition, the parameter estimates in the OLS model are biased upward in absolute magnitude compared with those in the manager fixed effect model. As a result, theoretically, t-statistics in the manager fixed effect model should be smaller than those in the OLS model. The reason that t-statistics for some variables in the manager FE model in Table 4 are larger than those in the OLS is that we adjust t-statistics for clustering within firms. If we do not adjust for clustering, then we typically find that t-statistics in the manager FE model are smaller than in the OLS model. (All the variables are still significant and the main results do not change if we do not adjust for clustering.)

[25] Like any specification test, the Hausman test results are suggestive. However, it can be reasonably argued that a managerial fixed effect, as a proxy of talent, is correlated with observable determinants. For example, talent may be correlated with firm size because larger firms may attract better employees or better managers are likely to be selected by larger firms. Talent may also be correlated with firm performance because good managers increase firm performance.

(exp(0.37×1.76)-1). The coefficient of 0.21 in the fixed effect model indicates that the percentage increase in pay caused by a one standard deviation increase in firm size is 45% (exp(0.21×1.76)-1). In other words, the impact of firm size on pay in the OLS model is nearly double that in the three-way fixed effect model.

The estimated coefficient is consistent with larger companies paying more to their executives than smaller companies. The smaller estimate in the fixed effect model, however, suggests that the firm size effect on compensation partially represents unobservable managerial characteristics. This result is particularly interesting in light of recent theory developed by Gabaix and Landier (2007). In Gabaix and Landier (2007), better skilled managers match with larger firms. Due to the complementarity between managerial skill and firm size in production, moderately better managerial skill could lead to significantly greater profit for a large company. Consequently, compared with smaller companies, larger firms are willing to pay much higher wages to more skillful managers. Consistent with this argument, our results that manager fixed effects partially absorb the firm size effect are consistent with managerial skill being an underlying driver in the relation between firm size and pay. This implication about managerial skill is absent in models that ignore executive fixed effects (because it is folded into the measured firm size effect). However, we note that firm size remains significant after manager fixed effects are included, suggesting a size premium unrelated to time invariant managerial ability.

The estimated coefficients on observable firm performance measures (stock return and return on asset) yield similar patterns – they generally decline when managerial fixed effects are included in the model. More talented managers improve firm performance and earn higher pay. Controlling for unobserved managerial skills, the marginal effects of firm performance

variables are lower because the unobserved managerial term captures some of the effects. Firm performance remains statistically significant after manager fixed effects are included, suggesting that factors other than managerial human capital (e.g., luck) affect firm performance, which in turn affects executive pay.

Another interesting variable that is significantly affected by the inclusion of manager fixed effects is the CEO indicator. The coefficient on the CEO dummy is 0.9 in the OLS model and drops to 0.3 in the manager fixed effect model. The CEO indicator potentially captures two compensation effects: the CEO's person-specific effect (i.e., the person who becomes CEO is more skillful) and job promotion effect (i.e., pay increase resulting from a non-CEO being promoted to CEO and vice versa). In models without manager fixed effects, the CEO indicator captures both effects. In models with manager fixed effects, the person-specific effect is absorbed into manager fixed effects and the CEO indicator captures the promotion effect only. The results suggest that, holding other variables unchanged, overall, a CEO is paid 150% (exp(0.9)-1) more than a non-CEO. For the *same* person, the pay increase due to promotion to CEO is 35% (exp(0.3)-1).[26]

Table 8 examines whether and how the estimated manager fixed effects and observable determinants of executive compensation are correlated.[27] The results indicate that manager fixed effects, viewed as the unobservable dimension of human capital, are

[26] Note that the CEO dummy is not perfectly collinear with manager fixed effects because in our panel dataset, a particular manager could be a non-CEO executive during some periods and a CEO in other periods. The identification of the coefficient on the CEO dummy in the presence of manager fixed effects relies on some executives being promoted from a non-CEO to a CEO or vice versa. In contrast, the female dummy variable can not be identified in the regressions with manager fixed effects because the female dummy is absorbed into manager fixed effects, which are time invariant.

[27] Table 8 should be interpreted with caution because fixed effects are estimated with error (they are the best linear unbiased estimator but are inconsistent), and therefore the correlations between the estimated fixed effects and other variables should be interpreted with this in mind. To formally test whether fixed effects are correlated with observable covariates, we use Hausman specification tests and discuss the results in the second paragraph of this section. Nonetheless, Table 8 is interesting because it suggests the approximate magnitude of the correlations estimated ex post (although with error).

significantly correlated with most of the independent variables. First, firm size is positively correlated with manager fixed effects. Larger firms on average hire "better" managers or "better" managers select to work in larger companies. In addition, accounting returns are positively correlated with managers' unobservable skill. The correlation coefficients further show that personal characteristics are related to the unobservable component of managerial human capital: managers who have stayed in the company longer have higher human capital; and CEOs have higher human capital than non-CEO executives.

[Table 8 about here]

The above discussion suggests that including manager fixed effects in the estimation changes both the magnitude and interpretation of the estimated coefficients on the observable determinants. It is worth noting that this does not imply that every empirical specification should include manager fixed effects. The decision of whether or not to employ a three way fixed effect model depends on the goal of the research. If the marginal effects (that is, holding all the other determinants unchanged) of certain determinants are of primary interest, the manager fixed effect model might be a good way to address the omitted-variable bias, assuming that the omitted variables are time-invariant or at least slow moving.[28] For example, if one is interested in the direct influence (but not any indirect influences, via the effect of skill or some other time invariant managerial characteristic) of firm size on compensation, excluding manager fixed effects may overestimate the size effect. However, if one is interested in the overall (direct plus indirect) effect of firm size, including fixed effects could sweep out the indirect effect (i.e., the size effect induced by unobserved managerial

[28] As noted in Lemmon et al. (2008), alternative ways to address the endogeneity bias issue include first differencing, structural estimation, natural experiments, etc.

characteristics) and thus underestimate the overall impact. Similarly, including manager fixed effects in the specification could underestimate the overall impact of firm performance on pay.

4.3 Manager Fixed Compensation Effects and Firm Performance

We have shown that a managerial fixed effect, which can be interpreted as a measure of a time invariant dimension of managers' human capital, is an important factor in determining compensation. A question that naturally follows is whether companies benefit from hiring managers with higher human capital (i.e., higher fixed effects in compensation). Drawing causality between managerial human capital and firm performance is difficult because firm performance may interact with managerial human capital. For example, a better performing firm may facilitate the human capital development of the manager. Nonetheless, in this section we attempt to address this question by examining firm performance changes following managerial turnover. Focusing on turnover mitigates the potential endogeneity problem due to the potential reverse causality of firm performance affecting managerial human capital.

We divide managerial turnover into two groups: one with incoming managers having higher fixed effects than out-going managers and the other with incoming managers having lower fixed effects than out-going ones. We then separately examine the changes in firm performance surrounding turnovers associated with these two groups of firms. If managerial human capital is reflected in manager fixed compensation effects, one could expect that, compared to the performance changes surrounding turnovers with new CEOs having lower fixed effects than the previous chief executives, the performance changes should be more positive for turnovers that involve new CEOs having higher fixed effects.

We use two measures of operating performance: return on assets (ROA) and return on equity (ROE). ROA is defined as net income before extraordinary items, divided by total assets. Because firms could engage in various downsizing activities after manager turnover (Denis and Denis, 1995), change in ROA could be driven by asset sales rather than operational efficiency. Another measure, return on equity, is less likely to be subject to asset restructuring activities and is measured as net income before extraordinary items divided by book value of equity.

[Table 9 about here]

Panel A in Table 9 provides mean and median comparisons for performance changes following manager turnover. Following Denis and Denis (1995) and Huson, Malatesta and Parrino (2004), we examine both unadjusted and industry adjusted performance changes from year -1 to year +3 (with year 0 being the turnover year), but focus on industry adjusted numbers. Industry adjusted performance changes are calculated by subtracting the median changes of the corresponding performance measures for all ExecuComp firms in the primary two-digit SIC industry in which the firm was active at the time of turnover.[29] Panel A shows that for both groups of firms, adjusted ROAs increase significantly after management turnover. In contrast, adjusted ROE increases significantly only for firms whose incoming managers have higher fixed effects than out-going managers.

The significant increase in ROA does not necessarily indicate the improvement in operating performance. For example, Denis and Denis (1995) show that manager turnover could result in corporate restructuring that reduces total assets, such as downsizing or eliminating poorly performing business units and writing down the book value of certain

[29] Adjusting by median changes of all Compustat (rather than Execucomp) firms in the same two-digit SIC industry generates similar implications.

assets. Also, a univariate comparison may not be sufficient because other factors may affect ROA and ROE. As a result, in Panel B of Table 9, we use regression analysis to control for firm size and other variables that may affect firm performance. The results indicate that the absolute increase in ROA (ROE) after turnover is significant and is 1.7% (5.7%), for the sample of firms with incoming managers having higher fixed effects than out-going managers. Given that the mean ROA and ROE are 4.7% and 9.2% respectively, the relative improvements in firm performance are about 1/3 (1.7/4.7) and nearly 2/3 (5.7/9.2) of the average ROA and ROE, economically important effects. In contrast, there is no significant change in ROA or ROE after turnover for the fixed effect declining subsample.

The results are consistent with managerial fixed effects in compensation to some degree reflecting manager's human capital, which contributes to better firm performance. Such managerial human capital may include not only managers' hard skills but also "soft capital" such as social connections and personality. In addition, the improvement in firm performance after a positive fixed effect manager is hired provides some justification for the higher compensation paid to such managers. Our estimates of manager fixed effects, interpreted as a proxy for latent managerial abilities, are from a three way fixed effect model. As a result, our estimates are net of firm and industry heterogeneities (such as the particular compensation policies of the firm), firm productivity shocks, as well as other time-specific idiosyncrasies. We close by noting that a disadvantage of using manager fixed effects to proxy for managerial human capital is the estimation error associated with the fixed effect estimates. The results in this section should be interpreted with this in mind.[30]

4.4 Excess Compensation and Leverage

[30] To mitigate a potential endogeneity issue, we also estimate the manager fixed effects using only historical data and then perform the firm performance analysis on a holdout sample. We obtain similar implications as those derived in this section, although the results are somewhat weaker statistically.

In previous sections, we examine how time invariant managerial heterogeneity plays an important role in affecting executive pay, how including managerial fixed effects alters coefficients estimated for other variables, and how managerial heterogeneity is related to firm performance. In this section, we investigate the effect of excess compensation (in addition to manager fixed compensation effects) on capital structure. Fama (1980) points out that, although an executive's human capital is not known with certainty, the labor market compensates the manager based on her expected human capital. This implies that a manager's expected human capital is priced by the market and is portable even if she moves to a different company. A recent paper by Berk, Stanton, and Zechner (2007) argues that, if an employee is paid her competitive wage, it should not be very costly for her to find a new job at the same wage. However, if an employee is entrenched and paid more than the competitive wage, it will probably be difficult for her to find a new job with similar pay should she lose her current job. This is because excess compensation is not portable and is not priced in the outside labor market. Amihud and Lev (1981) argue that managerial employment risk (i.e., risk of losing job, professional reputation, etc.) is largely undiversifiable and thus managers may reduce employment risk by such means as engaging their firms in conglomerate mergers, decreasing leverage, etc. Because managers with high excess compensation are faced with greater reduction in pay when losing jobs, we hypothesize that such managers have a greater incentive to reduce their employment risk by using less debt.

Similar to Berger, Ofek, and Yermack (1997), we define excess compensation as the difference between the pay the manager actually receives and expected pay. This difference is equal to the residual from regression (4) of Table 4, which is the three-way fixed effect regression of determining total executive compensation. Different from Berger, Ofek, and

Yermack (1997), we do not use the residuals from other regressions in Table 4 (such as pooled OLS regression or firm fixed effect regression) for two reasons. First, manager fixed compensation effects can be interpreted as portable human capital (Abowd et al., 2002) and when a manager loses his job, it may not be costly to find another job that values such portable human capital. In a model that does not explicitly consider manager fixed effects, these effects cannot be separated from the residual and thus the estimated residual may overstate excess compensation. Second, the parameter estimates in models that do not account for manager or firm fixed effects may be subject to endogeneity bias, in which case the residuals from these models would not be an unbiased measure of excess compensation.

[Table 10 about here]

We regress leverage on excess CEO compensation and other determinants of leverage and report the results in Table 10.[31] The specifications of our leverage equations follow from Frank and Goyal (2003, 2007a) and Graham and Tucker (2006). Columns (1) to (3) use market leverage as the dependent variable. Column (1) includes only one explanatory variable, excess compensation, besides year dummies. The regression shows that a firm's leverage level is negatively associated with its CEO's excess compensation. In column (2), we add lagged leverage and other control variables. The effects of other factors on leverage are consistent with the evidence documented in the literature (e.g., Frank and Goyal, 2003, 2007a, Leary and Roberts, 2005, Lemmon, Roberts, and Zender, 2008, and Roberts and Sufi, 2008). In column (3), we further include a CEO compensation fixed effect. The results from (2) and (3) indicate that the effect of excess compensation remains significantly negative while the coefficient on CEO compensation fixed effect is insignificant. In columns (4) to (6), we redo

[31] Firm fixed effect regressions account for industry differences in leverage because industry dummies are absorbed into firm fixed effects.

the regressions in columns (1) to (3) using book leverage as the dependent variable and the results are similar.[32] In all, these results are consistent with the view that CEO fixed effects are an integral part of compensation that reflects portable human capital and is priced by the labor market. In contrast, excess compensation captures premiums in CEO pay above that tied to expected human capital, which may give incentive to use debt conservatively and play it safe to avoid losing these premiums.

Given the statistical significance of excess compensation, the next question is: how important is the effect of excess compensation on leverage? We answer this question by determining the economic significance of the leverage effect of excess compensation. Mean CEO excess compensation is about $0.6 million (calculated as the difference between actual non-log compensation and the fitted value of non-log compensation from the model) and accounts for about 27% (0.6/2.2) of average total compensation. One standard deviation of excess log(total compensation) is 0.56 for CEOs and can be converted into the dollar amount as follows. The mean log(total compensation) is 7.08 and a one standard deviation increase in the residual from the mean gives a log(total compensation) of 7.64 (7.08+0.56) and the excess compensation is thus equal to $890 thousand (exp(7.64)-exp(7.08)), or approximately $0.9 million. In the main specification (3) of Table 10, the coefficient estimate of excess compensation is -0.007. A one standard deviation increase of excess log(total compensation), 0.56, will thus lead to a decrease in leverage of 0.007×0.56, i.e., 0.004, which is about 2% of the mean market leverage, 0.19. In other words, a one standard deviation increase ($0.9 million) in CEOs' excess compensation corresponds to about 2% decline in leverage. This 2% impact on leverage seems to be of similar magnitude to that of the effect of excess

[32] Table 10 reports the impact of CEOs' excess *total* compensation on leverage. We also examine the impact of excess *cash* compensation and the impact of executives' (not just CEOs') excess compensation on leverage and find that the negative impact is robust (results available on request).

compensation on leverage in Berger, Ofek, and Yermack (1997). In sum, the results suggest that the absolute value of excess compensation is nontrivial, but the impact on a firm's capital structure is of modest economic significance. This could be explained by the possibility that leverage is relatively persistent from year to year and may not be responsive to the annual fluctuations in CEO excess compensation.

5. Conclusion

This paper examines the role of manager heterogeneities in explaining executive compensation and finds that the majority of variation in executive pay can be explained by time-invariant managerial effects. The substantial heterogeneities among managers could come from the differences in managers' latent abilities, such as non-algorithmic reasoning, analytic or abstract decision-making, social skills, etc., none of which are observable or measurable.

In the paper, to disentangle manager fixed effects from firm fixed effects, we focus on the sample of firms that experience at least some managerial turnover, from which we can track switchers (movers) across firms. After quantifying manager fixed effects, we investigate the effect of manager fixed effects on firm performance and find that managers with higher fixed effects in compensation improve firm operating performance. We also show that including managerial fixed effects alters coefficients estimated for other variables. Compared to the OLS specification, the effects of firm size, performance and a CEO indicator are generally smaller in the fixed effect specification. Finally, we quantify managers' excess compensation and find that excess compensation negatively affects leverage.

The dramatic increase of executive compensation in recent decades has been under close scrutiny. Murphy and Zabojnik (2004, 2007) posit that such a trend is partially due to

the increase in the importance of general managerial ability (skills transferable across companies) relative to firm-specific human capital (skills valuable only within the specific firm). The transferability of managerial ability increases labor market competition among companies for such general skills and thus leads to an increased equilibrium CEO pay. Our estimated manager fixed effects capture transferable managerial ability that is priced in executive pay. Our result of the significance of managerial fixed effects in explaining executive compensation is consistent with the view of Murphy and Zabojnik (2004, 2007) that general managerial ability is an important factor in determining CEO pay.

We believe that accounting for managerial fixed effects represents a significant advance in our understanding of the determination of executive compensation. Nevertheless, the manager fixed effect model is not without limitations, leading to several potential extensions for future research. For one, perhaps as data availability improves, it will be interesting to see which factors explain manager fixed effects. These factors could include education, talent, risk preferences, etc. Second, allowing time variation in and interactions between firm and manager fixed effects, although still under development, could produce a more general understanding of the determinants of compensation. Clearly, these issues could be very challenging but interesting to both labor and financial economists.

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Table 1

Managerial Mobility

This table provides information on the mobility of sample managers.

Panel A: Number of firms in which managers have been employed

Number of firms in which managers have been employed	Number of managers	Percent	Cumulative
1	24,330	95.09	95.09
2	1,164	4.55	99.64
3	84	0.33	99.97
4	7	0.03	100.00
5	1	0.00	100.00
Total	25,586	100.00	

Panel B: Number of movers out of all managers

Mover	Number of managers	Percent	Cumulative
0	24,330	95.09	95.09
1	1,256	4.91	100.00
Total	25,586	100.00	

Panel C: Number of movers in a firm

Number of movers in a firm	Number of firms	Percent	Cumulative
0	1,072	45.73	45.73
1-5	650	27.73	73.46
6-10	351	14.97	88.44
11-20	224	9.56	97.99
21-30	39	1.66	99.66
31-50	8	0.34	100.00
Total	2,344	100.00	

Table 2

Sample Representativeness

This table provides information on the representativeness of the mover sample (i.e., each of the firms in this sample includes at least one manager moving across companies in the sample period), relative to the universe of firms on the ExecuComp database. The details of definitions and measurement of all the variables are reported in the Appendix. Panel A contains representativeness of continuous variables. In the second and the third columns of the table, we provide the overall universe and sample averages and medians. We then sort all ExecuComp firms with valid data into quintiles and report the universe averages for each quintile and the average and the percentage of the mover sample firms that fall into each quintile, based on universe quintile breakpoints for each variable. The reported percentages can then be compared with the benchmark 20%. Because about 29% (26%) of firms in the universe (sample) have zero option compensation, we combine the first two quintiles for the option compensation variable, and the sample percent for this group can be compared with a benchmark 40%. Panel B contains the sample and universe percentages of each indicator variable that falls in each category (0 or 1).

Panel A: Representativeness of continuous variables

Variable	Overall Average	Overall Median	ExecuComp Breakpoint Quintiles				
			1	2	3	4	5
Total Compensation ($thousands)							
Universe	1873.19	902.28	267.00	532.21	914.42	1673.45	5978.94
Mover Sample	2217.79	1098.46	272.02	535.15	917.98	1683.95	6108.61
Sample Percent			15.2	17.7	20.1	22.1	25.0
Salary + Bonus ($thousands)							
Universe	666.73	453.04	185.72	313.43	456.92	698.24	1679.35
Mover Sample	728.52	503.55	186.95	314.48	459.07	701.13	1685.77
Sample Percent			15.7	18.6	20.6	21.8	23.3
Option Compensation ($thousands)							
Universe	764.85	181.97	14.67		188.57	550.56	3055.85
Mover Sample	948.99	258.59	13.81		190.62	555.27	3188.83
Sample Percent			34.7		18.9	21.7	24.7
Tenure							
Universe	10.06	8.16	2.12	5.71	8.20	11.66	22.60
Mover Sample	9.88	8	2.06	5.78	8.28	11.65	23.02
Sample Percent			21.4	21.5	18.7	19.3	19.1
Market Leverage							
Universe	0.19	0.14	0.002	0.05	0.14	0.26	0.51
Mover Sample	0.19	0.14	0.002	0.05	0.14	0.26	0.50
Sample Percent			18.1	20.5	20.8	20.8	19.8
Book Leverage							
Universe	0.22	0.20	0.004	0.09	0.20	0.30	0.48
Mover Sample	0.22	0.21	0.004	0.09	0.20	0.30	0.48
Sample Percent			17.9	20.3	21.4	21.5	18.9
Assets ($millions)							
Universe	7481.59	1230.52	168.44	511.38	1275.42	3635.52	31817.51
Mover Sample	9609.73	1771.80	178.54	513.38	1294.91	3640.77	33830.42
Sample Percent			14.6	17.6	20.3	22.7	24.8
Market to Book							
Universe	2.01	1.48	1.00	1.20	1.49	2.04	4.32
Mover Sample	2.04	1.51	1.01	1.20	1.49	2.05	4.27
Sample Percent			18.7	19.6	20.5	20.5	20.7
Tangibility							
Universe	0.29	0.23	0.03	0.13	0.23	0.39	0.69
Mover Sample	0.29	0.23	0.03	0.13	0.23	0.40	0.68
Sample Percent			18.8	20.9	20.5	20.3	19.4

Return on Assets							
Universe	0.047	0.046	-0.084	0.020	0.047	0.082	0.171
Mover Sample	0.047	0.046	-0.082	0.020	0.047	0.083	0.171
Sample Percent			20.7	19.5	20.0	19.8	19.9
Return on Equity							
Universe	0.09	0.12	-0.25	0.07	0.12	0.16	0.35
Mover Sample	0.09	0.12	-0.26	0.07	0.12	0.16	0.35
Sample Percent			20.9	18.3	18.8	19.8	22.3
Stock Return							
Universe	0.19	0.12	-0.38	-0.06	0.12	0.31	0.95
Mover Sample	0.18	0.11	-0.39	-0.06	0.12	0.32	0.93
Sample Percent			20.3	20.1	19.9	19.8	19.8
Stock Return Volatility							
Universe	0.44	0.39	0.23	0.31	0.39	0.52	0.77
Mover Sample	0.44	0.38	0.23	0.31	0.39	0.52	0.77
Sample Percent			21.1	21.1	19.9	18.5	19.5

Panel B: Representativeness of dummy variables

Variable	Dummy Variable Equals	
	0	1
	Percentage	Percentage
CEO Indicator		
Universe	82.8	17.2
Mover Sample	82.7	17.3
Female Indicator		
Universe	95.4	4.6
Mover Sample	95.5	4.5
CEO Chair Indicator		
Universe	33.9	66.1
Mover Sample	32.0	68.0
Dividend Paying Indicator		
Universe	41.9	58.1
Mover Sample	41.0	59.0

Table 3

Summary Statistics for Final Sample

This table provides summary statistics of the main variables used in the mover sample. The detailed definitions of these variables can be found in the data appendix. For the variable *leverage*, financial (SICs 6000-6999) and utilities (SICs 4900-4999) firms are excluded because financial structure is regulated in these industries and the regression analysis in Table 10 removes firms in these industries.

	Mean	Median	Stdev	1%	25%	75%	99%
Total Compensation$_t$ ($thousands)	2,218	1,098	3,188	135	547	2,376	19,057
Salary plus Bonus$_t$ ($thousands)	729	504	694	75	314	862	4,021
Option Compensation$_t$ ($thousands)	949	259	1,924	0	0	901	11,600
Book Leverage$_t$	0.22	0.21	0.17	0	0.08	0.32	0.71
Market Leverage$_t$	0.19	0.14	0.19	0	0.04	0.29	0.78
Assets$_{t-1}$ ($millions)	9,610	1,772	24,084	59	543	6,401	159,501
Market to Book$_{t-1}$	2.04	1.51	1.47	0.82	1.16	2.27	9.29
Tangibility$_{t-1}$	0.29	0.23	0.23	0.004	0.11	0.44	0.87
Stock Return$_t$	0.18	0.11	0.51	-0.75	-0.11	0.37	2.36
Stock Return Volatility$_t$	0.44	0.38	0.20	0.18	0.29	0.55	1.07
Return on Assets$_t$	0.047	0.046	0.11	-0.40	0.014	0.093	0.32
Return on Equity$_t$	0.092	0.124	0.32	-1.564	0.054	0.183	1.094
Dividend Paying Dummy$_{t-1}$	0.59	1	0.49	0	0	1	1
CEO Chair Indicator $_{t-1}$	0.68	1	0.47	0	0	1	1
Tenure$_t$ (years)	9.88	8	7.93	0	5	12.4	38
CEO Indicator$_t$	0.17	0	0.38	0	0	0	1
Female Indicator	0.045	0	0.21	0	0	0	1

Table 4

Determinants of the Level of Total Executive Compensation

The table presents the regression results on the determinants of the level of total executive compensation. The dependent variable is *log(total compensation)*. (1) is a pooled OLS regression without firm or manager fixed effects. (2) is the firm fixed effect regression, (3) is the manager fixed effect regression, and (4) is a regression including both firm and manager fixed effects. The detailed definitions of all the variables are reported in the Appendix. Heteroskedasticity robust t-statistics adjusting for clustering within firms are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1) Pooled OLS (No Firm or Manager Fixed Effects)	(2) Firm Fixed Effects (No Manager Fixed Effects)	(3) Manager Fixed Effects (No Firm Fixed Effects)	(4) Firm and Manager Fixed Effects
$Log(Assets)_{t-1}$	0.37***	0.30***	0.21***	0.21***
	(41.23)	(16.46)	(18.43)	(14.88)
$Market\ to\ Book_{t-1}$	0.15***	0.10***	0.10***	0.10***
	(13.46)	(11.17)	(15.81)	(15.17)
$Stock\ Return_{t}$	0.20***	0.18***	0.18***	0.17***
	(14.42)	(13.75)	(20.82)	(20.30)
$Stock\ Return_{t-1}$	0.06***	0.09***	0.08***	0.07***
	(3.80)	(7.59)	(10.64)	(9.77)
$Return\ on\ Assets_{t}$	0.40***	0.20**	0.24***	0.29***
	(4.65)	(2.23)	(3.72)	(4.24)
$Return\ on\ Assets_{t-1}$	0.46***	0.31***	0.33***	0.36***
	(5.45)	(3.84)	(5.60)	(5.82)
$Stock\ Return\ Volatility_{t}$	0.91***	0.04	0.20***	0.10
	(12.05)	(0.38)	(3.23)	(1.60)
$CEO\ Chair\ Indicator_{t-1}$	0.09***	0.04**	0.01	0.01
	(4.20)	(2.46)	(1.01)	(0.46)
$Log(Tenure)_{t}$	0.03***	0.03***	0.03***	0.05***
	(3.12)	(5.77)	(4.30)	(6.81)
$CEO\ Indicator_{t}$	0.92***	0.90***	0.33***	0.30***
	(78.58)	(78.60)	(18.05)	(15.76)
Female	-0.14***	-0.17***	N.A.	N.A.
	(-5.10)	(-9.09)		
Year Effects	Yes	Yes	Yes	Yes
Adj. R-squared	0.49	0.64	0.73	0.75
P-value for F test that all fixed effects = 0	N.A.	0.00***	0.00***	0.00***
N	65,421	65,421	65,421	65,421

Table 5

Determinants of the Level of Salary plus Bonus

The table presents the regression results on the determinants of the level of total current compensation. The dependent variable is *log(salary plus bonus)*. (1) is a pooled OLS regression without firm or manager fixed effects. (2) is the firm fixed effect regression, (3) is the manager fixed effect regression, and (4) is a regression including both firm and manager fixed effects. The detailed definitions of all the variables are reported in the Appendix. Heteroskedasticity robust t-statistics adjusting for clustering within firms are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1) Pooled OLS (No Firm or Manager Fixed Effects)	(2) Firm Fixed Effects (No Manager Fixed Effects)	(3) Manager Fixed Effects (No Firm Fixed Effects)	(4) Firm and Manager Fixed Effects
$Log(Assets)_{t-1}$	0.25***	0.19***	0.16***	0.13***
	(35.56)	(15.61)	(17.21)	(12.72)
$Market\ to\ Book_{t-1}$	0.03***	-0.003	0.004	0.002
	(3.60)	(-0.72)	(1.00)	(0.60)
$Stock\ Return_{t}$	0.15***	0.14***	0.14***	0.14***
	(16.43)	(18.07)	(27.83)	(26.51)
$Stock\ Return_{t-1}$	0.05***	0.08***	0.09***	0.08***
	(5.65)	(11.55)	(17.12)	(16.73)
$Return\ on\ Assets_{t}$	0.93***	0.75***	0.76***	0.78***
	(13.89)	(12.51)	(17.49)	(18.13)
$Return\ on\ Assets_{t-1}$	0.07	-0.02	0.002	0.03
	(0.97)	(-0.43)	(0.04)	(0.71)
$Stock\ Return\ Volatility_{t}$	0.17***	-0.21***	-0.21***	-0.23***
	(3.12)	(-3.20)	(-4.35)	(-4.87)
$CEO\ Chair\ Indicator_{t-1}$	0.06***	0.01	0.01	-0.003
	(3.84)	(0.92)	(1.06)	(-0.29)
$Log(Tenure)_{t}$	0.07***	0.07***	0.04***	0.04***
	(12.31)	(15.34)	(7.72)	(7.73)
$CEO\ Indicator_{t}$	0.72***	0.72***	0.41***	0.41***
	(64.55)	(65.34)	(26.34)	(26.27)
Female	-0.10***	-0.12***	N.A.	N.A.
	(-4.75)	(-8.66)		
Year Effects	Yes	Yes	Yes	Yes
Adj. R-squared	0.51	0.66	0.78	0.80
P-value for F test that all fixed effects = 0	N.A.	0.00***	0.00***	0.00***
N	65,421	65,421	65,421	65,421

Table 6

Determinants of the Level of Option Compensation

The table presents the regression results on the determinants of the level of option compensation. The dependent variable is *log(option compensation)*. (1) is a pooled OLS regression without firm or manager fixed effects. (2) is the firm fixed effect regression, (3) is the manager fixed effect regression, and (4) is a regression including both firm and manager fixed effects. The detailed definitions of all the variables are reported in the Appendix. Heteroskedasticity robust t-statistics adjusting for clustering within firms are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1) Pooled OLS (No Firm or Manager Fixed Effects)	(2) Firm Fixed Effects (No Manager Fixed Effects)	(3) Manager Fixed Effects (No Firm Fixed Effects)	(4) Firm and Manager Fixed Effects
$Log(Assets)_{t-1}$	0.50***	0.31***	0.27***	0.25***
	(16.55)	(4.49)	(6.43)	(4.58)
$Market\ to\ Book_{t-1}$	0.34***	0.15***	0.19***	0.17***
	(9.00)	(5.09)	(8.44)	(7.41)
$Stock\ Return_{t}$	0.22***	0.08	0.10***	0.08**
	(4.48)	(1.63)	(3.24)	(2.54)
$Stock\ Return_{t-1}$	-0.04	0.05	0.004	-0.008
	(-0.83)	(1.06)	(0.12)	(-0.25)
$Return\ on\ Assets_{t}$	0.33	-0.03	0.11	0.22
	(1.05)	(-0.09)	(0.50)	(0.93)
$Return\ on\ Assets_{t-1}$	0.96***	0.61**	0.74***	0.82***
	(3.15)	(2.06)	(3.48)	(3.71)
$Stock\ Return\ Volatility_{t}$	2.06***	-0.62*	0.06	-0.33
	(8.08)	(-1.65)	(0.26)	(-1.17)
$CEO\ Chair\ Indicator_{t-1}$	0.20**	0.03	0.09*	0.05
	(2.46)	(0.32)	(1.70)	(0.83)
$Log(Tenure)_{t}$	-0.08***	-0.09***	0.002	0.06
	(-3.33)	(-4.81)	(0.06)	(1.62)
$CEO\ Indicator_{t}$	0.94***	0.87***	0.69***	0.67***
	(28.88)	(27.66)	(9.72)	(8.93)
Female	-0.13	-0.10*	N.A.	N.A.
	(-1.60)	(-1.79)		
Year Effects	Yes	Yes	Yes	Yes
Adj. R-squared	0.13	0.33	0.36	0.38
P-value for F test that all fixed effects = 0	N.A.	0.00***	0.00***	0.00***
N	60,985	60,985	60,985	60,985

Table 7

Decomposition of the Variance of Executive Compensation

The table reports the relative importance of each factor in explaining the variation in *log(compensation)* for various model specifications. This variance decomposition method is a standard analysis of variance (ANOVA). We first obtain Type III partial sum of squares for each factor. The Type III sum of squares for a particular variable is the increase in model sum of squares due to adding the variable to a model that already contains all the other variables in the model. We then divide the partial sum for each factor by the total Type III partial sum of squares over all factors for a particular model. This normalization procedure highlights the relative power of each factor in reducing the residual sum of squares given that all the other factors have been included in the model. The compensation variable in panel A, B, and C is total compensation, salary plus bonus, and option compensation, respectively.

Panel A: Decomposition of the variance of log(total compensation)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Firm Fixed Effects	1.000		0.088	0.854		0.053		0.530		0.075
Manager Fixed Effects		1.000	0.912		0.922	0.809			0.888	0.794
Year Fixed Effects				0.146	0.078	0.138	0.061	0.063	0.059	0.065
$Log(Assets)_{t-1}$							0.574	0.038	0.015	0.013
Market to $Book_{t-1}$							0.062	0.015	0.009	0.013
Stock $Return_t$							0.017	0.016	0.011	0.018
Stock $Return_{t-1}$							0.002	0.004	0.003	0.003
Return on $Assets_t$							0.002	0.001	0.001	0.001
Return on $Assets_{t-1}$							0.003	0.001	0.001	0.002
Stock Return $Volatility_t$							0.035	0.000	0.000	0.000
CEO Chair $Indicator_{t-1}$							0.004	0.001	0.000	0.000
$Log(Tenure)_t$							0.001	0.002	0.001	0.002
CEO $Indicator_t$							0.237	0.326	0.012	0.014
Female							0.002	0.003	-	-
Adj. R-squared	0.43	0.63	0.66	0.51	0.63	0.73	0.49	0.64	0.73	0.75

Panel B: Decomposition of the variance of log(salary plus bonus)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Firm Fixed Effects	1.000		0.088	0.895		0.065		0.502		0.084
Manager Fixed Effects		1.000	0.912		0.932	0.812			0.869	0.753
Year Fixed Effects				0.105	0.068	0.123	0.058	0.061	0.056	0.074
$Log(Assets)_{t-1}$							0.555	0.027	0.015	0.008
Market to $Book_{t-1}$							0.004	0.000	0.000	0.000
Stock $Return_t$							0.019	0.017	0.013	0.018
Stock $Return_{t-1}$							0.003	0.007	0.005	0.007
Return on $Assets_t$							0.021	0.013	0.008	0.012
Return on $Assets_{t-1}$							0.000	0.000	0.000	0.000
Stock Return $Volatility_t$							0.003	0.001	0.001	0.001
CEO Chair $Indicator_{t-1}$							0.004	0.000	0.000	0.000
$Log(Tenure)_t$							0.015	0.012	0.002	0.002
CEO $Indicator_t$							0.316	0.357	0.031	0.041
Female							0.002	0.003	-	-
Adj. R-squared	0.44	0.67	0.70	0.49	0.74	0.77	0.51	0.66	0.78	0.80

Panel C: Decomposition of the variance of log(option compensation)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Firm Fixed Effects	1.000		0.105	0.900		0.101		0.872		0.104
Manager Fixed Effects		1.000	0.895		0.967	0.837			0.963	0.838
Year Fixed Effects				0.100	0.033	0.062	0.114	0.066	0.024	0.042
$Log(Assets)_{t-1}$							0.503	0.007	0.003	0.002
Market to $Book_{t-1}$							0.149	0.005	0.003	0.005
Stock $Return_t$							0.009	0.001	0.000	0.000
Stock $Return_{t-1}$							0.000	0.000	0.000	0.000
Return on $Assets_t$							0.001	0.000	0.000	0.000
Return on $Assets_{t-1}$							0.005	0.001	0.001	0.001
Stock Return $Volatility_t$							0.088	0.001	0.000	0.000
CEO Chair $Indicator_{t-1}$							0.008	0.000	0.000	0.000
$Log(Tenure)_t$							0.006	0.002	0.000	0.000
CEO $Indicator_t$							0.117	0.045	0.006	0.008
Female							0.000	0.000	-	-
Adj. R-squared	0.28	0.33	0.35	0.31	0.35	0.37	0.13	0.33	0.36	0.38

Table 8

Correlations between Estimated Manager Fixed Effects and Other Determinants of Executive Compensation

The table reports the correlations between estimated manager fixed effects and independent variables in the regression analysis. Manager fixed effects in this table are estimated from the executive pay equation with the dependent variable being *log(total compensation)*. The definitions of all the other variables are reported in the Appendix. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Correlations	Manager Fixed Effects
Log (Assets)$_{t-1}$	0.22***
Market to Book$_{t-1}$	0.002
Stock Return$_{t}$	0.004
Stock Return$_{t-1}$	0.002
Return on Assets$_{t}$	0.02***
Return on Assets$_{t-1}$	0.006
Stock Return Volatility$_{t}$	-0.10***
CEO Chair Indicator $_{t-1}$	0.10***
Log (Tenure)$_{t}$	0.09***
CEO Indicator$_{t}$	0.20***
Female	-0.05***

Table 9

Changes in Firm Performance Following CEO Changes

The table presents analysis of the changes in firm performance surrounding CEO changes. Panel A presents the unadjusted and industry-adjusted mean and median changes in firm performance from one year before to three years after CEO changes (that is, event year -1 to +3 with year 0 being the CEO turnover year). Industry-adjusted variables are measured by subtracting SIC two-digit industry level median of all the ExecuComp companies. The cases where the new CEO's tenure ended before the end of year +3 are excluded from Panel A. Significances of mean and median changes are measured using a standard two-tailed t-test and a two-tailed Wilcoxon signed rank test, respectively. Panel B presents multivariate OLS regressions of firm performance variables on a CEO turnover dummy, using the subsample of firms in which new CEOs have higher / lower manager fixed effects than previous CEOs. In the regression analysis, the observations within 2 years after turnover (event year = 0, 1, and 2) are excluded to prevent from the confounding effect from previous CEOs. *After turnover dummy* is equal to 1 if time t is after CEO turnover and 0 otherwise. *Different industry dummy* is equal to 1 if the new CEO comes from a different SIC two-digit industry and 0 otherwise. *Outside CEO dummy* is equal to 1 if the new CEO is hired from another company and 0 otherwise. The details of the definitions of all the other variables are reported in the Appendix. Heteroskedasticity robust t-statistics adjusting for clustering within firms are in parentheses in Panel B. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Panel A: Univariate comparisons

Variable		New CEO's Fixed Effect > Previous CEO's Fixed Effect (Number of Firms = 326)		New CEO's Fixed Effect < Previous CEO's Fixed Effect (Number of Firms = 245)	
		Unadjusted	Industry-adjusted	Unadjusted	Industry-adjusted
ΔReturn on Assets	Mean	0.009	0.017***	0.004	0.013**
	Median	0.003	0.005***	-0.003	0.004***
ΔReturn on Equity	Mean	0.062**	0.074***	0.018	0.032
	Median	0.017**	0.028***	-0.014	0.004

Panel B: Regression analysis

	New CEO's Fixed Effect > Previous CEO's Fixed Effect (Number of Firms = 326)		New CEO's Fixed Effect < Previous CEO's Fixed Effect (Number of Firms = 245)	
	LHS = ROA	LHS = ROE	LHS = ROA	LHS = ROE
After Turnover Dummy$_t$	0.017***	0.057***	0.005	0.013
	(3.20)	(3.14)	(1.36)	(0.80)
Log(Assets)$_{t-1}$	-0.003	-0.001	-0.008***	-0.006
	(-0.95)	(-0.24)	(-5.20)	(-1.36)
Tangibility$_{t-1}$	-0.072*	-0.113*	-0.023	-0.057
	(-1.70)	(-1.69)	(-1.52)	(-0.85)
Market to Book$_{t-1}$	0.029***	0.053***	0.037***	0.060***
	(6.34)	(8.58)	(12.82)	(9.44)
R&D$_{t-1}$	-0.033***	-0.043***	-0.034***	-0.068***
	(-3.73)	(-2.67)	(-3.47)	(-3.53)
Advertisement$_{t-1}$	0.031**	0.012	0.020*	-0.006
	(2.21)	(0.29)	(1.95)	(-0.16)
Capital Expenditure$_{t-1}$	0.001	-0.080**	-0.026**	-0.051
	(0.07)	(-2.36)	(-2.15)	(-1.33)
Stock Return Volatility$_{t-1}$	-0.224***	-0.525***	-0.139***	-0.415***
	(-5.41)	(-6.75)	(-6.06)	(-4.13)
Different Industry Dummy	-0.025**	-0.024	0.016	0.040
	(-1.99)	(-0.82)	(1.53)	(0.86)
Outside CEO Dummy	0.015	0.054	-0.007	0.059
	(1.05)	(1.60)	(-0.72)	(0.96)
Year Fixed Effects and Industry (SIC 2 Digit) Dummies	Yes	Yes	Yes	Yes
Adj. R-squared	0.29	0.16	0.35	0.19
N	3,201	3,200	2,971	2,971

Table 10

Effect of Excess Compensation on Leverage

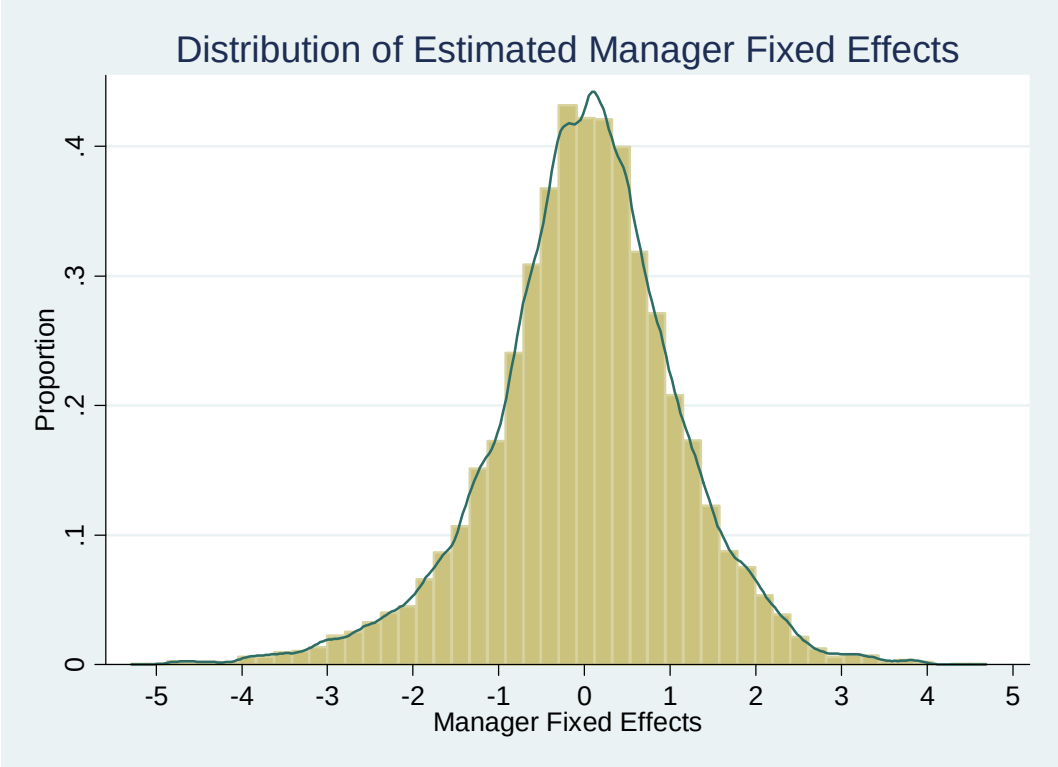
The table presents analysis of the effect of excess compensation on market and book leverage. The dependent variables are *market leverage* and *book leverage*. *Excess CEO compensation* is measured as the residual from regression (4) of Table 4, which is the three-way fixed effect regression of determining log(total compensation). Financial firms (SICs 6000-6999) and utilities (SICs 4900-4999) are excluded because debt utilizations are regulated in these industries. The definitions of all the variables are reported in the Appendix. Heteroskedasticity robust t-statistics adjusting for clustering within firms are in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	Market Leverage			Book Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
Excess CEO Compensation$_t$	-0.016***	-0.007***	-0.007***	-0.010***	-0.004**	-0.004**
	(-7.00)	(-3.74)	(-3.76)	(-4.81)	(-2.17)	(-2.15)
Manager Fixed Effect in Compensation			-0.001			-0.0001
			(-0.29)			(-0.02)
Leverage$_{t-1}$		0.587***	0.587***		0.608***	0.608***
		(38.16)	(38.13)		(33.09)	(33.03)
Log(Assets)$_{t-1}$		0.018***	0.018***		0.001	0.001
		(6.30)	(6.29)		(0.34)	(0.34)
Market to Book$_{t-1}$		-0.003***	-0.003***		-0.0004	-0.0004
		(-3.06)	(-3.08)		(-0.28)	(-0.27)
Tangibility$_{t-1}$		-0.020	-0.020		0.008	0.008
		(-0.89)	(-0.89)		(0.41)	(0.41)
ROA$_{t-1}$		-0.014	-0.014		-0.046***	-0.046***
		(-1.02)	(-1.03)		(-2.87)	(-2.86)
Dividend Paying Dummy$_{t-1}$		0.015**	0.015**		0.012**	0.012**
		(2.42)	(2.42)		(2.51)	(2.50)
Stock Return Volatility$_{t-1}$		-0.034*	-0.034*		-0.001	-0.001
		(-1.82)	(-1.81)		(-0.04)	(-0.04)
Year and Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.70	0.81	0.81	0.68	0.80	0.80
N	9,087	9,047	9,047	9,088	9,048	9,048

Figure 1

Distribution of Estimated Manager Fixed Effects

The figure presents the distribution of estimated manager fixed effects, using histograms and kernel density estimation (curved line). Because fixed effects are estimated relative to a benchmark, the mean and the location of the estimated fixed effects may change when different benchmarks are used. However, the shape of the distribution function and the standard deviation of fixed effects do not depend on benchmarks.



Appendix: Definition of Variables

Variable Names	Variable Definitions and Corresponding Compustat and ExecuComp Data Items
Firm Level Variables	
Log(Assets)	Natural log of total assets = log(data6). Assets is measured in $millions.
Market to Book	(Market value of equity plus the book value of debt)/total assets = (data25*data199+data6-data60)/data6
Tangibility	Net property, plant and equipment/total assets = data8/data6
Stock Return	Annual stock returns from CRSP
Return on Assets (ROA)	Net income before extraordinary items and discontinued operations divided by total assets = data18/lag(data6)
Return on Equity (ROE)	Net income before extraordinary items and discontinued operations divided by total book value of common equity = data18/data60
Stock Return Volatility	Standard deviation of daily log returns over the past five years and then annualized by multiplying by the square root of 254.
CEO Chair Indicator	A dummy variable equal to one if the CEO of the company is also the board chairman, and zero otherwise.
Book Leverage	(Long term debt + debt in current liabilities)/total assets = (data9+data34)/data6
Market Leverage	(Long term debt + debt in current liabilities)/(total debt + market equity) = (data9+data34)/(data9+data34+data199*data25)
Dividend Paying Dummy	A dummy variable equal to one if data21, common dividends, is positive, and zero otherwise.

R&D	Research and development expense/lag one year net property, plant, and equipment = data46/lag(data8)
Advertisement	Advertising expense/lag one year net property, plant, and equipment = data45/lag(data8)
Capital Expenditure	Capital expenditures/lag one year net property, plant, and equipment = data128/lag(data8)
Manager Level Variables	
Log(Total Compensation)	Natural log of total compensation, where total compensation is ExecuComp data item TDC1 and is comprised of salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total. Total compensation is measured in $thousands.
Log(Salary plus Bonus)	Natural log of salary plus bonus, where salary plus bonus is ExecuComp data item TOTAL_CURR. Salary plus bonus is measured in $thousands.
Log(Option Compensation)	Natural log of total options granted. Options granted, ExecuComp data OPTION_AWARDS_BLK_VALUE, are equal to the aggregate value of stock options granted to the executive during the year as valued using Black Scholes methodology. Option compensation is measured in $thousands.
Excess Compensation	This variable is measured as the residual (actual – predicted log(total compensation)) from regression (4) of Table 4, which is the three-way fixed effect regression of determining log(total compensation).
Log(Tenure)	Natural log of the number of years the manager has been with the company, which equals the difference between the year of the observation and the year when the individual joined the company.
CEO Indicator	A dummy variable that equals one if the manager is the CEO in a particular year and zero if the manager is a non-CEO top executive in a particular year. This dummy variable is time variant for a given individual because a specific manager could be a CEO in some years and non CEO in other years.
Female Indicator	A dummy variable that equals one if the manager is a female and zero otherwise.