Top Executive Mobility and Firm Specific Skills

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Abstract

This paper studies the impact of firm specific skills on the mobility and compensation of top executives. With the help of a simple model, I develop a set of empirical predictions on the cross-industry differences in the probability of internal promotions, the level of executive compensation and the pay differential between externally hired and internally promoted managers. These predictions are then tested on firm level data from the US by using the tenure of non-managerial workers as a proxy for the importance of firm specific skills. As predicted by my model, an increase in the importance of firm specific skills both raises the probability of internal promotion and decreases their total compensation. Moreover, the compensation differential between externally appointed and internally promoted managers increases with the importance of firm specific skills. Finally, I find evidence consistent with the view that firm specific skills are more important during expansion (growth) periods than during recession (downsizing) periods.

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1 Introduction

Executive compensation and the proportion of external hires significantly vary across industries (Murphy and Zabojnik, 2004 and Cremers and Grinstein, 2010). The compensation differential between externally hired and internally promoted executives also varies significantly: according to ExecuComp data, the compensation premium for external hires ranges between -15% to +27%. What are the determinants of these cross-sectional differences? What is the connection between executive compensation, external hiring and executive mobility?

Understanding the determinants of managerial mobility and compensation is important not only because it will give us a better knowledge of the executives labor market itself but also because of its implications for firm productivity. This paper highlights the importance of firm specific skills on the managerial labor market and uncovers high similarities between the managerial and non-managerial labor market.

In the first part of the paper, I develop a simple model where the main determinant of managerial mobility is the importance of skill specificity. The basic results are intuitive: in industries where firm specific skills are more important, there is a higher probability of internal succession. Conversely, firms hire an external manager if firm specific skills are less important or if the new manager is significantly a better match.

In the second part of the paper, I uncover new empirical results on the importance of skill specificity in the executive labor market. First, I show how differences in the importance of firm specific skills may explain the differential in compensation between externally appointed and internally promoted managers. Moreover, since skill specificity reduces internal manager outside option, this differential increases with the importance of skill specificity. Second, I discuss how the importance of firm specific skills on the executive labor market changes with different economic conditions.

The goal of this paper is to provide empirical evidence on the role of skill specificity in the executive labor market. The challenge arises from the unobservability of the importance of skill specificity as the empirical validity of the tests rely on finding an

appropriate proxy for this parameter. My contribution is to use the average tenure for non-executive employee as a proxy for the degree of skill specificity required in an industry. Among other consequences, when labor input is firm specific, labor relations tend to be longer as both the firm and the employee find this unique relationship valuable.[1] Therefore, non-executive employee tenure seems a good proxy for the relative importance of finding the "right" worker. The main disadvantage of this measure is that, due to data limitations, it is defined at the industry level, being equal for all firms within an industry.

In choosing this proxy, I took into consideration several issues. First, using executive data will lead to important endogeneity and reverse causality problems. Hence, I use non-executive employee data. Second, using executive employee data from the same firms as the non executive employee data will cause my results to be affected by the "quiet life" problem documented by Bertrand and Mullainathan (2003): executives in companies with lower governance will not only entrench themselves but will also have lower incentives to (costly) monitor non-executive employees, creating a correlation between executive and non-executive job tenure.

As evidence of the relevance of non-executive employee data for executive labor market, I find that the average executive and non-executive tenure are highly correlated at the industry level. Additionally, non-executive turnover explains around 20% to 25% of the differences in CEO turnover across (as well as within) industries documented by Cremers and Grinstein (2010).

Therefore, I use non-managerial employee tenure as a measure of the importance of skill specificity to test the empirical implications of my model regarding executive mobility and compensation. First, I document that executives are more often internally promoted and paid lower total compensation in industries where labor input is more specific. Since external executives are paid more than internal executives, these differences may just come from differences in the type of hires across industries. Therefore, I repeat this analysis on compensation focusing only on internally

[1] See Lazear and Oyer (2009) and Oyer and Schaefer (2011) for a recent review on personnel economics and an extensive review of the determinants of employee-firm match.

promoted managers, finding the same results. This empirical evidence is in line with the literature on internal succession. Parrino (1997), Murphy and Zabojnik (2004, 2007) argue that internal succession is more common in industries where firm specific skills are more important. Zhang and Rajagopalan (2003) show that external hires happen only if the new manager is significantly a better match.[2] Himmelberg and Hubbard (2000), Oyer (2004) and Rajgopal et al. (2006) show that managerial compensation is linked to the manager outside option. Aivazian et al. (2010) empirically document the relationship between the increase in executive compensation and the increasing importance of general skills.[3]

Second, I document that the compensation differential between externally appointed and internally promoted managers increases with the importance of skills specificity. Finally, I show that the increase in the percentage of firms employing external executives during recessions is larger the higher the importance of specific skills. As Cappelli and Hamori (2008) documented, firm specific knowledge may be particularly important during expansive (or growth) periods but generic skills may be more relevant during recession (or downsizing) periods.[4] This finding is in line with Eisfeld and Kuhnen (2009), who document that the probability of hiring an external executive increases when there is forced turnover compared to when this turnover is voluntary since, most probably, forced turnover will happen more often around recession periods.

The rest of the paper is structured as follows. Section 2 presents the theoretical model. Section 3 discusses the empirical methodology and Section 4 shows the empirical evidence. Robustness checks are in Section 5. Finally, Section 6 concludes.

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[2] Giannetti (2010) further explores the importance of firm specific skills in managerial replacement and argues that executives may undertake some value decreasing decisions in order to affect their learning and to increase their outside options.

[3] Similarly, Albuquerque et al. (2009) Bizjak et al. (2009), Cadman et al. (2009) and Faulkender and Yang (2010), among others, document the importance of peer groups in executive compensation, making use of the recent requirement to disclose the peer groups used to set executive compensation.

[4] This differential impact of firm specific skills may reconcile the empirical evidence between the long run study by Frydman and Saks (2010) and the shorter term study done during relatively expansive periods by Murphy and Zabojnik (2007).

2 Theoretical Analysis

In this section, I present a model that highlights the relation between the importance of skills specificity and both executive compensation and executive mobility. I also analyze how these differences in the importance of skills specificity may explain the compensation differential between externally appointed and internally promoted managers. Then, I explore the relevance of specific skills in different economic conditions and its impact on the executive labor market.

2.1 The Model Setup

Consider an economy with many firms and many individuals and two states of the economy $\rho \in [0, 1]$.

At $t = 0$, each firm requires a manager to be productive and also employs an unproductive trainee, who can replace the manager at $t = 1$. The trainee chooses his effort $a \in [0, 1]$ at cost $ka^2/2$.

At $t = 1$, the incumbent manager retires and the firm must replace the incumbent manager and can choose between promoting the internal trainee or hiring an external manager. At that point, the firm and the trainee learn whether they are a good or a bad match. The trainee and the firm are a good match with probability $p = a\rho$ and a bad match with probability $1 - p$. If the trainee and the firm are a good match, the output is Y_H; if the manager and the firm are a bad match, the output is Y_L; if there is there is an external hire at $t = 1$, the outsider produces Y, where $Y_H > Y > Y_L$. Before the replacement decision, the manager and the firm set managerial compensation. The manager has bargaining power equal to $\alpha \in [0, 1]$. The market for managers at $t = 1$ is as follows. If a trainee is internally promoted, he will produce outcome according to the quality of his match with the firm. Instead, if a trainee joins another firm, he will be an external manager for that firm and will produce Y. However, when a manager moves to another firm, he bears a cost of moving C. This cost of moving is increasing in γ, the skills specificity of the firm where he was a trainee. In short, the outside option of a trainee at $t = 1$ is $Y - \gamma C$.

At $t = 2$, production, realization of output and payment of compensation takes place.

I assume that $0 \leq Y_H - Y + \gamma C \leq k$. This condition implies that there is an internal optimal choice of effort.

2.2 Replacement decision and compensation

In this section, I solve for the replacement decision and the manager compensation and show how the importance of skill specificity interacts with them.

To solve the model, I proceed by backward induction. Given that the newly appointed manager and the firm split the surplus in fractions equal to α and $1 - \alpha$, both share the same goal at the replacement decision stage: maximizing total surplus.[5] If a firm promotes the internal trainee, the surplus generated would be equal to

$$Y_i - (Y - \gamma C)\,. \tag{1}$$

where $i = \{H, L\}$ depending on the match between the firm and the trainee. Hence, firm's profit would be

$$\pi = (1 - \alpha)(Y_i - Y + \gamma C) \tag{2}$$

and the manager compensation would be

$$w = Y - \gamma C + \alpha(Y_i - Y + \gamma C). \tag{3}$$

If the match between the trainee and the firm is bad and the manager is replaced by an external, the firm produces Y and the external manager is paid Y as this external manager could work for any other firm in the economy producing Y, i.e. the external manager outside option is Y. In other words, when a firm negotiates compensation with an external manager, his costs of moving are sunk. Therefore, a firm makes zero profit when employing an external manager.

[5] Precisely because both parties agree with the replacement decision, this model does not make any difference between voluntarily and forced turnover.

Hence, given that $Y_H > Y$, the trainee will always be internally promoted if the match between him and the firm is good. A firm will choose to promote a badly matched internal manager if

$$\pi = (1-\alpha)\left[Y_L - Y + \gamma C\right] > 0 \tag{4}$$

or

$$\gamma \geq \widehat{\gamma} \equiv \frac{Y - Y_L}{C} \tag{5}$$

Therefore, if there is a good match between the firm and the manager, he gets compensation equal to

$$w = Y - \gamma C + \alpha(Y_H - Y + \gamma C) \tag{6}$$

while if there is a bad match between the firm and the manager, he gets compensation equal to

$$w = \begin{cases} Y - \gamma C + \alpha\left[Y_L - Y + \gamma C\right] & \text{if } \gamma \geq \widehat{\gamma} \\ Y - \gamma C & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{7}$$

Therefore, as of $t = 0$, trainees have an expected salary equal to

$$Ew = \begin{cases} Y - \gamma C + p\alpha\left(Y_H - Y + \gamma C\right) + (1-p)\,\alpha\left[Y_L - Y + \gamma C\right] & \text{if } \gamma \geq \widehat{\gamma} \\ Y - \gamma C + p\alpha\left(Y_H - Y + \gamma C\right) & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{8}$$

and will therefore choose effort to maximize the following objective function:

$$\max_a \begin{cases} Y - \gamma C + a\rho\alpha\left(Y_H - Y + \gamma C\right) + (1 - a\rho)\,\alpha\left[Y_L - Y + \gamma C\right] - k\frac{a^2}{2} & \text{if } \gamma \geq \widehat{\gamma} \\ Y - \gamma C + a\rho\alpha\left(Y_H - Y + \gamma C\right) - k\frac{a^2}{2} & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{9}$$

Solving the first order condition

$$a^* = \begin{cases} \frac{\rho}{k}\alpha\left(Y_H - Y_L\right) & \text{if } \gamma \geq \widehat{\gamma} \\ \frac{\rho}{k}\alpha\left(Y_H - Y + \gamma C\right) & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{10}$$

Moreover, a^* is a continuous function increasing in γ. Not surprisingly, the first best is achieved when $\alpha = 1$ and no effort is undertaken if $\alpha = 0$ as the trainee would receive all the value generated by his effort in the former case and none of it in the latter case. Additionally, trainees are always internally promoted if $\gamma \geq \widehat{\gamma}$ while they

are internally promoted with probability $p = \rho a^*$ if $\gamma < \widehat{\gamma}$. Given the optimal choice of effort, the probability of internally promoting a trainee, $\Pr(Int)$, is as follows:

$$\Pr(Int) = \begin{cases} 1 & \text{if } \gamma \geq \widehat{\gamma} \\ \frac{\rho^2}{k}\alpha\left(Y_H - Y + \gamma C\right) & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{11}$$

with

$$\frac{\partial \Pr(Int)}{\partial \gamma} \geq 0 \tag{12}$$

Moreover, manager's compensation at $t = 2$ equals

$$w = \begin{cases} (1-\alpha)(Y - \gamma C) + \alpha Y_L + \alpha p(a^*)(Y_H - Y_L) & \text{if } \gamma \geq \widehat{\gamma} \\ \alpha Y_H + (1-\alpha)(Y - \gamma C) & \text{if } \gamma < \widehat{\gamma} \text{ \& trainee promoted} \\ Y & \text{if } \gamma < \widehat{\gamma} \text{ \& external hire} \end{cases}$$

where $p(a^*) = \rho a^*$ is the probability of having a good match between the firm and the trainee given a^*. Therefore,

$$\frac{\partial w}{\partial \gamma} = \begin{cases} -(1-\alpha)C < 0 & \text{if } \gamma \geq \widehat{\gamma} \\ -(1-\alpha)C < 0 & \text{if } \gamma < \widehat{\gamma} \text{ \& trainee promoted} \\ 0 & \text{if } \gamma < \widehat{\gamma} \text{ \& external hire} \end{cases}$$

as $\partial p(a^*)/\partial \gamma = 0$ if $\gamma \geq \widehat{\gamma}$.

Hence, I have derived the following result:

Result 1: An increase in the importance of skills specificity increases the percentage of internal promotions and reduces executives compensation.

Additionally, the probability of internally promoting a trainee increases with C, γ, α, and $(Y_H - Y)$. All these results are quite intuitive: the larger is the cost of moving to another firm (either via C or γ), the better it is to promote internal managers. Moreover, the larger is the manager bargaining power or the increase in the value generated by a good match $(Y_H - Y)$, the larger is the probability of internal promotion. The reason is because an increase in these parameters increases trainees reward for effort, increasing their optimal choice of effort. This implies an increase in the probability of a good match, which results in an internal promotion.

Furthermore, manager's compensation increases with managerial power more when the importance of skill specificity (γ) is larger:

$$\frac{\partial w}{\partial \gamma \partial \alpha} = \begin{cases} C > 0 & \text{if trainee promoted} \\ 0 & \text{if external hire} \end{cases} \tag{13}$$

2.3 External Premium

In this section, I discuss the sign of the external premium and its dependence on the importance of skill specificity. I define external premium as the difference between the compensation managers hired from outside the firm earn with respect to the internally promoted ones. For empirical reasons, I focus on ex-post ($t = 2$) managerial compensation differential instead of (unobservable) expected compensation differential at $t = 1$. In other words, this analysis is undertaken given the optimal replacement decision.

The external premium (EP) depends on whether γ is larger than $\widehat{\gamma}$ or not. If $\gamma \geq \widehat{\gamma}$, all managers are internally promoted. Hence, there is no external premium. If $\gamma < \widehat{\gamma}$, all well matched trainees are internally promoted and badly matched trainees are replaced by an external hire. Therefore,

$$EP = Y - [Y - \gamma C + \alpha (Y_H - Y + \gamma C)] = (1 - \alpha) \gamma C - \alpha (Y_H - Y), \tag{14}$$

which is positive if externally hired managers produce similarly to internally hired ones, $(Y_H - Y)$ is small; or if the internal cost of moving is large, γC is large.[6] Since the cost of moving depends on the importance of skill specificity, this compensation differential depends on the importance of skill specificity. Specifically,

$$\frac{\partial EP}{\partial \gamma} = (1 - \alpha) C > 0 \tag{15}$$

Hence,

Result 2: The external premium is increasing in the importance of skill specificity.

[6] Empirically, Cremers and Grinstein (2010) document that, on average, externally hired CEOs earn 8% more than internally promoted ones.

This result is intuitive: the higher is γ, the lower is the promoted trainee outside option, decreasing internally promoted managers salaries and increasing the external premium.

2.4 Business Cycles

In this section, I discuss the impact of skill specificity on the replacement decision under different economic conditions. Economic conditions influence the probability of promoting an internal manager through their interaction with the manager probability of being a good match,

$$\frac{\partial \Pr(Int)}{\partial \rho} = \begin{cases} 0 & \text{if } \gamma \geq \widehat{\gamma} \\ 2\frac{\rho}{k}\alpha\left(Y_H - Y + \gamma C\right) > 0 & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{16}$$

which implies that internal promotions happen more often during expansion periods, which is in line with Cappelli and Hamori (2008).

Moreover, I can analyze the differential impact of the importance of skill specificity depending on the state of the economy, i.e.

$$\frac{\partial \Pr(Int)}{\partial \rho \partial \gamma} = \begin{cases} 0 & \text{if } \gamma \geq \widehat{\gamma} \\ 2\frac{\rho}{k}\alpha C > 0 & \text{if } \gamma < \widehat{\gamma} \end{cases} \tag{17}$$

which implies that the positive impact of skill specificity on the probability of hiring an internal manager is larger the better are the economic conditions. Thus,

Result 3: The importance of the skill specificity on the type of replacement is larger the better are the economic conditions.

3 Empirical Methodology

In this section, I discuss how to empirically test the previous results and the design of some possible robustness analysis.

The empirical tests presented here will be implemented with a commonly used panel of US managers, ExecuComp. This dataset includes information on the top five executives of each firm, including different components of their pay, some personal

and employment characteristics and tracks an executive across firm. My proxy for the importance of skill specificity is defined at the industry level, i.e. all firms in the same industry have the same importance of firm specific skills. In Section 4.1, I present further details on my proxy for the importance of skill specificity.

3.1 Compensation and turnover characteristics

In this section, I develop the empirical predictions following from Result 1: the higher the importance of firm specific skills, the higher the probability that executives are promoted internally and the lower their compensation.

To test this prediction, I estimate the following logit regression

$$Internal_i = F(\alpha + \beta_s SkillSpecificity_i + \beta X_i + \varepsilon_i) \tag{18}$$

where $Internal_i = \{0, 1\}$. $Internal_i = 1$ if the new executive was promoted internally and $Internal_i = 0$ if the new executive was not a worker of the firm the year before the new appointment. $SkillSpecificity$ is the importance of specific skills and my empirical prediction would imply $\beta_s > 0$. X are a set of controls that could affect the type of replacement. Since the argument just presented takes the decision to replace the executive as given and focuses on the type of replacement, this test should also be conditional on replacement. Therefore, I only include one observation for each executive-firm-position match.

To test the empirical implication that highly relevant specific skills imply lower executive compensation, I estimate the following OLS regressions

$$TotalComp_{it} = \alpha + \beta_s SkillSpecificity_i + \beta X_{it} + \varepsilon_{it} \tag{19}$$

where $TotalComp_{it}$ is a measure of executive compensation, $SkillSpecificity$ is the importance of firm specific skills and my empirical prediction would imply $\beta_s < 0$. In this case, I will use executive compensation for all the years the executive was employed at a given firm-position and not only the first year he was hired or promoted. The reason is because the skill specificity should affect the executive compensation through the entire career and not only the first year she is hired.

Finally, I will analyze the impact of managerial bargaining power on executive compensation using executive tenure as a proxy for executive bargaining power. Bebchuk and Fried (2004) document the positive relation between executive compensation and tenure. Instead, I will focus on how this relationship changes with respect to the importance of skill specificity. According to the model, the second derivative of compensation on skill specificity and managerial power is positive (see equation (13)). To test this result, I estimate the following OLS,

$$\begin{aligned} TotalComp_{it} &= \alpha + \beta_{ST} SkillSpecificity_i * Tenure_{it} + \\ &\quad + \beta_1 SkillSpecificity_i + \beta_2 Tenure_{it} + \beta X_{it} + \varepsilon_{it}. \end{aligned} \tag{20}$$

where $TotalComp_{it}$ is a measure of executive compensation, $SkillSpecificity$ is the importance of firm specific skills, $Tenure$ is the number of years the executive has been in that position and the differential effect of specific skills on the relationship between executive compensation and tenure is β_{ST}. In this regression, I need to add the external dummy and its interaction with the importance of firm specific skills in my set of controls as, according to my theoretical model and as we will see below, they affect the level of compensation.

3.2 The external premium

In this section, I present the empirical predictions following from Result 2 about the external premium and its dependence on the importance of firm specific skills. I define external premium as the difference between the total compensation executives hired from outside the firm will earn with respect to an internally promoted one.

To test the differences in external premium with respect to the importance of skill specificity, I will estimate the following OLS regression,

$$\begin{aligned} TotalComp_{it} &= \alpha + \beta_{SE} SkillSpecificity_i * Ext_i + \beta_1 SkillSpecificity_i \\ &\quad + \beta_2 Ext_i + \beta X_{it} + \varepsilon_{it} \end{aligned} \tag{21}$$

where $TotalComp_{it}$ is a measure of executive compensation, Ext_{it} is a dummy variable that takes value one if the executive was externally appointed, zero otherwise.

$SkillSpecificity$ is the importance of firm specific skills and X are a set of controls. In this regression, β_{SE} captures the changes in the compensation differential for different levels of skills specificity, with result 2 implying $\beta_{SE} > 0$. Finally, it is worth noting that while the coefficient on the lower order components in a regression with an interactive effect usually lack any economic or statistical significance, this is not true for the case when one of this lower order variables is a dummy variable. In the regression just presented, the coefficient β_1 and $\beta_1 + \beta_{SE}$ represents the effect of $SkillSpecificity$ for internally and externally appointed executives, respectively.

3.3 Business Cycles

Finally, consider the empirical predictions following from Result 3: the importance of the skill specificity on the replacement decision is larger the better are the economic conditions.

To test this prediction, I estimate the following logit regression

$$Internal_i = F(\alpha + \beta_{SR} SkillSpecificity_i * R_i + \beta_1 SkillSpecificity_i + \beta_2 R_i + \beta X_i + \varepsilon_i) \tag{22}$$

where, as before, $Internal_i = \{0, 1\}$ with $Internal_i = 1$ if the new executive was promoted internally and $Internal_i = 0$ if the new executive was not a worker of the firm the year before the new appointment. $R_i = \{0, 1\}$, with $R_i = 0$ when the state of the economy is expansion and $R_i = 1$ when the state of the economy is recession. $SkillSpecificity$ is the proxy for the importance of firm specific skills and X are a set of controls that could affect the type of replacement. Again, I only include one observation for each executive-firm-position match and analyze whether in that period $R_i = 1$ or $R_i = 0$. According to result 3, $\beta_{SR} < 0$.

4 Empirical Evidence

In this section, I provide empirical support for the predictions presented above. The biggest challenge when documenting the empirical validity of my predictions arises from the unobservability of the importance of skill specificity. Obtaining an appropri-

ate proxy for this parameter is crucial for my empirical tests. As previously discussed, I use non-executive employee data to reduce endogeneity and reverse causality problems. Specifically, I use the tenure of non-executive employees as a measure of the relevance of skill specificity. Further details can be obtained in the data description section below and evidence on its relevance is presented in the section with the same title.

4.1 Data Description

The databases used in this empirical tests are the National Longitudinal Surveys of the Young started in 1979 (NLSY79), ExecuComp, Compustat CRSP and Risk Metrics.

The NLSY79 is a US representative sample of 12,686 young men and women who were 14-22 years old when they were first surveyed in 1979. These individuals were interviewed annually from 1979 until 1994 and are interviewed on a biennial basis since 1994. The last wave available corresponds to 2008. When first interviewed, most of the individuals were students.

I use the data on NLSY79 to obtain my proxy of skill specificity. I define *Skill Specificity* as the average length, in years, of all jobs in a given industry. I define job as an employee-employer relationship. Therefore, I consider the job has not changed if an employee changes tasks but keeps working for the same employer. As Topel and Ward (1992) pointed out, to reduce the noise from unqualified (non-representative) jobs, I use NSLY79 data on jobs from 1992 onwards only. I also restrict the sample to white male workers. Appendix 1 shows the different values of *Skill Specificity* for the different industries, the within industry standard deviation in the job length and the number of observations in each industry.

I use ExecuComp to obtain executive data; including mobility and compensation. The most relevant variables for my study are the tenure of executives at each position, and whether they were promoted internally or hired from another firm. For this purpose, I use not only the data directly available on the date they joined the company but I also improve it by keeping track of a specific executive through different firms

and/or positions whenever possible. I define *Internal* as a dummy variable that takes value one if the executive was working in the firm before taking that specific position for longer than one year, zero otherwise. Conversely, I define *External* as a dummy variable that takes value one if the executive was not working for that firm the year prior to getting that position, zero otherwise. This variable is defined at the executive, firm and position level to take into account internal promotions. I exclude from the analysis the executives for whom I cannot know whether they were internally or externally appointed. I define *Left-Joined* as the difference between the year the manager left the firm minus the year the manager joined the firm, *Became-Joined* as the difference between the year the manager became CEO and the year she joined the firm and *Executive Tenure* as the number of years the executive has been working in that firm-position. I also obtain executive compensation from ExecuComp. I define *Total Comp* as the logarithm of total compensation (item `tdc1`).

I also use CRSP, Compustat and Risk Metrics to obtain other control variables such as the firm market capitalization (*Market Cap*), the normalized *Herfindahl Index* for each industry-year, the annualized returns demeaned at the industry level (*Returns*) or the industry homogeneity (*Homogeneity*). To define these variables, I use the matched CRSP-Compustat subsample as the universe. The industry homogeneity is defined as in Parrino (1997) and captures the similarity in stock returns of firms within each industry. I use the Gompers et al. (2003) governance index as my measure of corporate governance, which I obtain from RiskMetrics. The *GIM Index* ranges from 1 to 24 and adds one point for each governance provision restricting shareholders right vis-a-vis executives (for further details, see Gompers et al. (2003)).

The recession dummy variable (*Rec*) takes value one for a given industry if this industry average Tobin's Q has been decreasing for the last two years, zero otherwise. I compute the industry average Tobin's Q as the (equally weighted) average of all the firms Tobin's Q in that industry. Again, it is important to define an industry wide variable and not a firm specific measure of recession as the later one would lead to endogeneity problems. Most notably, if a firm is performing badly with respect to the industry, this will most probably lead to a forced turnover, which is usually followed by an external replacement. Additionally, firm underperformance may indicate bad

managerial abilities at the top positions; negatively conditioning the value of an internal promotion.

As a robustness check, I also use of the Noncompetition Enforcement Index constructed by Garmaise (2009). This index is constructed using Malsberger's (2004) twelve questions regarding the enforceability of noncompetition agreements for each state. Garmaise's (2009) Noncompetition Enforcement Index scores one point for each question if the state enforcement of that dimension of noncompetition law exceeds a given threshold, zero otherwise. Then, I divide this sum by twelve to create a score from 0 to 1. It is important to notice that non compete agreements are governed by employment law. Hence, the relevant jurisdiction is the one in which the executive works, typically the headquarters. Therefore, it is the headquarters location and not the state of incorporation that matters. For further legal details, please refer to Garmaise (2009) and Malsberger (2004).

Following Garmaise (2009), I multiply this index by a measure of within state competition to obtain the increased restrictions the no compete agreement set on the possibility of hiring an external manager (*External Hire Cost*). He argues that this correction is important because no compete agreements are mostly only enforceable when executive moves take place within a given state. To obtain this measure of within state competition, I divide the sum of the market capitalization of the firms established in a given state for a given industry by the sum of the market capitalization of all firms in a given industry. I exclude the own firm market capitalization from both sums and restrict the sample to those sectors with more than one firm in more than one state. This is a slight variation from Garmaise (2009), who uses sales instead of market capitalization. I choose market capitalization for two reasons: first, for consistency with all other measures of size throughout the paper, and second, because executives seem to use market capitalization as their reference for firm size more than sales.

Table 1 presents the summary statistics for my data that spans from 1992 to 2008.

4.2 Identifying assumptions: Evidence on the relevance of non-executive employee tenure

The tests presented in the empirical section are based on the assumption that non-executive employees tenure is a good measure of the importance of skill specificity at the executive level. Although this assumption cannot be directly tested, I provide below some auxiliary evidence that may shed some light on the discussion of its relevance.

Jovanovic (1979), Hashimoto (1981), and more recently Lazear (2003) and Wasmer (2006), among others, document the relationship between non-executive employee tenure and the importance of skill specificity. My measure of skill specificity is based on the labor input specificity. In other words, the relative importance of the firm-employee match. Among many other consequences, when the firm-employee match is more important, labor relations tend to be longer as both the firm and the employee find valuable this unique relationship. This argument holds for both non-executive and executive workers.

Aside from the reasoning just presented, I can provide some auxiliary evidence on the relevance of non-executive employee tenure as a proxy for executive specific skills. Table 2 shows the correlation between non-executive and executive tenure. In columns (1) and (2), I regress the difference between the year an executive left the company minus the year this executive joined the company on the average non-manangerial industry tenure and a different set of controls. We can see that industries with higher average non-executive employee tenure also exhibit longer executive tenure at the firm level. This measure has an obvious concern: it is only available for those executives that have left the firm. To avoid this censoring concern, in columns (3) and (4), I also show the positive correlation between the average non-manangerial tenure and the difference between the year a executive joined the company and the year this executive became CEO. Finally, in column (5), I show that the previous results are not driven by the effect of declining industries; that is, declining industries may fire both their employees and their executives, causing a positive relation between these two tenure measures. Therefore, I repeat the analysis focusing only on

those industries that increased the average number of firm employees over the period 1992 to 2008. I find very similar results, suggesting that declining industries may be firing their employees but keeping their executives.

The different determinants of executive tenure that I use in columns (2), (4) and (5) include controls at the firm level and controls at the industry level. Controls at the firm level include firm size (*Market Cap*), relative performance (*Returns*) and corporate governance (*GIM Index*). Controls at the industry level include the competitiveness of the industry (normalized *Herfindahl index*) and the similarity of the firms within the industry (*Homogeneity Index* as developed by Parrino, 1997). It is reassuring that, although some of them are not statistically significant, the coefficients on the control variables have the expected sign.

Moreover, these results are not only statistically but also economically significant. When the average tenure of non-manangerial employees increases by one year, the average tenure of executives increases by 0.74 years and it takes CEOs 0.58 years more as a worker in that firm to reach that position. Moreover, I can also use an overall measure of regression fit such as R^2 to analyze the economic relevance of my proxy. On one hand, in untabulated results, I find that the R^2 of the regression excluding the non-executive employee tenure but including all other controls is 16%. On the other hand, I find that including industry dummies increases the R^2 to 25%; the upper bound for any possible combination of variables defined at the industry level.

As previously mentioned, I find that the turnover of non-executive workers explain around 20% to 25% of the executive moves. To get this result, I proceed as follows. I obtain a transition matrix where each element x_{ij} in the matrix corresponds to the percentage of moves from industry i to industry j. I obtain one transition matrix for executives, one for non-executive employees and I generate one randomly. To account for the different industry sizes in the randomly generated moves, the probabilities of moving to industry j equals the number of ExecuComp firms in industry j divided by the total number of firms in ExecuComp. Then, I calculate the sum of the absolute differences between each element x_{ij} of the transition matrix for executives and the

transition matrix for non-executive employees, i.e.

$$\sum_{\forall ij} \left| x_{ij}^{E} - x_{ij}^{NE} \right|$$

I do the same for the differences between the executives and the randomly generated matrix. I find that the sum of the differences in the first case is around 20% to 25% lower than in the second case. Results are very similar if I use only CEOs to generate the executives transition matrix or I use a quadratic measure of distance.

An alternative hypothesis for this auxiliary evidence is that both tenures are caused by executives preferring to enjoy a "quiet life" as proposed by Bertrand and Mullainathan (2003). However, two characteristics of my setting mitigate this potential problem. First, non-executive data is aggregated at the industry level. Second, my data on non-executive and executives workers do not come from the firms (not even the same database). Additionally, I control for corporate governance in all my specifications.

4.3 Compensation and turnover characteristics

In this section, I will present the empirical evidence on the relationship between the importance of skill specificity and both total executive compensation and turnover characteristics. Briefly, my hypothesis would predict that executives are paid less and are more probably hired from inside the firm in industries where skill specificity is more relevant, as presented in equations (18) and (19).

These predictions are confirmed by the results presented on Table 3. Columns (1) to (3) show the results for all executive executives while columns (4) to (6) repeats the analysis focusing only on CEOs. Columns (1) and (4) show very similar results: an internal promotion is more probable the higher the skill specificity; with a 1.5% increase in the probability of employing an internal executive given a marginal increase in the employee tenure from its mean. Although this increase is economically small, it is very similar to the impact of a marginal increase in the GIM Index and about 40% of the impact of a marginal increase in firm's market capitalization, both calculated around each variable mean.

Columns (2), (3), (5) and (6) present the results regarding total executive compensation, showing a statistically significant decrease in total compensation as skill specificity increases. Again, the first two columns include all executives while the last two focus on CEOs. In both cases, results are similar: executive compensation decreases between 6% and 6.5% for a marginal increase in the importance of skill specificity. Given that externally appointed executives earn more than internally appointed ones, the differences across industries could arise from the differences in composition of the executive hires just reported. To reduce this concern, columns (3) and (5) repeat this analysis focusing only on the executives that were internally promoted. Results remain unchanged.

In all these specifications, I also include controls at the firm level and controls at the industry level. Controls at the firm level include firm size (*Market Cap*), relative performance (*Returns*) and corporate governance (*GIM Index*). Size may have different implications for executive turnover characteristics and compensation. First, larger firms may have both a larger and a better pool of workers to promote than smaller firms. Moreover, Gabaix and Landier (2008) also document an important relation between executive compensation and firm size through a matching model. The inclusion of GIM Index is also important as differences in corporate governance may affect the replacement decisions in many ways. First, Bebchuk and Fried (2004) documented the impact of entrenched executives on compensation and internal promotion. Additionally, Acharya et al. (2010) and Chan (1996) documented how the probability of being internally promoted could have an important effect on lower level executives. As predicted for these theories, an increase in corporate governance implies a decrease in the probability of being internally promoted and in compensation.

Controls at the industry level include the competitiveness of the industry (normalized *Herfindahl index*) and the similarity of the firms within the industry (*Homogeneity Index* as developed by Parrino, 1997). All the coefficients on the control variables have the expected sign, except for the similarity of the firms within the industry. The differences between my results and Parrino (1997) may arise from the differences in the sample period.

Finally, in untabulated test, I repeat the analysis weighting each observation by the inverse of the standard deviation of within industry non-exectuive employee tenure to (approximately) account for the estimation error of this variable. Results hold similarly.

In Table 4, I show the differential impact of skill specificity on the impact of executive tenure on compensation as presented in equation (20). Columns (1) and (2) report the results using all executives while columns (3) and (4) use only CEOs. Consistent with the predictions, results show that there is a larger raise in compensation as executive tenure increases in those industries where skill specificity is more important. To help interpret the results, I report the estimated impact on compensation of a marginal increase in executive tenure for the industries where skill specificity is the lowest decile (*Low Skill Specificity*) and in the top decile (*High Skill Specificity*). We can see that executive compensation increases by 1.5% and decreases by 0.2% for a marginal increase in tenure for the *High Skill Specificity* industries and the *Low Skill Specificity* industries, respectively. In all these regressions, it is important to include the external dummy and its interaction with skill specificity as externally appointed executives earn more on average. In columns (2) and (4), I add a triple interaction with the importance of skill specificity, the executive tenure and the external dummy, documenting no differential effect of executive tenure on compensation for externally hired and internally promoted managers with respect to skill specificity. Putting all these results together, externally appointed managers earn a compensation premium at the moment they join the firm depending on employee tenure but this does not affect their compensation changes thereafter.

4.4 External premium and specific skills

In this section, I present the empirical evidence on the relationship between the importance of skill specificity and the external executive premium. I refer to external premium as the difference between the total compensation of executives hired from outside the firm and the total compensation of executives appointed internally, as exposed in equation (21).

The first implication of the model on the external premium is that external executives earn more than internally appointed ones. Table 4 columns (1) and (2) show results for this implication. On average, external executives earn 18% more than internally appointed ones while external CEOs earn around 8% more than internally promoted ones. In untabulated tests, I find that most of this external premium takes the form of stock options.

Table 5 columns (3) to (6) focus on the differences in the external premium across industries. Columns (3) and (5) presents the results regarding all executives while columns (4) and (6) focus on CEOs only. Overall, results support the hypothesis that external executives premium increases with skill specificity. As a robustness check, the last two columns introduce industry dummies, without finding any statistical or economical change in the results. The advantage of columns (3) and (4) is that they allow me to test the overall effect of skill specificity on the externally appointed executives (CEOs) by testing whether the sum of the coefficients on the multiplicative term and the skill specificity is different than zero. I cannot reject this hypothesis, implying that external executives total compensation is unaffected by the importance of skill specificity. This result is consistent with the results reported on Table 3 columns (3) and (5) where I show that the effects of the importance of skill specificity on total compensation arise primarily from internally promoted executives.

In summary, these results show that there are differences in the external premium across sectors but they primarily arise from differences in the internally promoted executives total compensation rather than from the external ones. This is very close to the intuition in my predictions: executives in highly firm specific industries have lower outside option; therefore, they earn less. Instead, when a firm hires an external executive, they need to pay her the same across all industries as she could have moved to any industry, reducing the differences in external executives compensation across industries.

4.5 Business Cycles

In this section, I will discuss how different economic conditions impact replacement decision differently across sectors with different importance of skill specificity as presented in equation (22). To do so, I use a recession measure defined at the industry level and analyze its impact on replacement decisions.

Table 6 shows the differential impact of skill specificity during expansion and recession periods with respect to the probability of promoting an internal executive. The coefficients (and their statistical significance) reported for the logit model with a multiplicative effects in column (1) have limited interest by themselves as their economic and statistical significance depends on the predicted probability of internal promotion. Instead, it is the sum of the interaction coefficient and the coefficient on the importance of skill specificity that bears economic interest. The sum of these coefficients is not statistically different from zero ($p - value = 0.96$), meaning that the probability of employing an external executive does not depend on the importance of skill specificity during recession. Instead, the coefficient on the firm specific skill is positive and statistically different from zero, implying that they do matter during expansive periods. In short, this result is in line with the common view that generic skills are more relevant when it comes to re-structuring (downsizing) the firm and instead very specific knowledge of the firm is important during the growing (expansion) of the company.

Table 6 also presents some robustness analysis for this finding. Columns (2) and (3) present the same results as column (1) but splitting the sample instead of using an interactive effect to capture any differential effect in the other control variables. I also use a linear probability model in columns (4) and (5). Column (4) replicates column (1) while column (5) introduces industry dummies. Results are similar across all specifications: I cannot reject the null hypothesis that the effect of skill specificity in recession is equal to zero while the importance of skill specificity is positively related to the probability of internally promoting an executive during expansions. Finally, in untabulated tests, I regress total compensation on the recession dummy and the usual set of controls and I find that executive compensation does not vary

during recession periods. I also find no differential impact on the importance of skill specificity on compensation between expansion and recession. These results seems to be in line with the widely criticized finding that executives seems to benefit from the upside but bear no downside cost.

5 Robustness Analysis

5.1 No Compete Agreements

In this section, I use the differences in the enforceability of the no compete agreements across US states as a robustness test for the main results. When no compete agreements contracts are enforceable, executives cannot move to another firm within the same (or closely related) industry. On the contrary, these contracts apply little restrictions on cross industry executives moves. This variation in the enforceability of no-compete agreements imply a variation in the costs of employing an external executive across different U.S. states. The higher the cost of hiring an external executive ($ExternalHireCost$) and the higher is the importance of firm specific skills, the higher the probability of promoting an internal executive. Arguably, the no compete agreement restrictions should be more relevant for those firms that hire external managers more often, i.e. those with relatively low skill specificity.

To analyze this effect, I estimate the regression

$$\begin{aligned} Internal_i &= F(\alpha + \beta_{SC} SkillSpecificity_i * ExternalHireCost_i + \\ &\quad + \beta_1 SkillSpecificity_i + \beta_2 ExternalHireCost_i + \beta X_i + \varepsilon), \end{aligned} \tag{23}$$

where $Internal_i = \{0, 1\}$. $Internal_i = 1$ if the new executive was promoted internally and $Internal_i = 0$ if the new executive was not a worker of the firm the year before the new appointment. $SkillSpecificity$ is the proxy for the importance of firm specific skills and $ExternalHireCost$ is the firm cost of hiring an external manger and my previous discussion would predict $\beta_{SC} < 0$. Finally, the differences in no compete agreements enforceability across states allow a cross-sectional heterogeneity test.

Table 7 reports the results for regression (23). Column (1) presents a logit es-

timation while columns (2) and (3) present linear probability models. Again, the interpretation of the results reported in column (1) is not straight-forward since the coefficient on a multiplicative variable for non-linear model lacks economic and statistical significance as it depends on the predicted probability of the dependent variable. When properly assessed, the coefficient on the interaction is always negative and it is statistically different from zero across all regressions.

Table 7 also reports the results using a linear probability model for different reasons. First, it serves as a good robustness check on the coefficient of the multiplicative variable: both the economic and statistical significance are similar to the non-linear model. Second, exploiting the differences in the *External Hire Cost* across states, I can undertake a cross-sectional heterogeneity test by introducing industry dummies. In that case, the interactive coefficient has the right sign but it is not significantly different from zero.

More importantly, the differences in the enforceability of no-compete agreements imply a different cost of hiring an external manager that comes from the same industry relative to hiring an external manager that comes from another industry. The higher is the enforceability of no-compete agreements, the higher is the difference in these costs. Therefore, this allows me to analyze the relative importance of two possible components of my skills specificity measure. On one hand, specific skills could be useful in a given firm and useless anywhere else. On the other hand, specific skills could not only be useful at a given firm but also useful for all firms in a given industry, being useless anywhere else.

Depending on which of these components dominates the skill specificity measure, the expected sign on the interaction coefficient between skill specificity and enforceability of the no compete agreements is different. If the second type of skills dominate the first one, the coefficient should be positive. The reason is as follows. If the measure of skill specificity captures a skill that could be used in any firm within a given industry indistinctly, significantly reducing the possibility to hire from within the industry should have a particularly large negative impact on the probability of hiring an external replacement when this measure is large.

On the contrary, if the first component of skill specificity dominates, the coefficient on the multiplicative term should be negative since reducing the possibility of hiring a manager from within the industry should not affect those firms that are highly specialized, as they would hire an internal anyway. However, the pool of external managers of those firms that tend to hire externally is (slightly) reduced. Hence, the firms with low skills specificity promote internally (slightly) more often. Therefore, the coefficient on the multiplicative term should be negative; as shown in Table 7.

5.2 Replacement frequencies

Since the previous analysis is conditional on replacement, it abstracts from the possibility that there could be different replacement rates across industries. If industries with highly-specific skills were replacing executives much less often than industries with low firm specific skills, this could result in a much smaller unconditional probability of being internally promoted. This would definitely influence the trainee choice of industry at $t = 0$. In short, I will test whether the negative relationship between external promotions and the importance of firm specific skills also holds when I endogenise the replacement decision.

Therefore, in this section, I test whether the unconditional probability of employing an external executive is negatively related to the importance of firm specific skills. To do so, I will use a duration model with

$$h(t) = \Pr(T = t | T \geq t, X) = F(\alpha + \beta_s SkillSpecificity_i + \beta X_i + \varepsilon_{it})$$

where $h(t)$ is the hazard function, defining the failure event as the employment of an external executive. If employing an external executive is unconditionally less probable for firms with high skill specificity, there should be a lower probability of appointing an external executive for those cases.

Since this analysis heavily relies on tracking a executive position through different executives, I need to focus on a clearly defined position: CEOs. There is one and only one CEO per firm-year while the same is not true for the other executive positions. This allows me to clearly identify whether an internal or an external occupied this

position. Table 8 shows the results regarding this analysis. In columns (1) and (2), I present the results using an exponential survival model and a Cox model. In both cases, I define failure as external CEO succession. As we can see, the hazard function is smaller for those industries, where skill specificity is larger, implying that it takes longer to hire an external executive.

A possible alternative explanation for this result would be that industries with large skill specificity do not replace their CEOs at all. This would mechanically imply that firms in those industries take longer to employ an external CEO. To deal with this possible concern, I repeat the analysis but consider any replacement as a failure in the survival analysis and not only external replacements. Columns (3) and (4) show that firms with large skill specificity actually take, on average, less time to change their CEOs.

In short, if skill specificity is important, not only the conditional probability of employing an external CEO is smaller once the decision to replace the CEO has been taken, but it also takes longer to employ an external CEO unconditionally.

5.3 Alternative measure of skill specificity

In this section, I show that previous results also hold when I use an alternative (although related) measure of the importance of firm-employee match. This new measure aims at reducing the noise in my measure of non-executive employee tenure by calculating my indicator only using those employees that are paid more than the industry average salaries. The reason for selecting these employees is that they may have more similar skills to executives. In Table 9, I report the results on the internal/external succession and compensation, by estimating specifications (18) and (19) using this new measure. Results are similar to those in Table 3. For brevity, I do not report the results on the other predictions, which hold similarly with this new measure.

Even if this measure reduces the noise from unqualified jobs, selecting only highly paid employees introduces additional concerns. If an employee is paid abnormally high, she will have no incentives to leave the firm, increasing her tenure. Therefore,

selecting highly paid employees may reduce the noise from unskilled employees but may increase the bias due to overpaid workers. Therefore, I find it more conservative to use all employees.

5.4 Choosing the industry to work

In all my empirical tests, I focus on the replacement type conditional on both the turnover decision and the pool of internal candidates. In the previous section, I presented some results on the turnover decision. I will now briefly discuss the impact of endogenizing the choice of industry for the first (career relevant) job from the point of view of an individual.

When choosing which industry to join as a worker, the individual would face the following trade-off. On the one hand, compensation decreases with the importance of skill specificity given its impact on the outside option. On the other hand, the probability of being internally promoted increases with the importance of skill specificity. Therefore, the higher the importance of skill specificity, the lower the probability that the trainee will need to find a job somewhere else and will have to move across firms. Hence, those individuals with a high cost of moving will prefer an industry with high skill specificity to increase the chance of internal promotion. Conversely, those with lower cost of moving will rather choose industries with low skill specificity, which pay a high salary, even if they face a greater risk of having to move to another firm.

This effect may generate a selection effect in my empirical tests. When I analyze the impact of skill specificity on both the probability of having an internal promotion and total compensation, I cannot distinguish whether these differences are caused by the importance of skill specificity itself or by the fact that higher skill specificity has attracted executives with a higher cost of moving, C. However, even if the channels are different, both effects are ultimately due to the importance of skill specificity.

6 Conclusion

This paper analyses the importance of skill specificity in the executive labor market both in terms of mobility and compensation. I develop a simple model that shows that firms are more likely to select internal candidates as CEOs, in industries in which skills are more specific. Moreover, given the specificity of their skills, executives have more limited outside options, which decreases their compensation.

To provide empirical support for these predictions, I use the average tenure of non-executive employee in an industry as a measure of skill specificity. First, I highlight the relevance of my proxy showing that the tenure of executive and non-executive employees are correlated at the industry level and I document the similarities between non-executives and executives mobility across (as well as within) industries. Second, I document that executives are more often internally promoted and paid lower total compensation in industries where skill specificity is more relevant. I also find that the compensation differential between externally appointed and internally promoted executives increases with the importance of skill specificity. Finally, I document that the percentage of firms employing external executives during recessions increases relatively more in industries with larger skills specificity.

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Appendix

This appendix provides details on the NLSY79 employment data for the different industries in my sample. For each industry, it includes the average job tenure (in years), the standard deviation of within industry job tenure and the number of observations. The data covers the period from 1992 to 2008.

Industry	Mean Tenure	Sd Tenure	Obs.
Crop Production	11,80	9,12	177
Forestry and Logging	4,12	5,00	63
Fishing, Hunting and Trapping	7,17	8,61	16
Mining (except Oil and Gas)	7,71	8,09	83
Utilities	11,50	7,46	205
Construction of Buildings	5,58	6,18	2027
Food Manufacturing	7,32	6,31	288
Beverage and Tobacco Product Manufacturing	8,49	7,87	81
Textile Product Mills	7,35	7,06	109
Apparel Manufacturing	6,55	7,30	43
Paper Manufacturing	9,67	9,32	182
Machinery Manufacturing	6,81	7,41	460
Computer and Electronic Product Manufacturing	6,02	6,28	200
Transportation Equipment Manufacturing	8,50	7,45	522
Furniture and Related Product Manufacturing	8,62	6,94	115
Miscellaneous Manufacturing	6,82	5,37	200
Wholesale Trade, Nondurable Goods	6,46	5,84	295
Motor Vehicle and Parts Dealers	5,53	6,01	350
Building Material and Garden Equipment	6,43	6,93	207
Food and Beverage Stores	7,62	7,73	369
Gasoline Stations	3,98	4,47	54
Sporting Goods, Hobby, Book, and Music Stores	3,91	4,40	33
General Merchandise Stores	6,91	7,18	165
Nonstore Retailers	5,30	4,87	49
Air Transportation	7,64	7,57	134
Rail Transportation	12,90	7,29	47
Water Transportation	3,93	3,01	29
Truck Transportation	3,51	3,44	211
Support Activities for Transportation	6,02	5,59	56
Postal Service	14,70	10,34	108
Couriers and Messengers	5,79	6,10	392
Motion Picture and Sound Recording Industries	6,08	5,13	71
Information Services and Data Processing Services	5,79	6,04	222
Credit Intermediation and Related Activities	4,52	3,41	63
Securities, Commodity Contracts, and Other Financial Investments	5,65	5,72	186
Real Estate	5,14	5,21	225
Professional, Scientific, and Technical Services	5,74	6,02	1108
Administrative and Support Services	4,48	5,43	651
Waste Management and Remediation Services	5,96	7,19	57
Educational Services	7,15	5,89	725
Ambulatory Health Care Services	4,94	4,84	255
Hospitals	6,29	6,10	319

Industry	Mean Tenure	Sd Tenure	Obs.
Nursing and Residential Care Facilities	4,79	6,02	99
Social Assistance	5,35	3,75	65
Performing Arts, Spectator Sports, and Related Industries	10,80	8,02	21
Museums, Historical Sites, and Similar Institutions	5,95	5,81	36
Amusement, Gambling, and Recreation Industries	5,21	5,69	210
Accommodation	4,02	5,60	124
Repair and Maintenance	5,01	5,43	576
Personal and Laundry Services	5,18	5,26	144
Religious, Grantmaking, Civic, Professional, and Similar Organizations	5,94	5,31	131
Private Households	1,78	1,70	11
Executive, Legislative, and Other General Government Support	10,80	7,74	167
Administration of Human Resource Programs	12,90	10,35	41
Administration of Environmental Quality Programs	11,40	8,09	108
National Security and International Affairs	9,84	6,84	122

Table 1. Summary Statistics

This table provides the summary statistics for the variables used in the empirical analysis.
The variables described are as follows: *Left-Joined* is the difference between the year the manager left the firm minus the year the manager joined the firm. *Became-Joined* is the difference between the year the manager became CEO and the year she joined the firm. *Internal* is a dummy variable that takes value one if the manager was internally promoted, zero otherwise. *Total Compensation* is the logarithm of total compensation. *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. *Executive Tenure* is the number of years the executive has been in that position. *Rec* is a dummy variable that takes value one if that industry is in recession, zero otherwise. *External Hire Cost* is the cost of hiring en external manager due to the enforceability of the no compete agreemets *Skill Specificity High* is the average industry tenure of above average industry paid non-managerial employees. The dataset covers the period from 1992 to 2008.

	Observations	Mean	Std Dev	Min	Max
Left-Joined	2146	9.885	11.458	0.000	59.000
Became-Joined	2361	5.354	9.661	0.000	45.000
Internal	4204	0.541	0.498	0	1
Total Comp	54904	6.942	1.121	0	13.393
Skill Specificity	54904	6.619	2.298	0.154	12.107
Market Cap	54904	7.724	1.611	0.169	11.319
Herfindahl index	54904	0.050	0.055	0.005	1.000
Returns	54904	0.026	0.494	-1.788	3.437
Homogeneity	54904	0.680	0.180	0.363	1.017
GIM Index	54904	9.327	2.644	1	19
Executive Tenure	54904	2.555	2.751	0	17
Rec	54904	0.238	0.426	0	1
External Hire Cost	1434	0.056	0.077	0	0.406
Skill Specificity High	44866	8.405	2.723	3.717	13.763

Table 2. Relevance of non-managerial employee tenure

This table provides evidence on the relevance of my measure of skills specificity: non-managerial employee tenure. I regress the maximum tenure for each firm-manager-position match on non-managerial tenure and other controls. The variables employed are as follows: *Left-Joined* is the difference between the year the manager left the firm minus the year the manager joined the firm. *Became-Joined* is the difference between the year the manager became CEO and the year she joined the firm. *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. Columns (1) and (2) include all executives while columns (3), (4) and (5) include only CEOs. Column (5) includes only industries that have decreased the average number of firm employees during the sample period. All regressions include year dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Dep	Left-Joined	Left-Joined	Became-Joined	Became-Joined	Became-Joined
Executives	ALL	ALL	CEOs	CEOs	CEOs
Skill Specificity	**0.841****	**0.739***	**0.715*****	**0.578****	**0.534****
	(0.371)	**(0.367)**	**(0.193)**	**(0.230)**	**(0.240)**
Market Cap		2.075***		1.895***	1.800***
		(0.292)		(0.242)	(0.283)
Herfindahl index		-4.535		-2.063	-14.00
		(8.933)		(7.768)	(13.31)
Returns		0.0386		1.583	1.210
		(0.507)		(1.179)	(1.273)
Homogeneity		4.629		4.493*	1.580
		(2.891)		(2.601)	(2.953)
GIM Index		0.284**		0.344**	0.335*
		(0.138)		(0.149)	(0.164)
Observations	2146	1146	2361	843	585
R-squared	0.023	0.179	0.026	0.181	0.159

Table 3. Executive Replacements and Compensation

This table provides evidence on the executive replacement and compensation dependence on the importance of skill specificity. I estimate the probability of internal turnover using a logit model and regress the total compensation on my measure of skills specificity and other controls.
The variables employed are as follows: *Internal* is a dummy variable that takes value one if the manager was internally promoted, zero otherwise. *Total Compensation* is the logarithm of total compensation. *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. Columns (1) and (2) include all executives, column (3) includes all executives internally promoted. Columns (4) and (5) include only CEOs and column (6) includes only internally promoted CEOs. All regressions include year dummies and, for columns (1) to (3), position dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var.	Internal	Total Comp	Total Comp	Internal	Total Comp	Total Comp
Executives	ALL	ALL	ALL Internal	CEOs	CEOs	CEOs Internal
Skill Specificity	**0.0538****	**-0.0640****	**-0.0648*****	**0.0570***	**-0.0603****	**-0.0604*****
	(0.0260)	**(0.0246)**	**(0.0224)**	**(0.0318)**	**(0.0242)**	**(0.0217)**
Market Cap	0.190***	0.417***	0.453***	0.177***	0.458***	0.453***
	(0.0224)	(0.0115)	(0.0169)	(0.0427)	(0.0135)	(0.0218)
Herfindahl index	-0.447	1.088	0.801	-0.481	0.920	1.838*
	(1.280)	(0.806)	(0.970)	(2.267)	(0.876)	(0.921)
Returns	0.174**	0.0352	0.0161	-0.169	0.0122	0.0154
	(0.0879)	(0.0280)	(0.0480)	(0.196)	(0.0370)	(0.0839)
Homogeneity	0.483*	-0.600***	-0.480**	0.549	-0.555***	-0.568***
	(0.253)	(0.194)	(0.196)	(0.401)	(0.199)	(0.207)
GIM Index	0.0708***	0.00268	-0.00122	0.0606***	0.0207***	0.0158*
	(0.0154)	(0.00626)	(0.00765)	(0.0214)	(0.00662)	(0.00839)
Observations	4204	54904	10246	1369	9713	4315
Pseudo/R-squared	0.1160	0.510	0.501	0.086	0.392	0.410

Table 4. Differential impact of executive tenure

This table provides evidence on the differential impact of executive tenure on compensation with respect to the importance of skills specificity.
The variables employed are as follows: *Total Compensation* is the logarithm of total compensation. *Skill Specificity* is the average industry tenure of non-managerial employees. *Executive Tenure* is the number of years the executive has been in that position. *External* is a dummy variable that takes value one if the manager was externally appointed, zero otherwise. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. In each specification, I report the effect on compensation of a marginal increase in tenure for the industries where skill specificity is the lowest decile (*Low Skill Specificity*) and in the top decile (*High Skill Specificity*). Columns (1) and (2) include all executives an columns (3) and (4) include only CEOs. All regressions include year and position dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)
	Total Comp	Total Comp	Total Comp	Total Comp
Executives	ALL	ALL	CEOs	CEOs
Skill Specificity * Executive Tenure	**0.00384***	**0.00374***	**0.00312***	**0.00312***
	(0.00217)	**(0.00207)**	**(0.00183)**	**(0.00179)**
Skill Specificity * Executive Tenure*External		-0.00137		-0.000119
		(0.00465)		(0.00253)
Executive Tenure	-0.0192	-0.0162	-0.0267**	-0.0219*
	(0.0167)	(0.0162)	(0.0124)	(0.0119)
Skill Specificity	-0.0780**	-0.0776**	-0.0895***	-0.0880***
	(0.0313)	(0.0309)	(0.0315)	(0.0312)
Skill Specificity * External	0.0274**	0.0276	0.0360***	0.0338*
	(0.0132)	(0.0178)	(0.0131)	(0.0200)
External	0.0407	0.130	-0.117	-0.0350
	(0.0751)	(0.101)	(0.0872)	(0.146)
Executive Tenure*External		-0.0309		-0.00853
		(0.0308)		(0.0168)
Market Cap	0.420***	0.421***	0.461***	0.461***
	(0.0115)	(0.0115)	(0.0139)	(0.0136)
Herfindahl index	1.034	1.034	1.068	1.053
	(0.899)	(0.900)	(1.012)	(1.006)
Returns	0.0367	0.0372	0.00897	0.00911
	(0.0284)	(0.0284)	(0.0356)	(0.0356)
Homogeneity	-0.587***	-0.586***	-0.501**	-0.508**
	(0.194)	(0.194)	(0.195)	(0.199)
GIM Index	0.00297	0.00300	0.0183***	0.0183***
	(0.00612)	(0.00612)	(0.00674)	(0.00669)
Observations	54904	54904	9326	9326
R-squared	0.514	0.514	0.396	0.397
Marginal Effect of Executive Tenure				
Low Skill Specificity	-0.00241	-0.00355	-0.01301	-0.01143
High Skill Specificity	0.018278	0.015868	0.003781	0.005166

Table 5. External Premium

This table provides evidence on the interaction between the differential impact of skills specificity and the external premium. I regress total compensation on my measure of firm specific skills interacted with an external dummy and other controls.
The variables employed are as follows: *Total Compensation* is the logarithm of total compensation. *External* is a dummy variable that takes value one if the manager was externally appointed, zero otherwise. *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. Columns (1), (3) and (5) include all executives and columns (2), (4) and (6) include only CEOs. All regressions include year dummies and, for columns (1), (3) and (5), position dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Total Comp	Total Comp	Total Comp	Total Comp	Total Comp	Total Comp
Executives	ALL	CEOs	ALL	CEOs	ALL	CEOs
External *Skill Specificity			**0.0410***	**0.0385*****	**0.0319***	**0.0319*****
			(0.0209)	**(0.0119)**	**(0.0169)**	**(0.00852)**
Skill Specificity			-0.0578**	-0.0694***		
			(0.0224)	(0.0239)		
External	0.184***	0.0825***	0.0573	-0.144*	0.0206	-0.143**
	(0.0179)	(0.0217)	(0.0805)	(0.0808)	(0.110)	(0.0628)
Market Cap	0.423***	0.463***	0.446***	0.460***	0.456***	0.474***
	(0.00755)	(0.0128)	(0.0156)	(0.0138)	(0.0115)	(0.0139)
Herfindahl index	-0.570	-1.105**	0.847	0.934	-0.351	
	(0.370)	(0.438)	(0.763)	(0.882)	(0.372)	
Returns	0.0397*	0.0219	0.0104	-0.00148	0.00694	0.00408
	(0.0209)	(0.0321)	(0.0295)	(0.0380)	(0.0264)	(0.0372)
Homogeneity			-0.490**	-0.540***		
			(0.183)	(0.194)		
GIM Index	0.00536	0.0187***	0.0102	0.0221***	0.00975*	0.0181***
	(0.00349)	(0.00522)	(0.00659)	(0.00650)	(0.00569)	(0.00634)
Industry dummies?	Y	Y	N	N	Y	Y
Observations	22712	10082	22712	9081	25220	10082
R-squared	0.518	0.432	0.488	0.391	0.519	0.434

Table 6. Economic Conditions

This table provides evidence on the interaction between the economic conditions and the importance of skills specificity on the probability of internally promoting a manger.
The variables employed are as follows: *Internal* is a dummy variable that takes value one if the manager was internally promoted, zero otherwise. *Rec* is a dummy variable that takes value one if that industry is in recession, zero otherwise. *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. All regressions include year dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Dep Var.	Internal	Internal	Internal	Internal	Internal
Method	Logit	Logit	Logit	Linear	Linear
Economic Conditions	All	Rec=0	Rec=1	All	All
Rec*Firm Specific	-1.438***			-0.283**	-0.273**
	(0.468)			(0.108)	(0.108)
Firm Specific	0.992***	1.119***	-0.743	0.191**	
	(0.362)	(0.357)	(0.587)	(0.0716)	
Rec	0.820***			0.162**	0.158**
	(0.295)			(0.0654)	(0.0668)
Market Cap	0.186***	0.179***	0.222***	0.0392***	0.0368***
	(0.0208)	(0.0290)	(0.0579)	(0.00455)	(0.00546)
Herfindahl index	0.630	2.166	-5.508**	0.141	0.380
	(1.541)	(1.548)	(2.601)	(0.314)	(0.291)
Returns	0.180*	0.191**	0.131	0.0420*	0.0396**
	(0.0922)	(0.0939)	(0.201)	(0.0211)	(0.0197)
Homogeneity	0.422	0.449	0.315	0.0880	
	(0.263)	(0.292)	(0.430)	(0.0555)	
GIM Index	0.0691***	0.0700***	0.0623**	0.0146***	0.00980***
	(0.0163)	(0.0179)	(0.0291)	(0.00349)	(0.00271)
Indsutry Dummies?	N	N	N	N	Y
Observations	4070	3293	775	4070	4487
R-squared	0.115	0.122	0.083	0.136	0.156

Table 7. No Compete Agreements

This table provides evidence on the interaction between the enforceability of the no compete agreements and the importance of skill specificty on the probability of internally promoting a manger. I estimate a logit model and a linear probability model with interactive effects.
The variables employed are as follows: *Internal* is a dummy variable that takes value one if the manager was internally promoted, zero otherwise. *External Hire Cost* is the cost of hiring en external manager due to the enforceability of the no compete agreement *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. All regressions include year dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)
Methodoly	Logit	OLS	OLS
Dep Var.	Internal	Internal	Internal
External Hire Cost* Firm Specific	**-5.264***	**-1.102***	**-0.330**
	(2.833)	**(0.551)**	**(1.078)**
External Hire Cost	2.700**	0.543*	-0.0457
	(1.349)	(0.278)	(0.547)
Firm Specific	1.073**	0.218**	
	(0.442)	(0.0900)	
Market Cap	0.185***	0.0392***	0.0379***
	(0.0249)	(0.00521)	(0.00564)
Herfindahl index	0.219	0.0786	0.403
	(1.519)	(0.303)	(0.402)
Returns	0.173*	0.0399*	0.0402*
	(0.101)	(0.0230)	(0.0224)
Homogeneity	0.305	0.0649	
	(0.321)	(0.0671)	
GIM Index	0.0776***	0.0162***	0.0128***
	(0.0182)	(0.00383)	(0.00296)
Industry Dummies?	N	N	Y
Observations	3546	3559	3734
(Pseudo) R-squared	0.117	0.142	0.168

Table 8. Replacement Frequency

This table provides evidence on the frequency of replacement across industries with different importance of skills specificty using duration models.
The variables employed are as follows: *External* is a dummy variable that takes value one if there is en external appointment, zero otherwise. *Turnover* is a dummy variable that takes value one if there is turnover, zero otherwise. *Skill Specificity* is the average industry tenure of non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. All columns include only CEOs. All specifications include year dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)
Model	Exponential	Cox	Exponential	Cox
Failure	External	External	Turnover	Turnover
Skill Specificity	**-0.0688***	**-0.0713***	**0.0806*****	**0.102*****
	(0.0356)	**(0.0392)**	**(0.0244)**	**(0.0303)**
Market Cap	-0.222***	-0.244***	0.117***	0.133***
	(0.0552)	(0.0592)	(0.0356)	(0.0410)
Herfindahl index	-3.038	-3.160	-0.351	-0.151
	(2.862)	(3.169)	(1.461)	(1.660)
Returns	0.264***	0.265***	-0.0630	-0.0653
	(0.0982)	(0.0962)	(0.127)	(0.127)
Homogeneity	-0.642	-0.759	-0.613**	-0.474
	(0.480)	(0.528)	(0.278)	(0.298)
GIM Index	-0.101***	-0.112***	0.0396*	0.0411
	(0.0239)	(0.0237)	(0.0225)	(0.0255)
Observations	5344	5344	4411	4411

Table 9. Executive Replacements and Compensation - Robustness

This table provides evidence on the executive replacement and compensation dependence on the importance of skill specificity. I estimate the probability of internal turnover using a logit model and regress the total compensation on my alternative measure of skill specificity and other controls.
The variables employed are as follows: *Internal* is a dummy variable that takes value one if the manager was internally promoted, zero otherwise. *Total Compensation* is the logarithm of total compensation. *Skill Specificity High* is the average industry tenure of above median paid non-managerial employees. *Market Cap* is the firm market capitalization, *Herfindahl Index* is the normalized Herfindahl Index, *Returns* is the industry de-meaned stock returns, *Homogeniety* is the similarity in stock returns as in Parrino (1997) and *GIM Index* is Gompers et al. (2003) governance index. Columns (1) and (2) include all executive, column (3) includes all executives internally promoted. Columns (4) and (5) include only CEOs and column (6) includes only internally promoted CEOs. All regressions include year dummies and, for columns (1) to (3), position dummies. Standard errors are reported in brakets and are clustered at the industry level. *, **, or *** indicates that the coefficient is statistically significantly different from zero at the 10%, 5%, or 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var.	Internal	Total Comp	Total Comp	Internal	Total Comp	Total Comp
Executives	ALL	ALL	ALL Internal	CEOs	CEOs	CEOs Internal
Skill Specificity High	0.0660***	-0.0727***	-0.0638***	0.0567	-0.0592***	-0.0510***
	(0.0229)	(0.0137)	(0.0107)	(0.0417)	(0.0145)	(0.0150)
Market Cap	0.164***	0.428***	0.467***	0.136***	0.470***	0.462***
	(0.0204)	(0.00845)	(0.0139)	(0.0367)	(0.0118)	(0.0214)
Herfindahl index	-3.990**	3.253***	3.740***	1.083	3.364***	4.648***
	(1.713)	(1.079)	(1.301)	(4.959)	(1.135)	(1.229)
Returns	0.253**	0.0303	-0.00542	-0.0907	8.47e-07	-0.0377
	(0.118)	(0.0310)	(0.0499)	(0.214)	(0.0426)	(0.0857)
Homogeneity	0.465	-0.597***	-0.547***	0.818	-0.713***	-0.751***
	(0.368)	(0.172)	(0.166)	(0.675)	(0.210)	(0.167)
GIM Index	0.0482***	-0.000193	-0.00567	0.0279	0.0151**	0.00553
	(0.0175)	(0.00490)	(0.00678)	(0.0287)	(0.00703)	(0.00878)
Observations	3333	44258	8403	1129	7831	3540
Pseudo/R-squared	0.1217	0.564	0.538	0.0936	0.452	0.433