

# **Rising Through the Ranks: The Evolution of the Market for Corporate Executives, 1936-2003**

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## **Abstract**

The market for managers from the 1930s to the 1970s was characterized by relatively stable pay and low inequality among executives. These patterns have reversed over the past three decades. To explain these trends, I propose that there has been a shift in the importance of skills from firm-specific to more general managerial skills for top executives and develop a simple framework where firms have asymmetric information on the composition of managerial skills. When general skills are important, a promotion to CEO reveals to outside firms that the individual may be a good match. However, a promotion does not convey the same information when only firm-specific skills are valuable. This shift leads to higher CEO pay, more inequality across top managers within the firm, and higher mobility of executives. To assess the implications of the model, I use biographical sources to construct a consistent panel dataset following the education, career paths, and compensation of top executives from 1936 to 2003. The rapid increase in business education and greater occupational mobility within the firm since the 1970s provide suggestive evidence of the growing importance of general skills. The predictions of the model regarding managerial turnover are confirmed by the data. The fraction of executives who worked at one corporation throughout their entire career was about 20 percentage points higher in the 1960s than in the 1990s.

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## 1. Introduction

In recent years, the soaring remuneration of top executives and the widening income gap between CEOs and other workers has stimulated an extensive literature concerning the absolute and relative levels of executive pay (Hall and Liebman 1998, Murphy 1999, Hall and Murphy 2003, Bebchuk and Fried 2004). Moreover, CEOs are now more likely to be replaced by outsiders than in the 1970s (Huson, Parrino, and Starks 2001). These trends in pay and external mobility of executives contrast sharply with those earlier in the century. The fraction of top managers who spent their entire career in one corporation was three times higher in 1950 than in 1900 (Newcomer 1955). Moreover, the average level of executive pay and inequality among managers were relatively stable from the 1930s to the 1960s (Frydman and Saks 2005a). In this paper, I analyze the role of the evolving market for corporate executives in explaining these long-run trends in the level of pay and the mobility of managers.<sup>1</sup>

The market for executives, I propose, has witnessed a shift toward general human capital from firm-specific managerial skills. I present a simple framework in which there is both an internal and external market for CEOs.<sup>2</sup> Firms know more about the composition of skills of inside candidates than do outside firms and a promotion to CEO reveals to outside firms that the individual is highly productive –all the more important when general skills are important. Large firms may find it attractive to replace their CEO

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<sup>1</sup> Although I ignore changes in the structure of pay in this paper, there is a sizable theoretical and empirical literature analyzing the effect of the market for managers on the correlation between pay and firm performance. See, for example, Fama (1980), Holmstrom (1982), Gibbons and Murphy (1992), Himmelberg and Hubbard (2000), and Frydman and Saks (2005b).

<sup>2</sup> The framework presented here is related to that in Murphy and Zábojník (2004a, 2004b). They also use a similar shift from specific to general managerial skills to explain the recent increase in CEO pay and turnover. While in their model there is perfect information about managerial ability, I consider the case where firms have asymmetric information on managerial skills. I explain how my model differs from theirs in more detail in Section 2.

with a high-ability outsider when executives have mainly general skills that are transferable across firms. However, a CEO of another firm is of little use to a competing firm when only specific skills are valuable. Thus, the outside option of CEOs and the probability of leaving the firm increase with the importance of general skills. The productivity of an executive is revealed if he is promoted to CEO, but outside firms have much less information on the individual performance of other managers. The asymmetry in information creates a compensation gap between CEOs and other top managers, which increases as general skills become more important.

In short, the combination of rising importance of general skills and asymmetric information increases the outside options and mobility of CEOs relative to past chief executives and to lower-ranked executives. Due to a decline in the monopsonistic power of firms and the better sorting of executives across firms, the model predicts a higher level of pay, higher within-firm inequality, higher variance in pay across corporations, and more mobility of managers across firms when the relative importance of general human capital increases. I assess these implications using data on executive compensation and the educational and job characteristics of individual executives across the twentieth century.

Throughout this study, I take the proposed shift in skills over the century as an exogenous process. Although a detailed analysis of the driving forces that caused a change in the types of managers exceeds the scope of the paper, several factors may have increased the demand for general managerial skills over the century. First, improvements in information and communication technology have increased the scope, scale, and complexity of firms and, consequently increased the relative value of general managerial

skills. Also, improvements in modern finance and strategic analysis have made general business skills more valuable. Hence, the increase in managerial human capital can be understood as part of a broader shift from apprentice-based knowledge to general skills acquired through formal schooling (Goldin and Katz 1999). Finally, the increasing industrial and geographic diversification of firms during the 1960s and 1970s can also explain a need for a CEO with higher general knowledge.<sup>3</sup>

The long-run evolution in executive pay and the career paths of managers are a complex phenomenon. There are, of course, many other factors (such as changes in tax policy, the market for corporate control, corporate governance, and an increase in the coordination of wage-setting policies across firms) that have probably contributed to the trends documented in this paper (Frydman and Saks 2005a, Bertrand and Mullainathan 1999, Bebchuk and Fried 2004, Hermalin 2005, Khurana 2004). However, none of them alone can explain the evolution of executive compensation, turnover, and the characteristics of managers over time. While proposing a simplified approach, the findings of this paper suggest that the labor market has played an important role as well.

The remainder of the paper is structured as follows. Section 2 presents a simple model on the effects of a shift in skills from specific to general on managerial pay and external mobility. Section 3 describes the long-run trends in executive pay in more detail. The dataset on managerial characteristics and the evolution of external mobility are described in Section 4. Section 5 provides verifying evidence of the change in skills and its implications for pay and mobility. Finally, Section 6 concludes.

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<sup>3</sup> Bertrand and Schoar (2003) find that CEOs with an MBA are also more likely to engage in diversifying acquisitions, providing suggestive evidence of a positive relationship between diversification and general managerial skills.

## 2. Theoretical Framework

The framework presented here to analyze the effect of a shift from specific to general human capital in the market for executives is related to that in Murphy and Zábojník (2004a, 2004b). They use a similar shift from specific to general managerial skills to explain the recent increase in CEO pay and turnover. Their model focuses on a firm's decision to hire externally versus promote internally when there is perfect information about managerial skills. In contrast, I consider both an internal and external market for CEOs. A key difference, then, is that firms have asymmetric information on the ability of managers. Thus, the framework presented in this paper also predicts an important trend in executive pay over the century: the rising inequality among top managers within a corporation.

The essential mechanism of this framework is as follows. When general human capital is more important, large firms endowed with low-ability managers have an incentive to poach high-ability CEOs from smaller firms because a large fraction of their skills are transferable across firms. Thus, a shift in the relative importance of general skills increases the outside option of CEOs and the mobility of managers across corporations. Furthermore, the distribution of executive pay widens because there is better sorting of managers across firms. Inequality among executives within firms also increases because the firm has more information about its executives' skills than outside firms. This informational advantage creates a compensation gap between CEOs and other top managers, which increases as general skills become more important.

*Timing, information, and basic structure*

Consider a finite number of firms, which differ by the productivity of their CEO. Managers have careers that last two periods, value only wages, and differ in their ability to acquire skills while on the job. Because actual managerial ability is uncertain and all potential managers look the same ex-ante, each firm is randomly assigned  $n$  managers at the beginning of period 1.

Each manager has a level  $g^*$  of general skills acquired before entering the company. During the first period, all managers go through an on-the-job learning process and acquire firm-specific and additional general human capital.<sup>4</sup> An executive is characterized by his ability to acquire skills  $a_i$ ,  $a_i \in [0,1]$ , which is initially unknown both to them and to the employers. The ability to accumulate skills during on-the-job training  $a_i$  is drawn from a uniform distribution. During the skill acquisition period, all managers exert the same amount of effort. At the end of the process, the skill level of individual  $i$  is  $s(\alpha, a_i) + g(\alpha, a_i)$ , where  $s(\cdot)$  and  $g(\cdot)$  represent the amount of firm-specific and general skills acquired by the manager while learning on the job.<sup>5</sup> The parameter  $\alpha$  measures the relative importance of general and specific human capital, and it is the same for all firms.<sup>6</sup> Firms design the process of on-the-job training so that managers accumulate more general human capital when general skills are relatively more important (i.e., for higher levels of  $\alpha$ ).<sup>7</sup> Thus, I assume that  $g(0, a_i) = 0 \forall i$ ,  $\frac{\partial g(\cdot)}{\partial \alpha} > 0$ , and

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<sup>4</sup> For simplicity, and because it does not add any additional insight, I ignore firms' cost of training executives.

<sup>5</sup> Throughout the rest of the section, I often use  $s_i$  and  $g_i$  to denote the amount of specific and general-human capital accumulated by individual  $i$ , respectively.

<sup>6</sup> Relaxing this assumption to let  $\alpha$  vary across industries or firms would not alter the main results of the paper. What is necessary is that  $\alpha$  is known by outside firms or at least predictable.

<sup>7</sup> To understand these assumptions, imagine that managers can perform tasks that give them either knowledge specific to the firm or general managerial skills. Then, the firm requires managers to perform

$\frac{\partial s(.)}{\partial \alpha} < 0$ .<sup>8</sup> Moreover,  $\frac{\partial s(.)}{\partial a_i} > 0$  and  $\frac{\partial g(.)}{\partial a_i} > 0$ , as more able individuals acquire both

more specific and general human capital when expending the same effort.

In this framework, all managers acquire more general skills for higher levels of  $\alpha$ . However, I assume that individuals at the top of the ability distribution will be able to gather more general skills relative to lower ability managers as  $\alpha$  increases. The total amount of general human capital obtained by person  $i$  at the end of period 1 is given by  $g = g^* + g(\alpha, a_i)$ , where  $g(\alpha, a_i) = \alpha a_i$ .<sup>9</sup>

At the end of the training process, each firm observes the level of skills (and thus, the individual learning ability) of its managers. Each firm needs to fill a CEO vacancy and  $(n-1)$  division-head positions during the second period. Thus, after the pool of skills is revealed, the firm decides whom to promote to the CEO position. I restrict the analysis to the case where firms promote the best internal candidate to fill the CEO vacancy after information is revealed at the end of period 1.<sup>10</sup> The remaining managers are assigned to

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mainly tasks specific to the firm when specific skills are more valuable (i.e., for low levels of  $\alpha$ ). On the other hand, they spend most of the training process acquiring general knowledge when  $\alpha$  is relatively high.

<sup>8</sup> The results of the model are robust to relaxing this last assumption to  $\frac{\partial s(.)}{\partial \alpha} < \frac{\partial g(.)}{\partial \alpha}$ .

<sup>9</sup> To avoid corner solutions and have decreasing returns to acquiring skills, I assume that  $\alpha$  has an upper bound  $\bar{\alpha} < +\infty$

<sup>10</sup> Because the difference in productivity between the CEO and other top executives is large ( $\theta > 1$ ), rent-sharing between CEOs and firms gives firms some incentives to promote their best internal candidate to the CEO position. Promotions may still be inefficient if the likelihood that the CEO will be poached by another firm is large. When promoting the top candidate, the probability of losing the CEO for a small firm with an extremely good draw may be large enough that the firm would rather keep the executive to head a division and promote the second best individual. Firms will have incentives to promote efficiently if the assumption that they can only hire in the external labor market when the CEO is poached is relaxed. In that case, firms will have the option of promoting the second best manager later. Efficient internal promotions can also be justified by assuming that division heads sabotage the firm if they observe that the internal CEO has lower ability than they do. When the cost of destructive activities is high enough, firms find it more profitable to promote the individual with highest ability even though he may be poached by another firm. For simplicity, I abstract from these problems and focus on the case of efficient promotions.

manage a division. For simplicity, I assume that only specific skills are valuable for non-CEOs if they remain as division heads of the incumbent firm.

I assume that the skill level of the internal candidate to fill the CEO vacancy becomes public information to all firms.<sup>11</sup> However, outside firms have no information about the internal ranking and level of human capital of non-CEOs of other companies. After the information is revealed, outside firms make offers to the managers of other companies. Because only firm-specific skills are valuable for non-CEOs, outside firms have no incentives to hire outsiders in order to replace division heads. Managers leave the initial firm when an outsider makes them an offer to become CEO of another corporation that exceeds the compensation set by the incumbent firm. To fill a vacated position, the firm must go to the outside market if the internal manager leaves. Top executives are then sorted across firms and production takes place.

#### *Productivity of CEOs and other top management across firms*

Prior to the (random) assignment of managers to firms, companies differ only in the marginal productivity that an individual would have by occupying the CEO position. Let  $\theta_k$  denote the productivity of a CEO in firm  $k$ , where  $\theta_k \in [\underline{\theta}, \bar{\theta}]$  and  $\underline{\theta} > 1$ . Although I will loosely refer to  $\theta$  as firm size, the parameter should measure a variety of factors that influence the sensitivity of profits to CEO ability. Moreover, I assume that there are a large number of firms in the economy for each level of  $\theta$ .<sup>12</sup>

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<sup>11</sup> This assumption is partly for simplicity, as the model can be extended to the case where outside firms observe the productivity of the CEO with some error. Then, only some information would be revealed by the job assignment process, as discussed by Waldman (1984).

<sup>12</sup> This assumption is only relevant to determine the level of wages for the CEOs at a firm of size  $\bar{\theta}$ .

Consider a firm of size  $k$  which promotes an insider with ability  $a_i$  to the CEO position and assigns managers with abilities  $\{a_j\}_{j \neq i}^{n-1}$  to head the divisions. The total product of the firm is given by:

$$q_k = \theta_k (s_i + g_i + g^*) + \sum_{j \neq i}^{n-1} s_j \quad [1]$$

where the first term represents the total product of the CEO and the second term measures the firm-specific productivity of non-CEOs.<sup>13</sup>

Firm-specific skills are only valuable at the firm where they were acquired. However, the general component of human capital is transferable across firms. Hence, the total output of a CEO  $i$  is given by  $\theta_k (s_i + g_i + g^*)$  if he stays at the firm  $k$  that he was originally assigned to but his productivity is  $\theta_{k'} (g_i + g^*)$  if he leaves in order to lead company  $k'$ . Similarly, the productivity of a non-CEO  $j$  is  $s_j$  if he stays and  $\theta_{k''} (g_j + g^*)$  if he leaves in order to lead company  $k''$ .

#### *Job assignment decisions and wage determination*

To solve for the (partial) equilibrium wages, consider the case where firms can share at most a fraction  $(1-\rho)$  of the value of the marginal product of labor of the CEO  $\theta_k (s_i + g_i + g^*)$  with him,  $\rho \in (0, 1)$ .<sup>14</sup> In this case, a large firm that had bad luck in the draw of ability may be willing to replace its CEO (even though that implies losing rents associated with his specific component of human capital) to hire an executive who has a higher total level of skills.

<sup>13</sup> For simplicity, I ignore production workers.

<sup>14</sup> It is likely that firms are able to extract some rents from the productivity of CEOs. However, the basic predictions of the model are robust to modifying the model to allow for free entry of firms (and thereby zero profits) if some firms experience exogenous separations of CEOs.

Denote the market wage of individual  $i$  promoted to CEO in firm  $k$  by  $w_{CEO_i}$ . Because the ability of individual  $i$  is publicly observed, competing firms know the amount of general skills acquired by the executive. Then, a firm  $k'$  with  $\theta_{k'} > \theta_k$  is willing to offer its CEO position to individual  $i$  if  $g_i > (s_l + g_l)$ , where person  $l$  denotes the internal candidate to CEO of firm  $k'$ . Thus, high  $\theta$  firms (e.g. bigger firms) that had a bad draw will poach executives from low  $\theta$  firms (e.g. smaller firms) that had a good draw of ability. Note that firms of many sizes may be interested in hiring executive  $i$ . Because the size of firms is observable, the relevant outside option for person  $i$  is given by the largest outside firm that is bidding for the CEO. Denote such firm as  $k'$  and recall that the firm offers person  $i$  a share  $(1-\rho)$  of the VMPL of the CEO. Then, executive  $i$  leaves firm  $k$  if  $(1-\rho)\theta_{k'}(g^*+g_i) > (1-\rho)\theta_k(s_i + g_i + g^*)$ . Thus, the condition for CEO turnover is:

$$(\theta_{k'} - \theta_k)(g^* + g_i) > \theta_k s_i \quad [2]$$

Therefore, the outside option of CEO  $i$ , and therefore his compensation, is given by:<sup>15</sup>

$$w_{CEO_i} = (1-\rho)\theta_{k'}(g^* + g_i) \quad [3]$$

Outside firms do not have information on the exact ability of non-CEOs. However, they can update their prior on the amount of general skills of non-CEOs given the observed ability of the CEO-elect if internal promotions are efficient. Consider firm  $k$ , and let individual  $i$  have the highest ability level  $a_i$  among its first-period managers. Because of asymmetric information, competitor firms only know that the remaining  $(n-1)$  managers have ability lower than  $a_i$  when person  $i$  is promoted to CEO. Recall that

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<sup>15</sup> Because there are multiple firms of each size and they differ on the distribution of ability, the relevant market for the CEO promoted at a firm  $\theta = \bar{\theta}$  is given by the other largest firms in the economy. Thus,  $w_{CEO_i} = (1-\rho)\bar{\theta}(g^* + g_i)$  for internal candidates at the largest firms.

competitor firms only value the general component of skills. Let firm  $k''$  (where  $\theta_{k''} < \theta_{k'}$ ) denote the largest firm willing to make an offer to a non-CEO  $j$  of firm  $k$ . The outside option (and therefore the market wage) of non-CEO  $j$  in a firm that promoted individual  $i$  to CEO is given by:

$$w_{non-CEO\ ji} = (1 - \rho)\theta_{k''} (g^* + E[g_j(\alpha, a_j) | a_j \leq a_i]) \quad [4]$$

Firms want to retain their non-CEOs because only the firm-specific component of their skills is valuable. Thus, the firm retains any non-CEO for which:

$$(1 - \rho)\theta_{k''} (g^* + E[g_j(\alpha, a_j) | a_j \leq a_i]) < s_j \quad [5]$$

Thus, the condition for non-CEO turnover is:

$$w_{non-CEO\ ji} \geq s_j \quad [6]$$

### *Predictions of the model*

The goal of this simple model is to provide a framework to understand how the market for top executives responds to the growing importance of general skills over time. Thus, the relevant comparative static is the response of wages, inequality and mobility of executives to an increase in  $\alpha$ . To provide some intuition, I start by considering the base case when only firm-specific skills are valuable (i.e.  $\alpha = 0$ ). Note that CEOs do not generally receive outside offers that are attractive in this case, as  $g(0, a_i) = 0$  and

$\frac{\partial s(\cdot)}{\partial \alpha} < 0$  in equation [2]. Thus, CEO  $i$  of firm  $k$  leaves if:

$$\frac{(\theta_{k'} - \theta_k)g^*}{\theta_k} > s_i \quad [7]$$

For a given distribution of learning ability and firm size, inequality [7] is less likely to hold in the base case  $\alpha = 0$  than for higher levels of  $\alpha$  because the amount of specific

skills is decreasing in  $\alpha$ <sup>16</sup> Moreover, because  $g^*$  is the same for all executives, firms never find it profitable to make an offer to an outsider, as they can extract rents on the specific component of human capital of their internal candidate. So CEOs remain at their initial firms, and their pay is given by:<sup>17</sup>

$$w_{CEO_i} = (1 - \rho)\theta_k g^* \quad [8]$$

Similarly, the wage for non-CEOs is given by:

$$w_{non-CEO_{ji}} = (1 - \rho)\theta_k (g^* + E[g_j(\alpha, a_j) | a_j \leq a_i]) = (1 - \rho)\theta_k g^* \quad [9]$$

Consequently, within-firm inequality in firm  $k$  is equal to:

$$ineq_k = \frac{w_{CEO_i}}{w_{non-CEO_{ji}}} = 1 \quad [10]$$

Then, dispersion in pay is given by

$$Var(w_{CEO_i}) = Var(w_{non-CEO_{ji}}) = ((1 - \rho)g^*)^2 Var(\theta_k) \quad [11]$$

Equations [7] to [11] suggest that the levels of pay, inequality within and between firms, and the external mobility of managers are at its lowest level in the base case. The following proposition formalizes this idea, and shows that trends in these variables are increasing in the importance of general human capital.

*Proposition 1.* For a given distribution of learning abilities  $a_j$  across firms, an increase in the relative importance of general skills  $\alpha$  is characterized by:

(a) more turnover,  $\frac{\partial \Pr(\text{manager leaves intital firm})}{\partial \alpha} > 0$

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<sup>16</sup> In fact, turnover is actually zero in the base case if  $\frac{(\bar{\theta} - \underline{\theta})g^*}{\underline{\theta}} < s(0, \bar{a})$  holds.

<sup>17</sup> Alternatively, CEOs and non-CEOs could be paid an outside option  $w$  to retain them in the firm. In this case, the main results would not be altered.

(b) higher compensation for both CEOs and non-CEOs,  $\frac{\partial w_{CEO_i}}{\partial \alpha} > 0$  and  $\frac{\partial w_{non-CEO_{ji}}}{\partial \alpha} > 0$

(c) greater inequality among managers within the firm,  $\frac{\partial (w_{CEO_i} / w_{non-CEO_{ji}})}{\partial \alpha} > 0$

(d) greater inequality among all managers,  $\frac{\partial Var(w_{CEO_i})}{\partial \alpha} > 0$  and  $\frac{\partial Var(w_{non-CEO_{ji}})}{\partial \alpha} > 0$

*Proof:* See Appendix 1.

Thus, the model predicts a higher level of pay as general human capital becomes more important. Although compensation is increasing in  $\alpha$  for both CEOs and non-CEOs in period 2, informational asymmetries imply that the rate of growth is faster for CEOs. Then, the inequality among managers within the firm increases with  $\alpha$ . Moreover, managerial turnover also increases as a higher fraction of skills are transferable across firms. Finally, better sorting for CEOs in period 2 leads to a widening in the distribution of income across all executives.

### 3. Long-run trends in executive compensation

The framework presented in the previous section has implications for the trends in executive pay and interfirm mobility. Specifically, the model predicts that the average level of executive pay, the inequality across executives within and between firms, and managerial turnover will increase with the relative importance of general skills. The levels of pay and inequality across managers were relatively low from the late 1930s to the mid-1970s and have soared since then (Frydman and Saks, 2005a).<sup>18</sup> Thus, the evolution of executive pay is consistent with higher levels of firm-specific skills during

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<sup>18</sup> Frydman and Saks (2005a) discuss the long-run trends in executive pay and the effect of other factors on executive compensation, in more detail than the brief account given in this paper.

earlier decades and increasing importance of general human capital since the 1970s. To provide further evidence on these trends, in this section I describe the long-run changes in executive compensation in more detail.

### **3.1 Sample selection and data description**

I use information from a consistent panel dataset that follows the compensation of the three highest-paid executives in the 50 largest publicly-owned corporations in 1960 according to the value of sales from 1936 to 2003.<sup>19</sup> From 1936 to 1991, the data was collected from proxy statements and 10-K reports available in the collection at Baker Library of Harvard Business School.<sup>20</sup> The information was supplemented with data from Compustat's Executive Compensation database from 1992 to 2003. Using biographical sources, I have obtained information on the educational and job background characteristics of these officers. Thus, I relate the compensation of top executives with changes in the characteristics of these managers later in the paper.

Although the data on managerial pay used in this paper correspond to the 50 largest firms in 1960, the trends are consistent with those described in Frydman and Saks (2005a) for the 50 largest firms in 1940, 1960, and 1990 (a total of 102 corporations). Moreover, the trends in the absolute and relative level of executive compensation are also robust to restricting the sample to the 708 managers with available biographical information.

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<sup>19</sup> The majority of the sample (about 75 percent) is composed of manufacturing firms, with many automobile producers, airplane manufacturers and oil companies. In addition the sample contains communications and retail companies. A complete list of the firms in the sample is given in Appendix Table 1.

<sup>20</sup> Occasionally, corporate reports were missing in the collection at Baker Library. Whenever available, we completed this information with proxy statements from Thompson Research database and Lexis-Nexis.

### 3.2 Changes in the level of pay and inequality among managers

The most striking finding about the time series of average real executive compensation from 1936 to 2003 is that there was relative stability from the late 1930s to the 1940s, then slow growth from 1950 to the mid-1970s.<sup>21</sup> The sudden increase and soaring levels of executive compensation do not begin until the late 1970s. The time series is shown in Figure 1 where total compensation is decomposed into three major types of remuneration: salaries and current bonuses, long term bonus payments, and stock option grants.<sup>22</sup> The short-dashed line shows the value of salaries plus any bonus that was both awarded and paid out within the same year, or *current* direct compensation. The long-dashed line adds the amount paid to each executive as part of a deferred bonus or long-term incentive payment (the sum of current direct compensation and deferred bonuses is defined as *total* direct compensation). Finally, the solid line adds the Black-Scholes value of stock option grants.

The long-run trends in total executive pay have been similar for CEOs and non-CEOs (see Figure 2). The growth in compensation was relatively slow for both groups until the mid-1970s but their level of managerial pay has grown at a fast rate since then. However, as predicted by the model, the growth in managerial pay has been more pronounced for CEOs. While the average CEO earned 34 percent more than non-CEOs in 1975, CEO-pay was twice as high as that of non-CEOs by the end of the sample in 2003.

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<sup>21</sup> The stability in the average level of pay was interrupted by a sharp contraction during War World II. This sharp change can probably be attributed to the salary controls imposed during the war period.

<sup>22</sup> Real values are measured in year 2000 dollars using the Consumer Price Index. See Frydman and Saks (2005a) for a detailed description of the compensation variables.

Similar to the trend in overall compensation, the distribution of income among all top managers changed across the century. Table 1 shows the level of pay at the 10<sup>th</sup>, 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> percentiles of the executives in the sample. The distribution of executive compensation was compressed during the war period, and then remained stable until the 1970s. After the 1970s, the distribution of compensation widened even though the level increased at all points in the distribution. The most highly-paid executives experienced faster compensation growth during the 1980s and 1990s. In 2003, the executive at the 90<sup>th</sup> percentile earned about 16 times more than the executive at the 10<sup>th</sup> percentile, more than three times the ratio prior to the war.

Differences in pay within the firm follow similar trends to those generally. Table 2 compares the compensation of the highest-paid executive in each firm to the compensation of the 3<sup>rd</sup> and 5<sup>th</sup> highest-paid executives, and CEO pay relative to the average compensation of the two highest-paid officers other than the chief executive.<sup>23</sup> Within-firm inequality experienced a slow but steady compression from the 1930s to the 1960s. Disparities in compensation within the firm began to increase in the 1970s, and have widened even more since 1990. The remuneration of the highest-paid officer compared with the 3<sup>rd</sup> highest in the 2000 to 2003 period was about 65 percent greater than in the pre-World War II period.

#### **4 . The evolution of managerial careers**

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<sup>23</sup> The theoretical framework emphasizes the ratio of CEO to other top management pay as a measure of within-firm inequality. However, the title of CEO was not commonly used in the past, and so it is difficult to identify the chief executive in earlier decades. When examining relative CEO pay, the chief officer is identified as the president of the company in firms where the title “CEO” is not used (Mace, 1971). Although not directly derived from the model, comparisons of officers by income rank have the advantage of allowing for a consistent definition over time.

The long-run trends in executive pay seem consistent with a shift in the importance of specific skills during earlier decades towards general human capital becoming increasingly relevant since the mid-1970s. But how has interfirm mobility changed over time? To be consistent with the proposed shift in skills and the documented trends in compensation, the external mobility of executives should have been low earlier in the century and increased since the 1970s. This section makes use of data on the career histories of executives to verify the trends in turnover over time.

#### **4.1 The characteristics of executives**

A considerable literature in sociology and economics has studied the educational backgrounds, career paths, and social status of executives at different points in time.<sup>24</sup> Because each study has used a different design and focus on different aspects of managerial careers, they cannot provide a systematic understanding of the long-run evolution of the market for corporate officers. To evaluate the predictions of the model regarding managerial mobility, I construct a consistent panel dataset following the careers of all top executives within the same set of firms spanning most of the twentieth century.

To obtain information on managerial careers, I supplement the panel dataset on executive compensation at the 50 largest firms in 1960 described in Section 3.1 with biographical information for the three highest-paid executives for the period 1936 to 2003. For each individual that appears in the compensation database during this period, information on educational, age, career paths, and other personal characteristics was collected using the printed versions of *Who's Who in Industry and Commerce* for various

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<sup>24</sup> See, for example, Taussig and Joslyn (1932), Newcomer (1955), Warner and Abegglen (1955), Roberts (1959), Temin (1997), Tedlow, Purrington, and Bettcher (2003). Friedman and Tedlow (2003) provide a comprehensive review of the literature.

years and the *Biography Resource Center* from Gale Research.<sup>25</sup> Although the *Biography Resource Center* usually provides information on the jobs of individuals after they left the firms included in my sample, I do not use this information to be consistent with the data collected from printed versions of *Who's Who*. Thus, the data excludes any job that the executive started after the last year in which he is observed in the compensation database.

These new data have several advantages for an understanding of the evolution of the market for managers. The data follow the careers of all top executives that worked at the sampled firms in every year over a long time span. Also, an important feature of this dataset is that it links the information on the personal, educational, and job experience characteristics with data on the remuneration of corporate officers. Thus, this study relates to Bertrand and Schoar (2003), who pioneered linking manager biographical information to measures of compensation and firm performance.

The initial sample of the three highest-paid officers contains 1545 individuals, of which 63 percent are matched to biographical records. I further restrict the sample to the 903 executives for which year of birth is known.<sup>26</sup> Matching rates are higher for more recent periods and the likelihood of finding information is higher for more important personalities. Thus, the sample is biased towards including more presidents and chairmen, but fewer vice-presidents and other lower-ranked officers relative to the initial

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<sup>25</sup> To find an individual in printed sources, I use a volume of *Who's Who* published in a year close to the last year that the individual appears in the compensation database. The *Biography Resource Center* includes information from several editions of *Who's Who* (including *Who's Who in America* and *Who's Who in Finance and Business*) that were published from 1985 to the present. Moreover, the Center contains narrative biographies from several sources of the Gale Research Group.

<sup>26</sup> *Who's Who* sometimes lists the name of an executive but provides very little information on the individual. When less than three jobs are specified for a person, I do not consider it to be a successful match and exclude the individual from the sample.

sample.<sup>27</sup> In consequence, the results of this paper reflect the careers only of those executives who were successful in large corporations.

Biographical sources provide information on each subsequent position held by the executive. For each job observed since the executive entered the labor force, I collect information on the name of the company, the year the executive started and ended a position, the job title, and (when available) the name of the division, sector of the firm, or specific function held by the officer.<sup>28</sup>

Information on the career history is not always complete and to address this problem, I further restrict the sample to managers for whom a “complete” work history (since they entered the labor force until the last year in which they appear among the three highest-paid executives in the firm) is observed (a total of 708 executives).<sup>29</sup> The results presented in this paper are robust to using the full sample of 903 executives.

Basic descriptive statistics for both samples are shown in Table 3. To construct a consistent picture of the typical top executive in each year, I match the information on the characteristics of managers to the dataset on executive compensation. Thus, each executive appears in the sample for every year in which he was among the three highest-paid officers in the firm. In this manner, the dataset has a total of 4,900 person-year

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<sup>27</sup> For example, I find on average 8 out of 10 executives holding the jobtitle of presidents of the firm. However, I match only about 37 percent of the individuals who had at most reached the vice-presidency of the company.

<sup>28</sup> The amount and content of the information reported is not always consistent. For certain executives, more than 20 different positions are listed. On average, about 7 changes along their career are observed. In many cases, the biographies do not list the jobs that executives held in the beginning of their career. Instead, they mention that “several positions” were held by the individual during an extended period of time. Because of these limitations, I abstain from using these data to analyze how the number positions held during the career has changed over time.

<sup>29</sup> To construct a sample of executives with complete information on most of their careers, I exclude individuals for whom the first job observed was started six or more years after they completed their education. For the individuals lacking information on educational attainment, I assume that the career path is incomplete if the age upon starting the first job observed exceeded 29. Also, I leave out observations with a gap in information of more than six years between two occupations at some point in the middle of the career.

observations. As shown in Table 3, the long-run trends in the compensation of these managers are consistent with the levels shown in Section 3.2.

#### **4.2 Mobility of managers across corporations**

During the past three decades, the turnover of CEOs and other top management has significantly increased. In the 1970s about 15 percent of new CEO appointments in the firms in the Forbes annual surveys were outsiders, but 26.5 percent were hired from another firm in the 1990s (Murphy and Zábajník 2004b). Moreover, the probability of forced CEO separations increased significantly over time, from 10.2 percent in the 1971 to 1976 period to 23.4 percent from 1989 to 1994 (Huson, Parrino and Starks 2001). This trend has not been specific to CEOs, as the mobility across firms during the career has also increased in recent years for other top managers (Cappelli and Hamori 2004). These recent increases in turnover are a stark departure from the mobility patterns documented for earlier decades. Newcomer (1955) finds that about 7 percent of the chairmen and presidents of large corporations in 1900 had had business experience only in their own company. By 1950, the fraction had increased to 22 percent.<sup>30</sup> Moreover, only 18 percent of the chairmen and presidents had reached these positions by working their way up within the company at the turn of the century.<sup>31</sup> By 1950, more than half of the executives had climbed the corporate ladder.

Although these previous studies suggest that the interfirm mobility of top executives has increased since the 1950s, the overall trend is hard to assess because mobility

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<sup>30</sup> Newcomer's sample is limited to the largest corporations according to the value of assets, and includes 214 firms in 1900 and 428 in 1950.

<sup>31</sup> Other ways of getting to the top of the corporation in Newcomer's study were: having organized the firm, inheriting the company, investing in the company, having success in another firm, etc.

measures and sample definitions vary widely across the studies cited. In this section, I use the panel dataset on managerial characteristics to provide a consistent description of the evolution of top management mobility and verify whether they are consistent with the predictions of the model. Because the companies included in the sample are among the largest in the economy (and thus have a larger internal labor market and are less likely to change their recruiting policies), mobility rates documented in this paper are probably lower than those in the average firm and to those reported in previous studies.

Table 4 describes the evolution of managerial career paths.<sup>32</sup> The evolution of the tenure of executives at the sampled firms (measured as the number of years as an employee of the corporation) gives a first indication of the changes in external mobility over time. The number of years at the firm increased from an average of 24 years in the late 1930s to almost 29 years in the 1960s.<sup>33</sup> However, business experience at the firm started to decline in the 1970s, and by the 1990s it had recovered its pre-war level. These changes are not a mere reflection of an increase in the duration of careers in the 1950s and 1960s. In fact, it took the same number of years since the beginning of the career for an executive to reach the very top of the corporate ladder or to be among the three highest-paid executives throughout the entire time span of the sample (see Table 4).<sup>34</sup> Thus, managers spent a larger fraction of their careers working at the same firm in the 1950s and 1960s than in recent years.

To assess changes in mobility of managers in more detail, Table 5 shows the average and median number of firms that the typical top executive worked for during his career. I

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<sup>32</sup> See Appendix 2 for a detailed definition of the variables on education and career paths of executives.

<sup>33</sup> These measures of tenure and experience are calculated by defining a firm as the principal company, all its subsidiaries and firms acquired by the sampled firm.

<sup>34</sup> Top executive position is defined as having a position as president, chairman or vice-chairman of the board, CEO, CFO, or COO at the parent company.

construct two definitions of a firm and, consequently, two measures of mobility across companies. First, I consider an organization to be defined by the parent company, all subsidiaries, and acquired companies. Following this *broad* definition of a firm, I construct a measure of mobility that excludes moves of executives between subsidiary companies or due to the merger of two corporations.<sup>35</sup> I also construct a *narrow* measure of external mobility that incorporates moves between subsidiaries and those occurring at the time of a merger.

I consider these two different measures because it is unclear how to assess the mentioned changes in turnover. On the one hand, the broad definition of the firm is closer to the model because it entails poaching of executives by outside firms. However, movements due to mergers or across subsidiaries may reflect the skill composition of executives, and thus it may be desirable to take them into account. Specifically, the decision to retain personnel of the acquired company following a merger may be influenced by the skill-composition of the employees. Movements across subsidiaries are more likely to occur for firms that are diversified and operate in very different markets. Thus, movement across subsidiaries may reflect a higher level of general skills or be part of a firm's strategy to increase the general human capital of its employees. To avoid this problem, I present measures of external mobility using both definitions of a firm.

The mean and median numbers of moves across companies are presented in Table 5. Overall, the mobility of managers followed a U-shaped pattern over the century. In the late 1930s, the average manager of a large corporation had worked at 2.5 companies during his career. By the 1950s and 1960s, the typical manager had moved only once (and the median manager had worked at the same corporation for his entire career).

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<sup>35</sup> The pattern of mobility is almost the same when I only exclude moves between subsidiaries.

Using a broad definition of the firm, managerial mobility had recovered its pre-war level by the end of the century. The increase in turnover in recent years is more accentuated when including moves across subsidiaries and due to mergers. In this case, the typical executive worked for about three corporations during his career.

The average number of companies that an executive worked for provides an important measure of mobility but it is heavily influenced by outliers. As an alternative measure, Figure 3 shows the fraction of executives who spent their entire career working for the same corporation. The solid line uses a broad definition of the firm while the dashed line includes moves due to mergers and between subsidiary companies. Using a broad (narrow) definition of the firm, the fraction of managers who had always worked at the same company increased from about 45 (40) percent in the 1930s to more than 65 (50) percent in the late 1960s. The trend reversed in recent years, but the decline is more pronounced when using a narrow definition of the firm. By the end of the sample period, only 1 out of 4 executives remained in the same corporation for the entire span of their working life when including moves across subsidiaries and due to acquisitions. Using a broad definition of the firm, this fraction is a much higher 42 percent.

A problem with these mobility measures is that they are based on an unbalanced panel of firms (see Table 3). Thus, these measures may be biased because firms dropping out of the sample since the 1980s tended to be less successful.<sup>36</sup> Moreover, mobility rates in the 1930s and 1940s may be higher because some companies had had a brief life until that point, and thus necessarily hired employees with prior experience in other firms. To address this issue, Figure 4 reproduces Figure 3 but limits the sample to the 19 firms that

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<sup>36</sup> Specifically, firms disappear from the sample when they go bankrupt, merged into another company that operates in a different industry, or become private.

are always in the sample. Not surprisingly, the fraction of executives that spent their entire career at the firm is higher for this sample of (even) larger companies. Moreover, the long-run trends in executive mobility are more accentuated for this set of companies. On average, 70 percent of the top executives had never worked at another company for the period 1940 to 1967. However, less than half of the executives had done so by the end of the sample (about 30 percent when considering a narrow definition of the firm).

Consistent with the previous literature, I find that managerial mobility followed a U-shaped pattern over the century. However, employees may have moved for different reasons earlier in the century. On the one hand, firms were significantly smaller earlier in the century, and thus the opportunity of upward mobility within a given organization was limited. Also, the earlier part of the sample contains several founders of companies. These individuals usually worked for more than one corporation before becoming successful entrepreneurs. On the contrary, the mobility of managers later in the century appears to have been driven by different factors. In particular, the increase in outside hiring to replace outgoing CEOs during the past 30 years suggests that managers are now likely to switch firms late in their careers.

Differences in the timing of moves over the career cycle are relevant because they have different implications for the accumulation of skills. If most moves occur only early in the career, employees are still likely to acquire significant amounts of firm-specific human capital at the main corporation. However, a move of top executives at the later part of their career suggests that specific skills are less important. To assess this issue, Table 6 shows the average age of top executives at their first and last move.<sup>37</sup> For both

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<sup>37</sup> To define a move, I use a broad definition of the firm, excluding those movements that occurred because companies merged or across subsidiaries.

measures, the average age upon a move was fairly constant from the 1930s to the 1960s but it increased substantially since the 1970s. Conditional on moving, executives experienced both their first and last move when they were 10 years older by the end of the sample than those managers that switched firms earlier in the century.

In summary, I find that managerial turnover was lower during the 1950s and 1960s. If an executive changed firms during this period, he usually did so early in his career and was still able to accumulate firm-specific skills. The increase in external mobility during the past 30 years, coupled with the higher likelihood of moving later in the career, are consistent with an increase in the importance of general skills (and with the rising trends in executive pay).

## **5 The interaction between managerial skills, compensation and mobility**

### **5.1 Changes in education and occupational mobility**

In this section, I offer verifying evidence that the trends in compensation and the mobility of executives documented in earlier sections correlate with a change in the skills of top executives. Assessing this point is particularly difficult since it is necessary to define a measure of the generality of skills. Given the complexity of defining specific and general skills, I take a simple approach and use two main variables to proxy for the generality of skills: the field of education, and the diversity of sectoral experience across the career path.

There have been two main changes in the education of top executives over the twentieth century. As reflected by highest level of education achieved, the years of formal education have increased substantially over time (see Figure 5). Moreover, the

field of education pursued by top managers has also experienced important changes. During earlier decades, most executives had a technical degree in science or engineering, a BA/MA, or had attended law school. Having a formal education in business was quite uncommon, and most firms preferred to hire individuals with a technical background (Newcomer 1955). The fraction of executives with business education rapidly increased in the 1960s and 1970s (Daniel 1998). To control for changes in the level of education, Figure 6 shows the type of education of the managers in the sample by the latest degree achieved. The fraction of executives with a business degree increased steadily since the 1970s while the percentage with a technical degree plummeted since the 1990s.

Changes in the type of formal education are a reflection of a transformation in the skills of executives. An MBA degree probably confers general managerial knowledge that is useful for firms in different industries. On the contrary, degrees in engineering and science may be more valuable in specific industries.<sup>38</sup> The rising importance of formal business education provides indirect evidence of the increase in general skills over time.<sup>39</sup>

The occupational mobility of managers over their career gives another measure of the generality of managerial skills. Using detailed information on job titles, division names, and specific functions held by the executive, I measure whether an individual has ever had a position in five different sectors of a firm: production, sales, human resources,

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<sup>38</sup> As an example, most executives of oil companies had a degree in Chemical or Petroleum Engineering.

<sup>39</sup> At the time, managers also realized the increasing importance in general managerial skills. A survey administered to almost 300 chief executives in the late 1960s reveals that those with educational backgrounds in engineering and physical sciences thought that a formal education in finance and business would have provided them with better preparation for the job of CEO (Stieglitz 1969). Another indication of this change was the expansion of executive development programs in universities since the late 1950s. Corporations sent their top executives back to school because the job of manager was becoming more complex. Moreover, executives needed to be up to date with the latest managerial and organizational practices because the attitude toward managerial problems was becoming increasingly scientific (West and Sheriff 1969).

finance, and legal department.<sup>40</sup> I define occupational mobility as the total number of different sectors that the executive has worked for during his entire work history.<sup>41</sup> The diversity of sectoral experience is related to the generality of skills in two important ways. First, an individual with more general skills is more likely to be able to work in different sectors of the firm over their career. Moreover, corporations may rotate executives through different sectors of the firm to provide more general skills during a process of on-the-job training or to assess whether an individual would be successful at leading a diversified and complex organization (Cochran 1977). Regardless of the reason, higher occupational mobility is associated with higher levels of general human capital. As shown in Table 7, the occupational mobility of top managers has steadily increased over the century. While executives now work in two sectors on average, managers had mostly risen from one sector of the firm at the beginning of the sample period.

The increase in business education and in occupational mobility provides suggestive evidence that there has been a shift from specific to more general managerial skills over the century. The evolution in these proxies for the generality of skills has been smooth over time, and so it is difficult a priori to assess whether these changes correlate with the documented trends in mobility across firms and in executive pay. To do so, I construct an index of the generality of managerial skills and use regression analysis to provide a better assessment of the predictions of the model.

## **5.2 Constructing an index of the generality of human capital**

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<sup>40</sup> “Law” does not include executives that worked at a law firm at some point in their career.

<sup>41</sup> Thus, this variable has a minimum value of 1 and a maximum of 5.

Using the type of the latest degree achieved, I construct two indicator variables for whether a manager had “technical” or “business” education. These dummy variables are not mutually exclusive because a substantial fraction of the executives had neither technical nor business education. To combine these variables with the measure of occupational mobility into a uni-dimensional index of general human capital, I extract a common component using factor analysis. Specifically, principal-components factor method is used to analyze the correlation matrix. Using this strategy, I obtain a component with an eigenvalue of 1.5. As expected, the factor loadings are positive on the measure of occupational mobility and the indicator variable for business education. Moreover, there is a negative loading on the dummy variable for technical education. The factor gives about equal weight to each of the education indicators, and a bit less to the occupational mobility variable.<sup>42</sup> Thus, higher levels of general human capital are reflected in a higher value of the index.<sup>43</sup>

Figure 7 shows the distribution of the index of human capital over time. The dashed vertical lines separate the sample into low, medium, and high levels of the index by splitting the sample for 1936 to 2003 according to an equal fraction of the person-year observations. The top left panel shows that there is almost no variation in the index before 1950s. The lack of variation is due to the fact that most executives had only worked at one sector of the firm and that almost none had a degree in business. Both the variation and the average level of the index increased over time.

Overall, these trends go in the direction predicted by the model: the generality of managerial skills has increased over time, and so have done the level of pay, the

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<sup>42</sup> The specific factor loadings are 0.52 for mobility variable, -0.72 for the dummy on technical education, and 0.83 for the business education variable.

<sup>43</sup> The index is standardized to have mean 0 and standard deviation of 1.

inequality among executives, and the external mobility of top officers. Although the evidence is highly suggestive, a variety of other factors also changed over this period. To get a better grasp on the relationship between skills, pay and mobility, I exploit cross-sectional and time-series variation in the index of general human capital.

### **5.3 The interaction between skills, level of pay, inequality and mobility**

The theoretical framework predicts that the level of executive pay should be higher when managerial skills are more important. To assess this prediction, Table 8 shows the correlation of the log real level of executive pay and the index of general human capital for each executive.<sup>44</sup> Regressions are clustered by person because the index takes the same value for each individual.<sup>45</sup> Using the entire time span of the sample, col. (1) suggests that individuals with higher general human capital had also higher level of compensation (a one standard deviation in the index increased compensation by 11 percent in a given year). Figure 7 shows that most of the dispersion in the index occurs mainly over time. Because there is almost no variation in the index of general human capital prior to 1950, the remaining of the paper focuses on the period 1950 to 2003. Col. (2) shows that excluding the first 14 years of the sample does not affect the results. This coefficient is estimated using both cross-sectional and time-series variation, and so it compares very different periods of time. A more convincing strategy would be to find a positive correlation between the index and the level of pay within decade. Thus, col. (3) includes dummy variables for each decade. Because the labor market has changed

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<sup>44</sup> Appendix Tables 2 to 4 present estimations similar to those described in this section but introduce each component of the index separately.

<sup>45</sup> Regressions include controls for log market value, dummy variables for president, chairman of the board, executive vice president and vice president, and dummy variables for highest level of education achieved by the executive.

significantly over time, the size of the coefficient gets reduced by half when using mainly cross-sectional variation.<sup>46</sup> However, it is still positive and significant. Finally, it is interesting to see how the correlation between skills and pay has changed over time. A natural way to do so would be to interact the index variable with decade dummies. However, there is not substantial variation within decade and these estimates are extremely noisy. Alternatively, I lump decades into three different periods: 1950-1969, 1970-1989, and 1990-2003. Col. (4) shows that the effect of skills is basically the same when using these 20-year periods than when including separate controls for each decade as done in col. (3). Col. (5) provides evidence on the changes in the correlation between general human capital and compensation over time. Surprisingly, the correlation has not increased steadily over time. While one standard deviation in the index increased executive pay by 8 percent for the 1970-1989 period, a similar change in the index led to less than a 6 percent increase in pay from the 1990s.<sup>47</sup>

To evaluate whether general skills are associated with higher external mobility of managers across companies, Table 9 presents the effect of the index on the number of firms that the executive worked for and on the probability of spending the entire career at the same firm. Results for the number of companies are presented in cols. (1) to (4). Using mainly time-series variation in col. (1), I find that a one-standard deviation in the index increases the number of companies by 0.16. This result is robust to controlling for the periods in which the executive appeared in the compensation database (cols. (2) and

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<sup>46</sup> Including decade fixed effects helps to control for part of the time trend in the variables over time, but some of the identification is still coming from time series variation within each decade. Although it would be even better to have year fixed-effects, there are only a small number of individuals in each year and the specification is consequently difficult to estimate precisely.

<sup>47</sup> The reduction in the sample size since the 1990s is a possible explanation for the decline in the estimate in this period.

(3)). Using a probit model, cols. (5) to (8) study the effect of general skills on the probability of working the entire career at the same company. Over the 1950 to 2003 period, an increase of a standard deviation of the index was associated with a 3 percent decline in the probability of working always at the same firm. While there is no clear pattern over time, cols. (4) and (8) indicate that the correlation between general skills and managerial mobility was significantly higher during the 1970s and 1980s than in other periods.

Finally, inequality among top executives within the firm seems to be positively correlated with the level of general human capital of the highest-paid executive. Using both time-series and cross-sectional variation, the ratio of the highest to the second highest-paid executive in a firm increases by 13 percent for a one-standard deviation in the index for the highest-paid executive (see col. (1) of Table 10).<sup>48</sup> Controlling for each decade (col. (2)) or 20-year periods (col. (3)), a similar change in the index is associated with a 7 percent increase in within-firm inequality. Moreover, the correlation between general skills and inequality has increased over time. The effect of general skills was significantly higher for the 1990 to 2003 period than in prior decades (col. (4)). Cols. (5) to (8) present estimates for the effect of the amount of general skills on the ratio of the highest to the third highest-paid executive in the company. Overall, the results are similar to those for the compensation of the highest-paid executive relative to the second highest, but the coefficients are usually imprecisely estimated.

Although the estimated trends over time are not clear-cut and the coefficients are not always precisely estimated, the analysis shows that the level of executive pay, the

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<sup>48</sup> See Appendix Table 4 for a similar estimation using each of the components of the index separately.

inequality among top managers and the turnover of managers over their career are higher when general skills are more important.

## **6. Conclusion**

This paper provides an analysis of the effect of the labor market for executives on the long-run trends in the level of managerial pay, inequality among managers, and the external mobility of corporate officers. I propose that the change in these trends over time can be explained by a shift in the importance of specific toward general managerial skills. I present a simple framework where there is an internal and an external market for CEOs. In this model, the increasing importance of general human capital leads to higher levels of compensation, more sorting of executives across firms, higher levels of managerial turnover, and more within-firm inequality among top managers.

I offer two main pieces of evidence to verify the rising importance of general managerial skills over time. First, the type of formal education of top executives changed significantly over the century. While it was common for managers to have a technical background in science or engineering early in the century, most executives have now business education. Moreover, the diversity of sectoral experience has also steadily increased over time. I find that executives with higher general human capital received on average higher compensation and were more likely to switch companies. Also, disparities in pay among top managers within the firm were higher when the highest-paid executive had more general skills.

An important question remains unanswered: what has caused the change in the type of skills over time? Some plausible explanations are the increase in the complexity, scale

and scope of firms (and the growth of wage and skill inequality) caused by the rise in general purpose technologies, and the innovation in analytical methods that have led to a shift toward general skills learned in schools. While these changes apply to most professions, another important transformation occurred in American businesses during this period. Specifically, the increase in the demand for general managerial skills may have been driven by the industrial and geographic diversification of firms over time. Several studies have found that the conglomerate diversification of the 1960s and 1970s added value to companies (Baker 1992, Hubbard and Palia 1999, Klein 2001). A remaining question is whether these companies benefited more or were more successful in these undertakings when their top management had more general human capital.<sup>49</sup> Firms have become increasingly specialized since the 1980s, and there is now a negative premium upon the announcement of a diversification (Morck, Shleifer and Vishny 1990). However, large firms are still diversified geographically. To take advantage of the positive effects on firm value from geographic diversification (Bodnar, Tang and Weintrop 1998), firms may have incentives to appoint CEOs with general skills that can manage a corporation spanning different countries and cultures.<sup>50</sup>

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<sup>49</sup> The histories of different corporations provide some support to these hypotheses. Following a period of diversification and expansion overseas, Chrysler tried to solve its financial problems by appointing Riccardo (an accountant) to the presidency in 1969. But the troubles continued and it was not until Iacocca, who had previously been at Ford, took over in 1978 that the company revitalized. A similar case was experienced by International Paper. Headed by the Hinman family from 1943 to 1969, the company diversified to a whole array of different industries with little success during the 1960s. To help reverse the situation, Kappel and Gorman, both top executives at AT&T, were brought to the company in the late 1960s. Their reorganization efforts paid off, and earnings were on the rise by 1972. However, not all corporations have experienced a change toward managers with more general skills and many still select their CEOs from within. As an example, Tillerson, who is expected to replace Raymond as CEO of ExxonMobil at the end of the year, joined the company 30 years ago as a production engineer and gradually moved into top leadership jobs. Quoting an analyst of the industry, Tillerson is “a Texas engineer type in a company with a history of being run by engineers” (*Oil Daily*, March 1, 2004)

<sup>50</sup> Thus, I plan to study the effects of firms’ industrial and geographic diversification on managerial types in my future research.

While the background characteristics of managers have evolved smoothly over time, the trends in managerial pay and turnover can be divided in two different periods. From the 1930s to the mid-1970s, the average level of executive pay remained fairly stable and so did the inequality among managers (both within and between firms) and (to some extent) managerial turnover. All these trends have reversed since then. Thus, the increase in the generality of managerial skills was steady throughout the century, but the growth in executive pay and turnover was not. Hence, the timing of the effects suggests that other forces interacted with the documented changes in the labor market to give rise to the soaring levels of pay in the past three decades. Among other factors, changes in social norms, the reduction in personal income tax rates, and an increase in the coordination of wage setting policies across companies may have contributed to acceleration in absolute and relative CEO pay witnessed in recent decades. Although these factors have probably influenced the patterns over time, the interaction of compensation, turnover, and characteristics of managers documented in this paper suggest that the labor market has also played an important role.

## Appendix 1

### Proof of Proposition 1:

(a) To show that total *turnover* increases in the importance of general skills, note that the left-hand side of equation [2] is increasing in  $\alpha$  while the right-hand side is decreasing.

Intuitively, the valuable part of the productivity of a CEO at an outside firm is higher when a larger fraction of the skills are general. Thus, more individuals find it profitable to move and more firms poach executives away from smaller companies.

(b) *Compensation* is increasing in  $\alpha$  for both CEOs and non-CEOs. This is true for chief

executives because  $\frac{\partial w_{CEO_i}}{\partial \alpha} = \frac{\partial[(1-\rho)\theta_{k'}(g^*+g_i)]}{\partial \alpha} = (1-\rho)\theta_{k'} \frac{\partial g_i}{\partial \alpha} > 0$ , and for non-CEOs

because  $\frac{\partial w_{non-CEO_{ji}}}{\partial \alpha} = \frac{\partial[(1-\rho)\theta_{k''}(g^*+E[g_j(\alpha, a_j) | a_j \leq a_i])]}{\partial \alpha} = \frac{\partial((1-\rho)\theta_{k''} \alpha a_i / 2)}{\partial \alpha} > 0$

where I use the uniform distribution of the ability to acquire general skills and the assumption that  $g(\alpha, a_i) = \alpha a_i$ . As a simple check, wages for both types of executives are higher than in the base case  $\alpha = 0$ .

(c) *Within-firm inequality* among top executives is increasing in the importance of

general skills. For firm  $k$ ,  $ineq_k = \frac{w_{CEO_i}}{w_{non-CEO_{ji}}} = \frac{(1-\rho)\theta_{k'}(g^*+g_i)}{(1-\rho)\theta_{k''}[g^*+E[g_j(\alpha, a_j) | a_j \leq a_i]]}$ .

Using the functional and distributional assumptions mentioned in (b), the level of

inequality within the firm can be rewritten as

$$ineq_k = \frac{(1-\rho)\theta_k(g^* + \alpha a_i)}{(1-\rho)\theta_k[g^* + \alpha E[a_j | a_j \leq a_i]]} = \frac{\theta_k(g^* + \alpha a_i)}{\theta_k(g^* + [\frac{\alpha a_i}{2}])}. \text{ Thus, } \frac{\partial ineq_k}{\partial \alpha} > 0.^{51}$$

(d) The variance in CEO pay across firms increases as general skills become more important because there is increasing sorting of CEOs across companies. In fact,

$$\begin{aligned} Var(w_{CEO_k}) &= Var[(1-\rho)\theta_k(g^* + g_i)] = Var(w_{CEO_k, \alpha=0}) + ((1-\rho)\alpha)^2 Var(\theta_k a_i) + \\ &+ 2(1-\rho)^2 \alpha Cov(\theta_k, \theta_k a_i) \end{aligned}$$

Thus, the dispersion in the compensation of chief executives is higher than in the base case and increasing in  $\alpha$ .<sup>52</sup> The variance also increases for non-CEOs, as

$$\begin{aligned} Var(w_{non-CEO_{ji}}) &= Var((1-\rho)\theta_k[g^* + E[g_j(\alpha, a_j) | a_j \leq a_i]]) = \\ &= Var(w_{non-CEO_k, \alpha=0}) + \frac{((1-\rho)\alpha)^2}{4} Var(\theta_k a_i) + (1-\rho)^2 \alpha Cov(\theta_k, \theta_k a_i) \end{aligned}$$

The dispersion of non-CEO pay across firms increases with the relevance of general skills. Intuitively, firms need to compensate more non-CEOs that were lucky enough to be randomly assigned to a firm that had a really good draw for the CEO to avoid losing lowered-ranked managers.

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<sup>51</sup> In particular, note that  $ineq_k \xrightarrow{\alpha \rightarrow +\infty} 2(1-\rho)\frac{\theta_k}{\theta_k}$ . Recall that there is a cap on the highest

value of  $\alpha$  to avoid corner solutions in the investment in skills. Thus, the level of inequality is strictly increasing over the relevant values of the importance of general skills.

<sup>52</sup>  $Cov(\theta_k, \theta_k a_i)$  is positive since more able managers (i.e. higher  $a$ ) self-select into larger firms (i.e. higher  $\theta$ ).

## Appendix 2

### **Definition of variables:**

Year entered labor market: defined as the year in which the executive started his first job. When the date for the first job was missing, it was replaced by the year in which the executive finished his formal education. The year of graduation from school was also used if the first job observed was started 6 years later than the observed end of formal education. For 39 observations, this information was still missing and so it was predicted from a regression of “year entered labor market” on cohort dummies.

Age entered labor market: difference between “year entered labor market” and year of birth.

Tenure at corporation: for each definition of the firm (see explanation below) it was calculated as the difference from the current year in which compensation is observed to the year in which the executive started its first job at the firm.

Time to three highest-paid executive: defined as the lapse of time from “year entered labor market” and the first year in which the executive appears in the compensation database (and thus as one of the three highest-paid executives in the 50 firms sampled)

Time to top executive position: defined as the lapse of time from “year entered labor market” and the first year in which the executive reached a position of CEO, president, chairman or vice-chairman of the board, CFO, or CEO at one of the 50 firms sampled, according to the biographical records.

Time in the labor force: difference from the current year in which compensation is observed to the year in which the executive entered the labor market.

Definitions of the firm: I construct two main definitions of the firm. The broad definition of the firm encompasses the sampled parent company, all its subsidiaries, and all the companies that were merged into the parent company (or the company that the parent firm merged into, when that is the case). The narrow definition of the firm considers each firm separately. Thus, movements across subsidiaries and due to mergers are counted as a separate switch under the narrow definition. To identify subsidiaries and mergers, I used corporate biographies. It is likely, then, that the information is more accurate for recent years.

Occupational mobility: using detailed information on the job titles, the division and/or department that the executive worked for, I created five different sectors of the firm (production, sales, human resources, finance, and legal department).<sup>53</sup> I created a dummy variable for each sector which took 1 if the executive had ever worked at the sector in

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<sup>53</sup> The precise words used to categorize each sector are available upon request.

question during his career. The measure of occupational mobility is the simple sum of the five indicator variables for each individual.

Level of education: “Some college” was defined as attending junior college, senior college, or studying at (but not graduating from) a four-year college. “College” was defined as graduating from a 4-year college, or studying (but not finishing) a masters degree. “Graduate education” was defined as completing a master degree, and starting or finishing a doctorate. I excluded honorary degrees received by executives when they were close to retirement.

Business education: defined a degree as business education if received in the fields of marketing, accounting, business, commerce, finance, administration, management, or economics. Moreover, the following degrees were also counted as business education: BBA, BSBA, DBA, Doctorate in Business, Doctorate in Commercial Science, MBA, MPA. Finally, an executive was defined as having business education if he attended a Business School of College and his degree was not identified.

Technical (science or engineering) education: defined as technical degree (bachelor, master, BS or MS) if received education in any brand of engineering. Also, degrees in the following fields were counted as education in science: Chemistry, Geology, Science (unspecified), Mathematics, Operations Research, and Physics. The following unspecified degrees were also included: BS, doctorate in Science, and MS.

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**Table 1**  
**Average Real Value of Total Compensation by Percentile**  
**(Millions of \$2000)**

	10 <sup>th</sup> percentile	25 <sup>th</sup> percentile	50 <sup>th</sup> percentile	75 <sup>th</sup> percentile	90 <sup>th</sup> percentile	90/10 ratio
1936 - 1939	.35	.56	.89	1.35	1.77	5.06
1940 - 1945	.49	.66	.92	1.31	1.70	3.47
1946 - 1949	.44	.62	.84	1.18	1.69	3.84
1950 - 1959	.52	.65	.90	1.30	1.96	3.77
1960 - 1969	.56	.71	1.02	1.40	1.99	3.55
1970 - 1979	.56	.76	1.03	1.47	2.06	3.68
1980 - 1989	.75	1.02	1.53	2.20	3.22	4.29
1990 - 1999	1.03	1.60	2.90	5.29	9.22	8.95
2000 - 2003	1.39	2.29	5.23	12.23	22.19	15.96

Note: Total compensation is the sum of salaries, bonuses, long-term bonus payments, and the Black-Scholes value of stock option grants. Based on the three highest-paid officers in the largest 50 firms in 1960.

**Table 2**  
**Distribution of Total Compensation Within the Firm**

	Ratio of Top to Third Highest- Paid Officer	Ratio of Top to Fifth Highest- Paid Officer	Ratio of CEO to Two Other Highest-Paid Officers
1936 - 1939	2.3	-	1.6
1940 - 1945	2.1	2.8	1.6
1946 - 1949	1.9	2.7	1.5
1950 - 1959	1.9	2.7	1.4
1960 - 1969	1.8	2.4	1.3
1970 - 1979	1.8	2.7	1.4
1980 - 1989	2.1	3.0	1.7
1990 - 1999	2.8	4.6	2.1
2000 - 2003	3.8	6.1	2.6

Note: Total compensation is the sum of salaries, bonuses, long-term bonus payments, and the Black-Scholes value of stock option grants. The table presents the average ratio across companies in each decade. The first and third columns are based on the three highest-paid officers in the largest 50 firms in 1960, and the second column is based on the five highest-paid officers. The chief executive officer is identified as the president of the company in firms where the title “CEO” is not used. Information on the fourth and fifth highest paid officers was not available for the 1936-42 period.

**Table 3**  
**Descriptive Statistics by Decade**

		<b>1936- 1939</b>	<b>1940- 1945</b>	<b>1946- 1949</b>	<b>1950- 1959</b>	<b>1960- 1969</b>	<b>1970- 1979</b>	<b>1980- 1989</b>	<b>1990- 1999</b>	<b>2000- 2003</b>
Total # of person-year observations		148	290	256	795	935	826	886	579	185
Total # of executives		50	83	85	164	205	198	232	154	69
Average # of firms in each year		24	30	37	42	46	43	39	31	26
Average # of years each executive is observed		10.52	11.53	13.49	11.32	9.47	8.68	7.19	6.26	5.72
Average age of executives		57.04	56.22	55.85	56.87	57.07	56.24	57.03	57.03	57.53
Current direct comp.	Mean	1.24	1.16	.92	.97	.91	.95	1.12	1.83	3.47
	Median	1.05	1.00	.88	.89	.87	.87	1.02	1.44	2.20
Total direct comp.	Mean	1.26	1.18	.94	1.08	1.06	1.07	1.32	2.68	5.97
	Median	1.05	1.01	.88	.90	.95	.96	1.14	1.85	3.69
Total compensation	Mean	1.26	1.19	.94	1.16	1.21	1.40	1.85	4.37	10.95
	Median	1.05	1.01	.88	.96	1.08	1.12	1.51	2.72	8.58

Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on their career path. Current direct compensation is the sum of salaries and current bonuses. Total direct compensation is defined as the sum of current direct compensation and long-term bonus payments. Total compensation adds the Black-Scholes value of stock option grants to total direct compensation. The table presents the average ratio across companies in each decade.

**Table 4**  
**Career Path of Top Executives**

	<b>1936- 1939</b>	<b>1940- 1945</b>	<b>1946- 1949</b>	<b>1950- 1959</b>	<b>1960- 1969</b>	<b>1970- 1979</b>	<b>1980- 1989</b>	<b>1990- 1999</b>	<b>2000- 2003</b>
<b>Tenure at the firm</b>									
Mean (years)	25.40	24.80	25.88	27.63	29.24	27.25	25.10	25.69	22.29
Std. Dev.	12.22	11.77	11.23	11.10	10.60	10.44	11.81	12.11	13.97
# person-year observations	144	285	252	792	934	815	885	577	182
<b>Time to highest-three paid manager</b>									
Mean (years)	33.37	30.27	27.93	27.29	27.55	27.78	28.19	28.10	28.72
Std. Dev.	8.27	8.07	7.46	7.34	7.01	6.08	5.38	5.27	5.30
# person-year observations	148	290	256	795	935	826	886	579	185
<b>Time to top executive position</b>									
Mean (years)	27.43	26.69	27.02	27.71	28.67	28.34	28.00	27.32	26.92
Std. Dev.	6.68	7.00	7.12	7.59	7.28	6.19	6.14	5.70	6.81
# person-year observations	86	184	186	563	630	646	675	403	133
<b>Time in the labor force</b>									
Mean (years)	34.59	34.07	33.48	34.30	34.34	33.07	33.00	32.64	33.32
Std. Dev.	8.40	8.43	8.26	7.79	6.58	5.98	5.94	5.18	5.34
# person-year observations	148	290	256	795	935	826	886	579	185

Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on their career path. Firm is defined without counting movements between subsidiary companies of principal firm or due to mergers. Top executive position is defined as having a position as president, chairman or vice-chairman of the board, CEO, CFO, or COO at the parent company. Time to highest-three paid manager is measured as the total number of years from entering the labor force to the date in which the executive appears among the three-highest paid managers in the compensation database.

**Table 5**  
**Mobility of Executives across Corporations**

	<b>1936- 1939</b>	<b>1940- 1945</b>	<b>1946- 1949</b>	<b>1950- 1959</b>	<b>1960- 1969</b>	<b>1970- 1979</b>	<b>1980- 1989</b>	<b>1990- 1999</b>	<b>2000- 2003</b>
<b>Without moves between subsidiaries or mergers</b>									
Mean (# of firms)	2.31	2.23	2.05	1.97	1.79	2.00	2.07	2.13	2.38
Median	2	2	2	1	1	2	2	1	2
Std. Dev.	1.62	1.46	1.35	1.24	1.26	1.33	1.34	1.48	1.47
<b>Including all moves</b>									
Mean (# of firms)	2.56	2.54	2.29	2.19	2.14	2.50	2.70	2.97	3.52
Median	2	2	2	2	1	2	2	3	3
Std. Dev.	1.77	1.65	1.48	1.38	1.55	1.76	1.74	1.88	2.20
# person-year observations	148	290	256	795	935	826	886	579	185

Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on their career path.

**Table 6**  
**Age at first and last move, for executives that moved across firms**

	<b>1936- 1939</b>	<b>1940- 1945</b>	<b>1946- 1949</b>	<b>1950- 1959</b>	<b>1960- 1969</b>	<b>1970- 1979</b>	<b>1980- 1989</b>	<b>1990- 1999</b>	<b>2000- 2003</b>
<b>Age at first move</b>									
Mean (age)	29.24	31.17	31.04	31.21	31.02	32.29	34.40	35.66	37.78
Std. Dev.	7.66	7.08	6.69	7.72	8.17	9.03	9.55	8.94	9.56
<b>Age at last move</b>									
Mean (age)	37.27	38.95	38.77	37.35	37.65	38.71	42.37	45.02	49.37
Std. Dev.	8.31	7.57	7.91	8.55	10.06	9.79	10.35	9.86	8.77
<b>Age at entering labor market</b>									
Mean (age)	22.86	22.44	22.88	22.92	23.02	23.01	23.75	24.72	24.28
Std. Dev.	2.56	2.54	2.61	2.88	2.07	2.23	2.71	2.79	3.40
# person-year observations	78	158	128	381	362	414	453	276	107

Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on their career path. Firm is defined without counting movements between subsidiary companies of principal firm or due to mergers.

**Table 7**  
**Occupational Mobility of Executives along their Career**

	<b>1936- 1939</b>	<b>1940- 1945</b>	<b>1946- 1949</b>	<b>1950- 1959</b>	<b>1960- 1969</b>	<b>1970- 1979</b>	<b>1980- 1989</b>	<b>1990- 1999</b>	<b>2000- 2003</b>
Mean # of sectors	1.16	1.14	1.23	1.31	1.46	1.60	1.59	1.90	1.92
Std. Dev.	0.44	0.37	0.47	0.51	0.68	0.72	0.73	0.87	0.84
# person-year obs.	107	190	164	519	711	683	808	497	157
Fraction of person-year obs. for which at least one sector can be identified (%)	72.3	65.5	64.1	65.3	76.1	82.3	91.2	85.6	84.9

Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on their career path. A total of five different sectors of the firm are considered: production, sales, human resources, law, and finance. For each individual, the number of sectors is measured as the simple sum of the different sectors that he worked for during his career (a maximum of 5).

**Table 8**  
**Correlation between Executive Pay and Index of General Human Capital**

Dependent variable:  $\log(\text{real total compensation}_{it})$

	Period 1936 to 2003	Time period from 1950 to 2003			
	(1)	(2)	(3)	(4)	(5)
Index	0.112*** (0.026)	0.119*** (0.024)	0.042*** (0.018)	0.057*** (0.019)	-
Index + Index * I{1950-1969 period}	-	-	-	-	0.013 (0.038)
Index + Index * I{1970-1989 period}	-	-	-	-	0.080*** (0.022)
Index + Index * I{1990-2003 period}	-	-	-	-	0.056* (0.038)
Decade dummies?	No	No	Yes	No	No
20-year period dummy variables?	No	No	No	Yes	Yes
# Obs	3844	3374	3374	3374	3374

Note: Standard errors are clustered by person and shown in parentheses. Observations are at the person-year level. Period dummy variables are indicators for 1950-1969, 1970-1989, and 1990-2003. All regressions control for log market value, dummy variables for president, chairman of the board, executive vice president and vice president, , and highest level of education achieved by the executive (dummy variables for graduate, undergraduate, and some college education). Total compensation and the firm's market value are measured in year 2000 dollars. Total compensation is the sum of salaries, bonuses, long-term bonus payments, and the Black-Scholes value of stock option grants. Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and non-missing index. \* indicates significance at the 20%, \*\* indicates significance at the 10% level and \*\*\* indicates significance at the 5% level.

**Table 9**  
**Correlation between External Mobility and Index of General Human Capital**

	Total number of companies (OLS)				Always at the same firm (Probit)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Index	0.163*** (0.063)	0.179*** (0.065)	0.155*** (0.064)	-	-0.030* (0.022)	-0.037** (0.023)	-0.031* (0.022)	-
Index + Index * I{presence in 1950-1969}	-	-	-	0.128 (0.139)	-	-	-	0.004 (0.120)
Index + Index * I{presence in 1970-1989}	-	-	-	0.216*** (0.106)	-	-	-	-0.150* (0.095)
Index + Index * I{presence in 1990-2003}	-	-	-	0.116 (0.107)	-	-	-	0.034 (0.093)
Dummies for presence of executive during decade?	No	Yes	No	No	No	Yes	No	No
Dummies for presence of executive during 20-year period?	No	No	Yes	Yes	No	No	Yes	Yes
# Obs	550	550	550	550	550	550	550	550

Note: Standard errors are shown in parentheses. Observations are at the individual level. Coefficients in columns (1)-(3) correspond to an OLS specification. Coefficients in columns (4)-(6) are the marginal effects on the probability of remaining at the same firm from a probit specification. Dummy variables for presence in period are indicators for whether the executive was among the three-highest paid officers in any year during the periods 1950-1969, 1970-1989, and 1990-2003. All regressions control for highest level of education achieved by the executive (dummy variables for graduate, undergraduate, and some college education). Number of companies is the total number of firms that the executive worked for during his career, without counting moves of executives due to mergers or across subsidiaries. Always at the same firm is an indicator variable that takes 1 if the executive worked at the same company during his entire career. Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and non-missing index for the 1950 to 2003 period. \* indicates significance at the 20%, \*\* indicates significance at the 10% level and \*\*\* indicates significance at the 5% level

**Table 10**  
**Correlation between Within-Firm Inequality among Executives and Index of**  
**General Human Capital**

	Ratio of total compensation, highest to second highest-paid executive				Ratio of total compensation, highest to third highest-paid executive			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Index (of highest paid executive)	0.130*** (0.053)	0.068* (0.042)	0.071** (0.043)	-	0.201** (0.113)	0.043 (0.075)	0.083 (0.096)	-
Index + Index * I{1950-1969 period}	-	-	-	-0.064* (0.040)	-	-	-	-0.136* (0.089)
Index + Index * I{1970-1989 period}	-	-	-	0.041 (0.063)	-	-	-	-0.023 (0.082)
Index + Index * I{1990-2003 period}	-	-	-	0.200*** (0.077)	-	-	-	0.363* (0.235)
Decade Fixed Effect?	No	Yes	No	No	No	Yes	No	No
Period dummy variables?	No	No	Yes	Yes	No	No	Yes	Yes
# Obs	1494	1494	1494	1494	1145	1145	1145	1145

Note: Standard errors are clustered by firm and shown in parentheses. Observations are at the firm-year level. Period dummy variables are indicators for 1950-1969, 1970-1989, and 1990-2003. Index is the value of the index of general human capital for the highest paid executive at the firm in a given year. All regressions control for log market value. The firm's market value is measured in year 2000 dollars. Total compensation is the sum of salaries, bonuses, long-term bonus payments, and the Black-Scholes value of stock option grants. Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and non-missing index for the 1950 to 2003 period. \* indicates significance at the 20%, \*\* indicates significance at the 10% level and \*\*\* indicates significance at the 5% level

**Appendix Table 1**  
**Firms Included in the Sample**

Company Name	First Year in Sample	Last Year in Sample	Rank in 1940	Rank in 1960	Rank in 1990	Industry
AMERICAN CAN CO	1936	2003	35	43	249	Fabricated metal products
AMERICAN MOTORS CORP	1937	1986	299	44	--	Motor vehicles
AMERICAN STORES CO	1936	1998	262	58	309	Food stores
AMERICAN TELEPHONE & TELEG CO	1942	2003	--	3	7	Communications
ARMCO INC	1937	2003	212	55	548	Primary metals
ARMOUR & CO	1936	1969	227	23	--	Food mfg
BETHLEHEM STEEL CORP	1936	2000	25	16	251	Primary metals
BOEING CO	1936	2003	233	27	32	Motor vehicles
BORDEN CO	1936	1993	84	53	140	Food mfg
CHRYSLER CORP	1936	1997	21	11	211	Motor vehicles
CITIES SERVICE CO	1939	1981	--	50	--	Petroleum mfg
CONTINENTAL CAN INC	1936	1983	69	41	--	Fabricated metal products
DU PONT E I DE NEMOURS & CO	1937	2003	3	17	13	Chemical mfg
EASTMAN KODAK CO	1936	2003	18	54	38	Instruments
FIRESTONE TIRE & RUBBER CO	1936	1987	165	36	--	Rubber
FORD MOTOR CO DEL	1955	2003	--	4	41	Motor vehicles
GENERAL DYNAMICS CORP	1951	2003	--	19	503	Motor vehicles
GENERAL ELECTRIC CO	1942	2003	--	6	3	Electronic equipment
GENERAL FOODS CORP	1937	1984	39	42	--	Food mfg
GENERAL MOTORS CORP	1936	2003	2	1	18	Motor vehicles
GENERAL TEL & ELECTRS CORP	1941	2003	--	38	21	Communications
GOODYEAR TIRE & RUBR CO	1936	2003	185	28	99	Rubber
GULF OIL CORP	1946	1982	--	13	--	Petroleum mfg
INTERNATIONAL BUSINESS MACHS COR	1936	2003	50	32	1	Industrial machinery
INTERNATIONAL HARVESTER CO	1936	2003	32	24	808	Industrial machinery
INTERNATIONAL PAPER CO	1936	2003	190	48	102	Paper
LOCKHEED AIRCRAFT CORP	1936	2003	187	34	290	Motor vehicles
MCDONNELL DOUGLAS CORP	1936	1996	167	39	387	Motor vehicles
NATIONAL DAIRY PRODS CORP	1936	1987	86	25	--	Food mfg
PENNEY J C CO INC	1936	2003	30	31	63	Apparel and accessory stores
PHILLIPS PETROLEUM CO	1936	2003	41	37	83	Petroleum mfg
PROCTER & GAMBLE CO	1936	2003	15	33	9	Chemical mfg
RADIO CORP AMER	1936	1984	102	30	--	Electronic equipment
REPUBLIC STEEL CORP	1936	1986	59	45	--	Primary metals
ROCKWELL INTERNATIONAL CORP	1940	2003	153	52	100	Motor vehicles
SAFeway STORES INC	1937	2003	195	14	61*	Food stores
SHELL OIL CO	1936	1984	47	22	--	Petroleum mfg
SINCLAIR OIL CORP	1936	1967	89	35	--	Petroleum mfg
SOCONY VACUUM OIL INC (Mobil Corp)	1936	1998	27	10	16	Petroleum mfg
SPERRY RAND CORP	1941	2003	--	40	941	Industrial machinery

STANDARD OIL CO CALIFORNIA	1936	2003	29	26	12	Petroleum mfg
STANDARD OIL CO IND	1937	1997	13	18	10	Petroleum mfg
STANDARD OIL CO N J	1936	2003	5	2	2	Petroleum mfg
SWIFT & CO	1937	1984	58	15	--	Food mfg
UNION CARBIDE CORP	1938	1992	6	29	301	Chemical mfg
UNITED AIRCRAFT CORP	1936	2003	79	49	103	Motor vehicles
UNITED STATES RUBBER CO	1936	1985	147	51	--	Rubber
UNITED STATES STEEL CORP	1941	2003	--	8	47	Primary metals
WESTINGHOUSE ELECTRIC CORP	1936	2003	26	20	58	Electronic equipment
WOOLWORTH F W CO	1938	2003	20	46	168	General merchandise stores

Note. Rank in 1940 is defined according to market value and rank in 1960 and 1990 is defined according to total sales. Company names refer to the name most frequently used throughout the entire time period, with names in parentheses referring to other names frequently used. \* indicates rank in 1991 instead of 1990 because the company was not public in 1990. Industry definitions are the modal 2-digit SIC code reported in CRSP.

**Appendix Table 2**  
**Correlation between Executive Pay, Type of Education, and Occupational Mobility**

Dependent variable:  $\log(\text{real total compensation}_{it})$

	Period	Time period from 1950 to 2003		
	1936 to 2003	(2)	(3)	(4)
	(1)			
Occupational Mobility	0.080*** (0.032)	0.096*** (0.032)	0.038 (0.029)	0.032 (0.030)
Technical Education	-.053 (0.050)	-0.045 (0.053)	-0.021 (0.042)	-0.031 (0.045)
Business Education	0.205*** (0.071)	0.215*** (0.071)	0.065 (0.055)	0.109*** (0.057)
Decade dummies?	No	No	Yes	No
20-year period dummy variables?	No	No	No	Yes
# Obs	3844	3374	3374	3374

Note: Standard errors are clustered by person and shown in parentheses. Observations are at the person-year level. Period dummy variables are indicators for 1950-1969, 1970-1989, and 1990-2003. All regressions control for log market value, dummy variables for president, chairman of the board, executive vice president and vice president, , and highest level of education achieved by the executive (dummy variables for graduate, undergraduate, and some college education). Total compensation and the firm's market value are measured in year 2000 dollars. Total compensation is the sum of salaries, bonuses, long-term bonus payments, and the Black-Scholes value of stock option grants. Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and non-missing index. \* indicates significance at the 20%, \*\* indicates significance at the 10% level and \*\*\* indicates significance at the 5% level

**Appendix Table 3**  
**Correlation between External Mobility, Type of Education, and Occupational Mobility**

	Total number of companies (OLS)			Always at the same firm (Probit)		
	(1)	(2)	(3)	(4)	(5)	(6)
Occupational mobility	0.077 (0.087)	0.106 (0.089)	0.085 (0.089)	-0.026 (0.030)	-0.040* (0.031)	-0.034 (0.031)
Technical education	-0.086 (0.152)	-0.084 (0.152)	-0.095 (0.152)	-0.011 (0.051)	-0.012 (0.052)	-0.010 (0.052)
Business education	0.322** (0.186)	0.343** (0.187)	0.281* (0.187)	-0.075 (0.062)	-0.085* (0.063)	-0.067 (0.063)
Dummies for presence of executive during decade?	No	Yes	No	No	Yes	No
Dummies for presence of executive during 20-year period?	No	No	Yes	No	No	Yes
# Obs	550	550	550	550	550	550

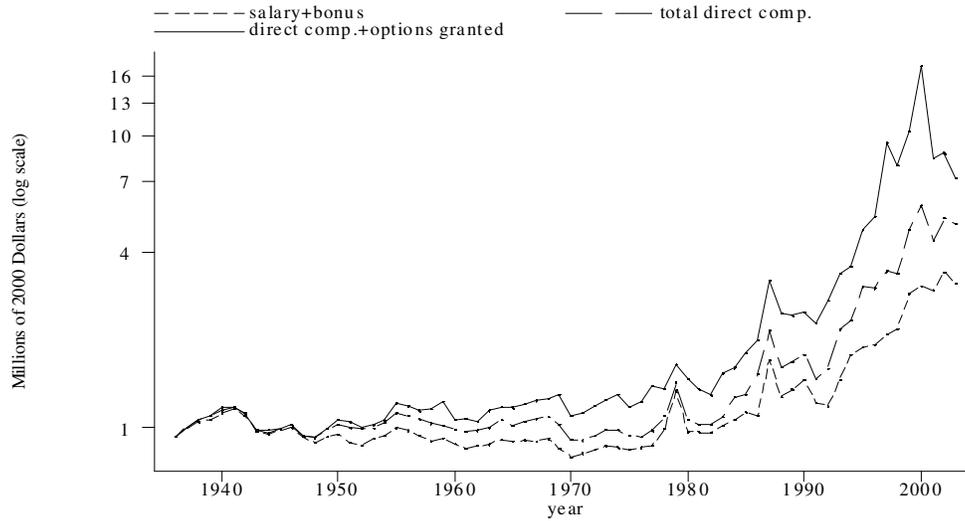
Note: Standard errors are shown in parentheses. Observations are at the individual level. Coefficients in columns (1)-(3) correspond to an OLS specification. Coefficients in columns (4)-(6) are the marginal effects on the probability of remaining at the same firm from a probit specification. Dummy variables for presence in period are indicators for whether the executive was among the three-highest paid officers in any year during the periods 1950-1969, 1970-1989, and 1990-2003. All regressions control for highest level of education achieved by the executive (dummy variables for graduate, undergraduate, and some college education). Number of companies is the total number of firms that the executive worked for during his career, without counting moves of executives due to mergers or across subsidiaries. Always at the same firm is an indicator variable that takes 1 if the executive worked at the same company during his entire career. Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and non-missing index for the 1950 to 2003 period. \* indicates significance at the 20%, \*\* indicates significance at the 10% level and \*\*\* indicates significance at the 5% level

**Appendix Table 4**  
**Correlation between Within-Firm Inequality among Executives, Type of Education, and Occupational Mobility**

	Ratio of total compensation, highest to second highest-paid executive			Ratio of total compensation, highest to third highest-paid executive		
	(1)	(2)	(3)	(4)	(5)	(6)
Occupational mobility	0.081* (0.051)	0.013 (0.049)	0.013 (0.049)	0.237*** (0.089)	0.073 (0.069)	0.093 (0.073)
Technical education	0.095* (0.070)	0.100* (0.063)	0.090* (0.063)	0.274*** (0.128)	0.357*** (0.119)	0.311*** (0.122)
Business education	0.421*** (0.145)	0.315*** (0.118)	0.315*** (0.120)	0.649*** (0.314)	0.463*** (0.223)	0.516*** (0.261)
Decade Fixed Effect?	No	Yes	No	No	Yes	No
Period dummy variables?	No	No	Yes	No	No	Yes
# Obs	1494	1494	1494	1145	1145	1145

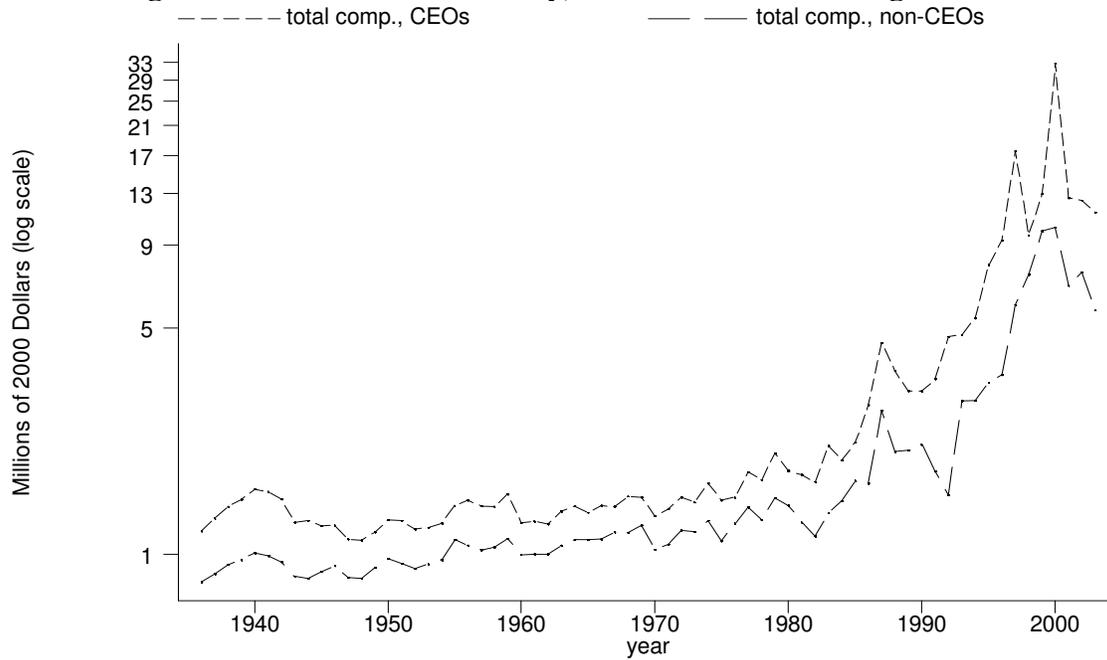
Note: Standard errors are clustered by firm and shown in parentheses. Observations are at the firm-year level. Period dummy variables are indicators for 1950-1969, 1970-1989, and 1990-2003. Occupational mobility, technical education and business education are the levels for the highest paid executive at the firm in a given year. All regressions control for log market value. The firm's market value is measured in year 2000 dollars. Total compensation is the sum of salaries, bonuses, long-term bonus payments, and the Black-Scholes value of stock option grants. Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and non-missing index for the 1950 to 2003 period. \* indicates significance at the 20%, \*\* indicates significance at the 10% level and \*\*\* indicates significance at the 5% level

**Figure 1**  
**Average Real Level of Executive Pay, by Type of Compensation, 1936-2003**



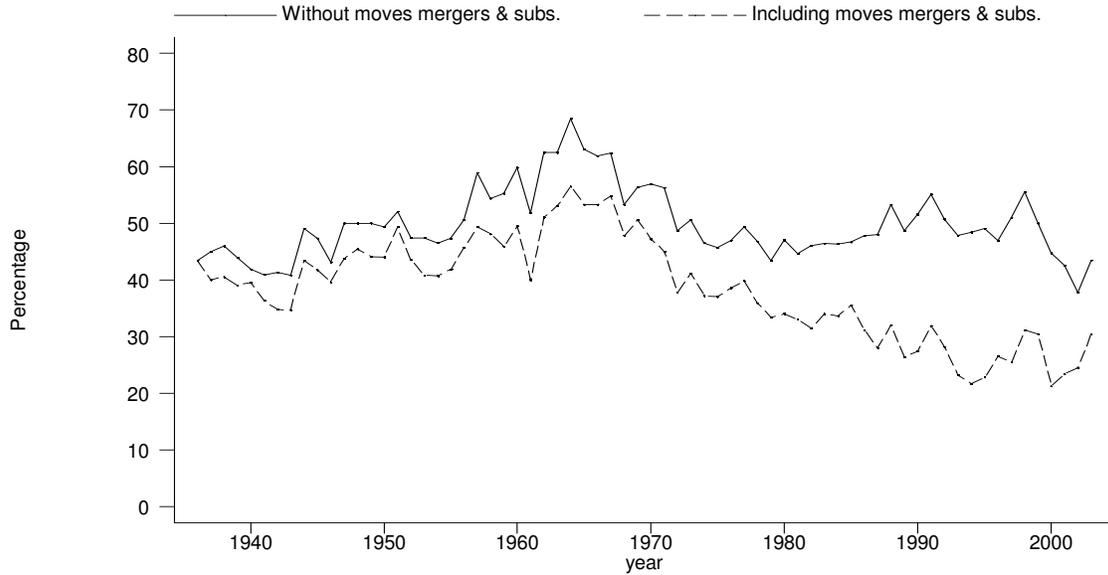
Note: Total direct compensation is the sum of salaries, bonuses and long term incentive payments. The solid line is total direct compensation plus the Black-Scholes value of options granted. Based on the three highest-paid officers in the largest 50 firms in 1960.

**Figure 2**  
**Average Real Level of Executive Pay, CEOs and other Managers 1936-2003**



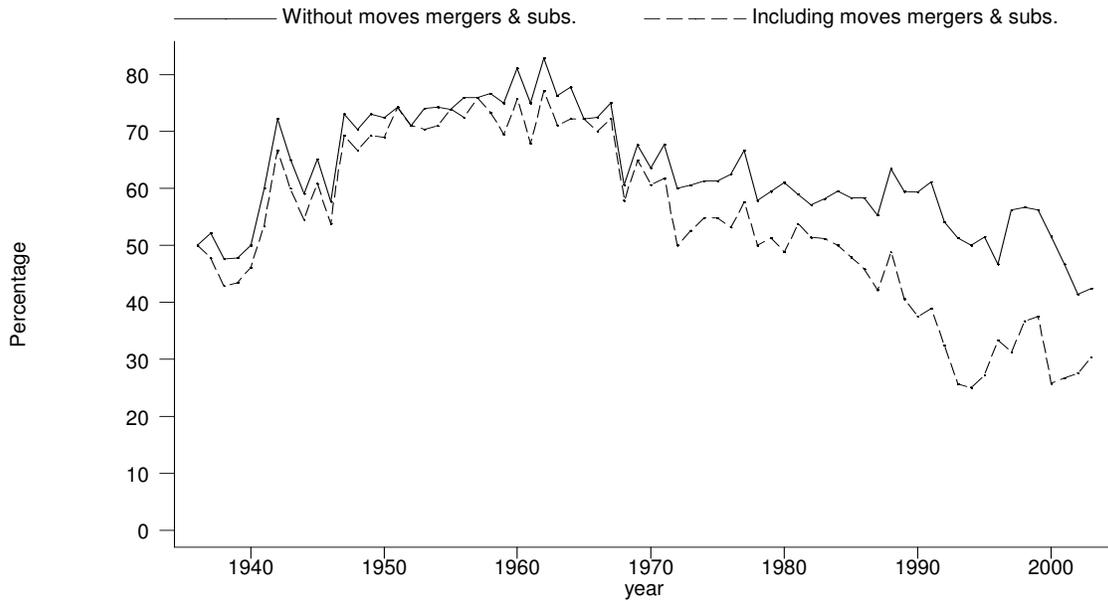
Note: Total compensation is the sum of salaries, bonuses, long term incentive payments, and the Black-Scholes value of options granted. The chief executive officer is identified as the president of the company in firms where the title “CEO” is not used. Based on the three highest-paid officers in the largest 50 firms in 1960.

**Figure 3**  
**Fraction of Executives that Worked at Same Firm for Entire Career**



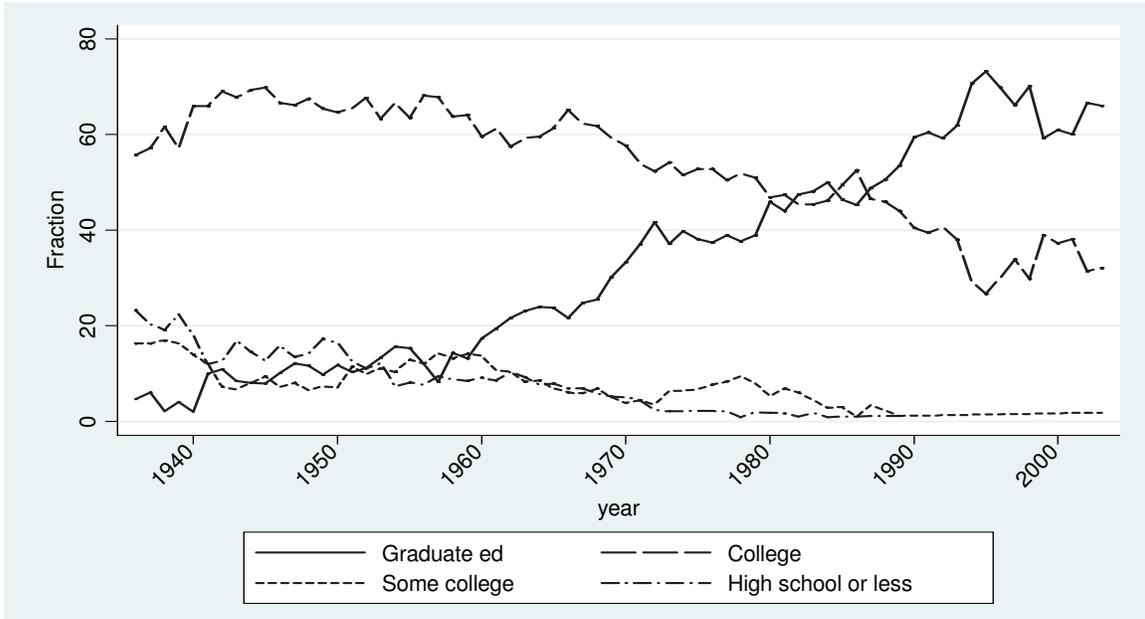
Note: Based on the three highest-paid officers in the 50 largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on the career path.

**Figure 4**  
**Fraction of Executives that Worked at Same Firm for Entire Career**  
**Balanced Panel of Firms**



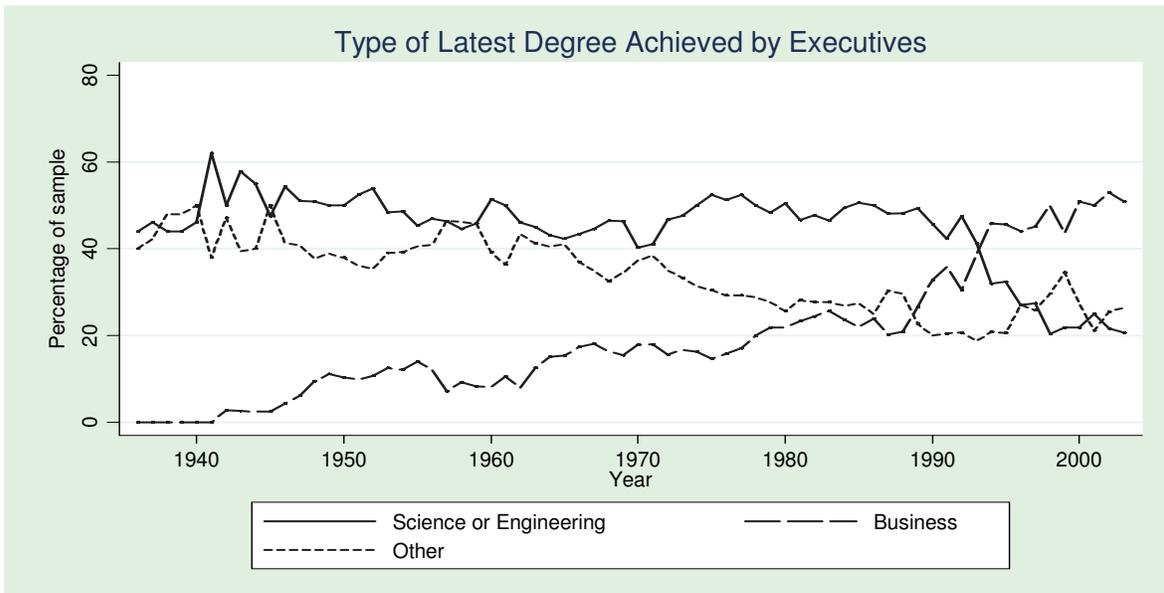
Note: Based on the three highest-paid officers in the 19 firms that appear in the sample for the entire time period, matched to biographical sources, with information on year of birth and complete information on the career path.

**Figure 5**  
**Highest Level of Educational Attainment of Top Executives, 1936-2003**



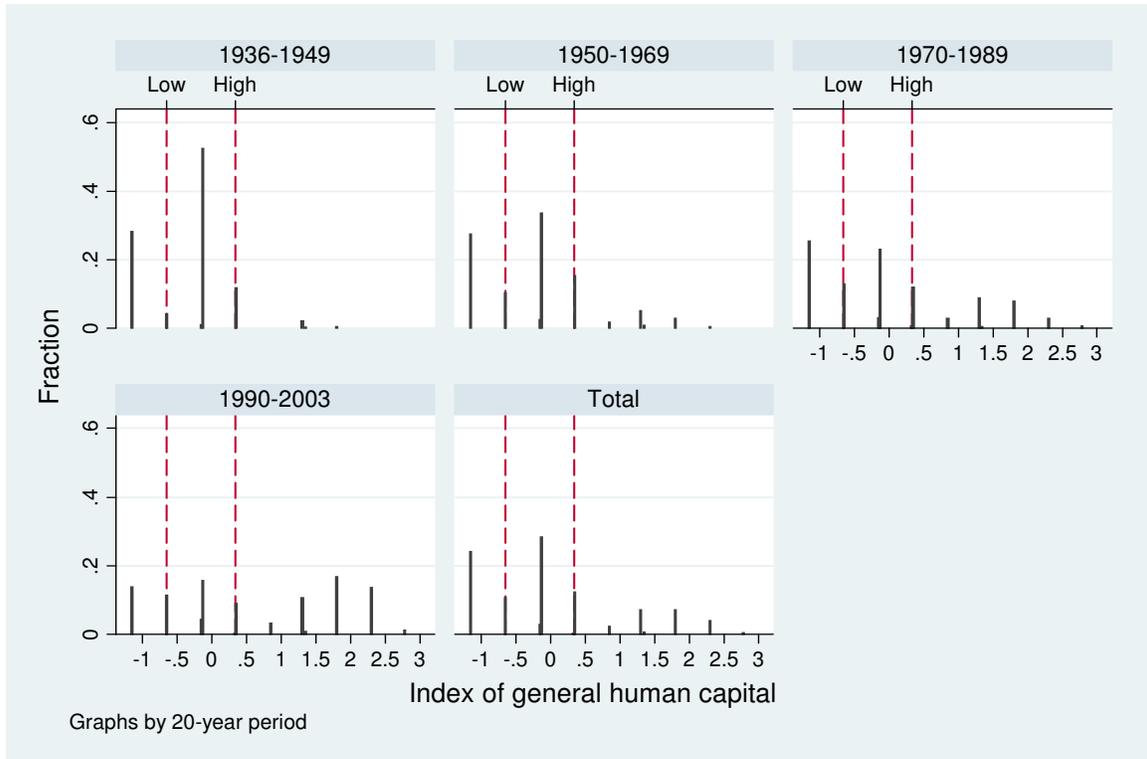
Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on education. “Graduate education” includes degrees at the masters and doctorate level. “Some college” includes junior college and individuals that attended college but did not complete their degree.

**Figure 6**  
**Type of Education, by Latest Degree Achieved, 1936-2003**



Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth and complete information on type of education.

**Figure 7**  
**Distribution of Index on Generality of Human Capital**  
**Total and by 20-year Period**



Note: Based on the three-highest paid executives in the largest firms in 1960, matched to biographical sources, with information on year of birth, and complete information occupational mobility and type of education. “Total” corresponds to the period 1936-2003. The index of general human capital is calculated performing factor analysis to extract the common component of occupational mobility, business education, and “technical” education. Dashed lines separate the sample into low, medium, and high levels of the index by splitting the “total” sample according to an equal fraction of the observations.