Executive Mobility in the United States, 1920 to 2011*

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Abstract

We examine the evolution of executive mobility from 1920-2011. In the eight decades leading up to 2001, movements of executives to new executive positions became more common. Starting in the early-2000s however, mobility started to decline. We develop a new measure of aggregate executive mobility and explore which forces contributed to these trends; we find that changing importance of general managerial skills, labor market size, and benefits of reallocating executives help explain executive mobility. We also explore the relation between mobility and executive pay. Using CEO deaths and health-related resignations in connected industries as an instrument, we find that increased mobility leads to a shift towards option pay, consistent with firms changing pay composition to retain CEOs in response to an increase in external labor market opportunities.

Key Words: Executive mobility; Executive labor markets; Corporate governance trends; CEO compensation;

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1. Introduction

A rich literature examines the labor market for corporate executives. This research is important because it sheds light on trends in labor market conditions, the skill sets required to be a successful executive, and the use and effects of executive compensation. Influential papers by Huson, Parrino, and Starks (2001) and Murphy and Zabojnik (2007) document that chief executive officer (CEO) turnover and external-to-the-firm hires increased through the last few decades of the 20th century, which they attribute to general managerial skills becoming more important.[1] Consistent with these generalist implications, the number of firms and occupations in which a typical executive works during her career increased starting in the 1970s (Frydman 2019). Other research documents that the level of executive pay and importance of equity-based compensation increased significantly since the 1980s (e.g., Murphy 1999; Gabiax and Landier 2008; Frydman and Saks 2010). A common thread in this literature is increasing executive job mobility through about 2000, when the data used in many of these papers end.

In this paper, we make six contributions to the executive labor market literature. The first two relate to the fact that the extant literature primarily focuses on the period with existing databases, 1970 through about 2000. We explore mobility in a broader setting and document new patterns over the past century by constructing a new dataset of executive moves between US public firms over the 1920-2011 period. The dataset contains more than 10,000 executive moves and 315,000 unique executives, involving nearly 17,500 unique firms.

Our first contribution using this near-century of data is to document long-term trends in executive mobility over the last eight decades of the 20th century. While only 1.2% of departing CEOs became CEOs of other firms before 1986, nearly 3% of departing CEOs moved to other

[1] See also Kaplan and Minton (2012) and Graham, Kim, and Leary (2020) for related evidence.

firms to become CEO during 1986-2001 (see Table 1).[2] In addition, the mobility of chief financial officers (CFOs) is generally higher than that of CEOs, and increased more rapidly during the 20th century. Between 1920-1949 and 1950-1985, the propensity of departing CFOs to become CFOs of other companies increased from 1.4% to 3.3%. But during 1986-2001, this propensity jumped to 10.5%, more than tripling the propensity of departing CEOs moving to other CEO positions during the same period. Moreover, chief executives move across an increasingly diverse set of industries over time, consistent with their skill sets becoming more general. Consistent with higher redeployability of CFO skills relative to CEO skills, we find that CFOs exhibit higher (and increasing) cross-industry mobility throughout the past century. These findings suggest that changing generality of executive skills helps explain the mobility trends that we document.

Our second contribution is documenting a sharp decline in executive mobility that started in the early 2000s, as movements of executives to new jobs in other firms became less common during 2002-2011.[3] In fact, by 2011 executive mobility had declined to levels not seen since the mid-1980s. As described next, we explore whether this new trend upends the common view of modern CEOs as generalists.

Third, we explore which factors are associated with the long-term evolution of aggregate mobility, both the increase preceding 2000 and the decline following 2000. Our analyses suggest that several forces are associated with the trends. One, measures of the importance of general managerial skills (e.g., ratio of enrollment in MBA to engineering master's degree programs, variety of industries to which executives move) are significantly positively correlated with our measures of aggregate mobility over time. Two, the increasing-then-decreasing trend in executive

[2] Throughout the paper, we separately examine periods before and after 1985, motivated by previous research, as well as our data, that suggests executive mobility began to increase in the mid-1980s (e.g., Murphy and Zabojnik 2007).
[3] This trend for executives appears to be consistent with a general decline in labor mobility in the US since 2000. See e.g., "Fewer Americans Uproot Themselves for a New Job," *The Wall Street Journal*, August 20, 2018.

mobility is also associated with the size of the executive labor market. Three, aggregate executive movements are more frequent when the benefits of these reallocations are greater, which is in contrast to patterns of capital and rank-and-file employee reallocations (Eisfeldt and Rampini 2006; Saks and Wozniak 2011). We confirm that the benefits of executive movements are also significantly associated with executive mobility in the cross-section of firms. Four, the more prevalent use of non-compete agreements in executive contracts since the mid-1990s coincides with the concurrent decline in mobility.

Our fourth contribution to the literature is the development of a new measure of executive mobility. This measure is the product of two components: (1) the propensity with which a departing executive finds new executive work rather than retiring, and (2) turnover (which creates job openings). Much of the existing literature uses the second component (turnover; e.g., Huson, Parrino, and Starks 2001; Murphy and Zabonjik 2007) as a proxy for mobility. However, we show that the first component is more important in driving trends in executive mobility (it explains more than three-fourths of the variation in overall mobility).[4] We also show that while most of the above-mentioned factors explain both the first and second components of aggregate mobility, the associations are more consistently significant for the first component.

Our fifth contribution is to explore whether firms appear to take steps to try to retain the CEO when the CEO's outside job prospects (mobility) increase. In particular, we estimate associations between mobility and CEO compensation during 1962-2011. To examine exogenous changes to mobility, we instrument industry-level executive mobility with the weighted average

[4] Earlier executive mobility research also uses career paths of given individuals to measure mobility, and often finds a different mobility trend. For example, we document that executive mobility trended up throughout most of the last century. The finding contrasts somewhat with a finding in Frydman (2019) that the mobility of executives at largest public firms, measured by the number of firms a given executive worked for during her career, declined between the 1930s and 1960s.

number of CEO deaths and health-related resignations in other connected industries. (The connected industry weights are measured using actual executive moves in the past three years.) We find that a positive external shock to CEO mobility (due to the death or health-related departure of other CEOs in related industries) significantly increases option-based CEO pay, consistent with the argument that option grants with vesting periods are an effective executive retention tool (e.g., Oyer 2004; Jochem, Ladika, and Sautner 2018). Firms also appear to increase the CEO's overall pay. Thus, the evidence suggests that when the CEO's outside option increases due to higher mobility, firms increase CEO pay, particularly option grants, in an attempt to retain the executive.

Sixth, we for the first time show that the mobility of CFOs is higher and increased faster than that of CEOs over the 1920-2011 period. Combined with the above-mentioned importance of skill generality measures in explaining executive mobility, this contrast between CFO and CEO mobility suggests skill generality as a key determinant of executives' labor market mobility. Also, the faster-rising CFO mobility since the mid-1980s is consistent with CFOs playing an increasingly active role across broad corporate functional areas over the past several decades (see, e.g., Groysberg, Kelly, and MacDonald 2011).

2. Data and Sample Selection

We construct a comprehensive database of corporate officers, such as the chief executive officer (CEO), chief financial officer (CFO), and various corporate vice presidents (VPs), and their movements across US public firms from 1920 to 2011. We combine information from a number of sources. First, we hand-collect names of corporate executives, as well as financial data on their firms, from Moody's Industrial Manuals ('Moody's') from 1920 to 1988, and also the year 1998. Second, we collect names of corporate executives from Compact Disclosure during 1985-2005.

Third, we supplement these two primary data sources using Mergent (which took over the Industrial Manual from Moody's; 2002-2011) and GMI Ratings (which took over Board Analyst; 2002-2011) for more recent years. We then use news searches to manually check the validity of all cases of CEO and CFO moves, and collect the new job titles of moving executives and whether the moves were associated with mergers and acquisitions or subsidiary relations.

Our full sample includes 184,494 firm-year observations for 17,767 unique firms and 315,423 executives (including 37,415 CEOs and 43,583 CFOs) from 1920 to 2011. We describe trends in executive mobility using this full sample (see the next section), as well as subsamples for 1920-1949, 1950-1985, and 1986-2011. (In addition, we often split the last subsample period at 2001, when the mobility started declining; having a 2001 breakpoint also aligns some of our analysis with existing research that uses samples the end around 2001).[5]

3. Trends in Executive Mobility in the Past Century

This section examines long-run trends in the mobility of US corporate executives from 1920-2011 using a representative sample of executives' movements across firms. We provide evidence that executive mobility across firms and industries increased over the past century; notably, some of the trends have reversed in the last decade. We construct formal variables that measure executive mobility across companies.

3.1 Propensity and Nature of Executive Mobility over the Century

The breadth of the US executive labor market has changed considerably over the past 90 years. The first four tables explore whether these changes led to improved mobility for executives, CEOs and CFOs in particular. We first document an increase (until recently) in the magnitude of

[5] For example, Murphy and Zabojnik (2007) and Frydman (2019) stop their samples in 2000 and 2003, respectively. In addition, our results are robust to alternative sample periods that begin in the 1980s, such as 1980-2011.

how often an executive leaving one job takes a job at another company, rather than retire from executive work. Table 1, Panel A shows that among the CEOs who left their jobs during 1920-1949 and 1950-1985, only 3.0% (= 45/1,496) and 5.3% (= 261/4,916) moved to other firms to become executives within the next two years.[6] In comparison, during 1986-2001, 7.6% (= 819/10,807) of former CEOs became officers at other firms, representing 153% and 43% increases in the "move rate" after vacating a CEO position.

A more detailed examination reveals that this increase around the mid-1980s is driven in part by those moving from one CEO position to another CEO position. 314 out of 10,807 departing CEOs (2.9%) became CEOs at other firms during 1986-2001, while only 18 out of 1,496 (1.2%) and 58 out of 4,916 departing CEOs (1.2%) moved to other firms as CEO for the periods from 1920 to 1949 and from 1950 to 1985, respectively.[7] The fraction of former CEOs who move to become non-CEO executives at their new firms also increased, from 1.8% during 1920-1949 to 4.1% and 4.7% during the 1950-1985 and 1986-2001 periods.

A comparison of the two right-most columns, however, reveals that this trend has somewhat reversed in the last ten years of the sample period. The propensity of former CEOs moving to become executives at other firms declined from 7.6% to 7.1% from 1986-2001 to 2001-2011. The fraction of CEO-to-non-CEO moves also declined from 4.7% to 4.1%.[8] This declining mobility of CEOs in the 2000s coincides with a declining frequency of firms' appointing external

[6] In Table 1 and throughout the paper, we define an executive move as a given executive leaving a firm and becoming an executive at another firm within two years after the departure.

[7] These fractions of CEO-to-CEO moves are similar to estimates in Gibbons and Murphy (1992) that 2.2% of 1,631 departing CEOs in their dataset become CEOs at other firms during 1970-1988. Also, they find that approximately 3.8% of the departing CEOs take a non-CEO position at another firm, similar to our finding that about 4.1% of departing CEOs became non-CEO officers during 1950-1985.

[8] Keep in mind that the declines shown in this and the previous sentence are for the first component of executive mobility, namely the propensity with which a departing executive finds new executive work. The second component (CEO turnover) also decreased after 2001, and we later show that the combined effect of these two components is a sharp decline in CEO mobility post-2001.

candidates to the CEO position during the decade (see, e.g., Graham, Kim, and Leary 2020). If, for example, firm- (or industry-) specific skills (e.g., technical knowledge about products and services), relative to general management skills, became more important during the 2000s, this would have led to declines both in the demand for external hires for the CEO position (which existing research shows) and the proportion of CEOs moving to other firms (which we show).

[Insert Table 1 here.]

Tuning to the mobility of CFOs, Panel B shows that the propensity of CFOs who leave their initial firms to accept executive positions at other firms increased even more than that of CEOs over the past century. During 1920-1949, only 2.8% of departing CFOs moved to become executives at other companies. By 1950-1985, this propensity more than doubled to 5.9% and increased again to 13.4% over 1986-2001. By this period, the average CFO's propensity to move to another firm is considerably higher than the average CEO's 7.6% propensity to move. CFO mobility declined to 13.1% during 2002-2011, akin to though smaller than the decline in CEO mobility.

This higher and faster-increasing mobility of CFOs relative to CEOs over the past century is consistent with the CFO's skills being relatively more general and thus more easily redeployable across firms. Anecdotal evidence suggests that CFO skills became increasingly "CEO-like," which would also increase their appeal to other firms.[9] Another non-mutually-exclusive explanation for the faster-increasing CFO mobility relative to CEO mobility (especially after 1985) is increasing visibility of CFOs due to improved communication technologies. In particular, increased exposure

[9] See e.g., Groysberg, Kelly, and MacDonald (2011) and "Johnson Controls Hires Company Outsider as Finance Chief," *The Wall Street Journal*, August 18, 2020. These articles suggest that CFOs are increasingly involved with operation-related roles such as product development, technology, and cost reductions, as well as traditional roles such as managing acquisitions.

of public firm CFOs in earnings calls and in the media may have given finance chiefs improved opportunities to move to other firms.[10]

In addition to the likelihood of moving to a new firm, we also explore the breadth of new positions. We find that throughout 1920-2011, common first job titles of moving CEOs at the new firm include CEO (39.4%), president (36.4%), VP (17.7%), and COO (8.7%). Thus, as explored in more detail below, it appears not uncommon for former CEOs to move to larger, more complex firms as non-CEO executives, and sometimes ultimately become CEO of the new firm (see Appendix B for examples of these CEO-to-non-CEO moves). In comparison, a relatively higher proportion of CFOs (about three quarters) move to a CFO position in their new companies. A plausible explanation for this difference is that CFOs' skills, while more portable across firms and industries, are specific for corporate finance functions. As a result, it is rare that previous CFOs become chief operating officers (COOs) or divisional managers that require operation-specific skills. Finally, consistent with CFOs' skills becoming more like CEOs', 5.5% of CFOs who moved to other companies became CEOs during 1986-2011, while only 3.4% of and no moving CFOs became CEOs during 1950-1985 and 1920-1949.

Table 2 explores a related question on the nature of executive moves: Do executive job movements represent external promotions? Answering this question is important to understand how firms might respond to changing external job opportunities of their own executives, which we examine in Section 6. The first three columns show that CEOs on average move to larger firms and receive a large pay increase. Over the full sample period (1920-2011), 66.2% of CEO moves are to larger firms, measured by total assets. A larger fraction of CEOs (72.6%) move to a bigger

[10] Also, the magnitude of the CFO pay increase in the last two decades is smaller than the increase in CEO pay, which may have led finance chiefs to continue to work longer than chief executives. Using Frydman and Saks (2010) and ExecuComp data, we find that the average total CEO (CFO) compensation increased by $2.0 million ($1.0 million) over 1986-2011.

company when they become non-CEO executives at a new firm (column 3). In comparison, column 2 shows that when CEOs move as CEOs, the new companies are less likely to be larger (at 55.5%). In addition, the pay (defined as the sum of salary, bonus, and stock and option grants) increase upon moving is on average marginally larger for CEO-to-other executive (108.0%) relative to CEO-to-CEO moves (74.3%).

These results are consistent with CEO's moving to other firms to receive either (1) job-title-prestige and substantially higher pay, or (2) less-job-title-prestige but a larger pay increase at a larger company, which may offer increased career opportunities in the future. Thus, the full sample results in Panel A suggest that the majority of CEO moves can be characterized as external promotions in terms of prestige of the employer, career opportunities, and compensation. In terms of trends, while moving to larger firms became more common between 1920-1949 and 1950-1985, particularly for CEO-to-non-CEO moves, this trend has reversed in 1986-2011.

[Insert Table 2 here.]

Columns 4 through 6 present the results for CFOs who move to other firms. On average, about half of CFOs move to larger firms. Thus, moving to a larger organization is less common for CFOs (48.0%) than CEOs (66.2%) over the century. Also, the propensities are similar in terms of whether CFOs maintain or change job titles at a new firm. Upon moving, CFOs experience larger pay increases than do CEOs. Contrary to CEOs, CFOs who keep their title upon moving receive a larger pay increase (523%) than those who change job titles (120%).

3.2 Cross-Industry Mobility of Executives

The previous section shows that the propensity of departing corporate executives to find new executive work increased until the early-2000 and then decreased. We now examine trends in frequency executives move to jobs in other industries among the subset of moves, which could be

an important element of the mobility patterns documented in the previous section. Table 3 illustrates trends in cross-industry mobility by presenting the fraction of CEO moves from an "origin" to a "destination" industry. For compactness, this "graphical" analysis relies on one-digit SIC codes but in our empirical analysis in Section 6, we use two-digit SIC codes to measure how "connected" industries are in terms of managerial skills. Panel A (1920-1949) and Panel B (1950-1985) show that before 1986, over 60% of CEO moves-to-new-firms, including moves to same- and different-industry firms, occur within the manufacturing sector (SIC = 2 or 3).[11] In comparison, Panel C shows that, from 1986 through 2011, the fraction of moves between manufacturing industries decreases to 31%. This magnitude of reduction (about 50%) is greater than that for the general reduction in the fraction of manufacturing firms among public firms during the same period (a 31% reduction, from 71% to 49% of all firms). Thus, Panel C demonstrates a more varied set of origin and destination industries for external CEO hires in recent decades.

[Insert Table 3 here.]

We formally examine the diversity of industries across which CEOs move using the Herfindahl-Hirschman Index (HHI) of the fraction of moves between industry pairs. This concentration measure of between-industry moves was 0.165 during 1920-1949, 0.157 during 1950-1985, and decreased to 0.065 during 1986-2011, indicating that CEO moves in the later period are more widely dispersed across industries. In addition, we find that "off-diagonal" movements (i.e., across different industries) became more frequent over the century: the fraction of across-different-industry movements was 40.0% during 1920-1949, and increased to 46.7% and 47.2% during 1950-1985 and 1986-2011. The finding that CEOs moved to a more diverse set of industries in recent decades is consistent with the increasing importance of general managerial

[11] For 1920-1949, 62.2% = 17.8% + 2.2% + 8.9% + 33.3%; and for 1950-1985, 63.3% = 11.9% + 8.4%+ 8.1% + 34.9%.

skills, as opposed to industry- or firm-specific skills, in the executive labor market (Murphy and Zabojnik 2007; Custodio, Ferreira, and Matos 2013; Frydman 2019). Overall, the evidence in Table 3 suggests enhanced across-industry mobility for CEOs through time.

[Insert Table 4 here.]

Table 4 presents the analogous fraction of CFO moves from one industry to another. The table shows that the career moves of CFOs are across a more diverse set of industries than are CEOs'. For example, between 1920 and 1949, the HHI of the fraction of CFO moves between industries is 0.126 and the propensity of across-industry moves is 52.4%, whereas the corresponding numbers for CEOs are 0.165 and 40.0% (from Table 3). Across the next two eras, CFOs' mobility increased, and finance executives continued to move across more diverse sets of industries and to different industries more often than chief executives. The CFO HHI decreased from 0.111 during 1950-1985 to 0.061 during 1986-2011 (vs. 0.157 and 0.065 for CEOs), and the fraction of out-of-industry moves increased from 52.9% to 55.2% (vs. 46.7% and 47.2% for CEOs). Thus, a comparison of across-industry mobility of CEOs and CFOs is consistent with CFOs having more general skills than CEOs, and thus exhibiting higher mobility across industries in the past century.

3.3 Trends in Formal Measures of Executive Mobility

3.3.1 Formal Measures of Executive Mobility

To further examine the time-series changes in executive mobility and the factors that driver the trends, we formally construct aggregate measures of executive mobility. Specifically, we measure executive mobility as the number of CEOs who move to other firms as executives, scaled by the lagged number of CEOs, or separately, scaled by the lagged number of CEO turnover events. These measures capture the propensity at which sitting or leaving CEOs are hired by other firms

at the aggregate level. (We repeat the same calculations for CFOs.) The resulting measures are defined as follows:

$$Mobility_t = \frac{\#\ CEO\ (or\ CFO)\ moves_t}{\#\ CEOs\ (or\ CFOs)_{t-1}}(A)\ or\ \frac{\#\ CEO\ (or\ CFO)\ moves_t}{\#\ CEOs\ (or\ CFOs)_{t-1}}(B), \quad (1)$$

where $Mobility_t$ is an aggregate measure of mobility for CEOs in year *t; # CEO moves*$_t$ represents the number of CEOs in years *t-2* and *t-1* who become officers at another firm in year *t*; *# CEOs* is the number of CEOs; and *# CEO turnovers*$_{t-1}$ is the number of CEO turnovers in year *t-1*. And likewise for CFOs.

An executive may move to another firm because she was looking for an opportunity at unrelated firms or because of mergers and acquisitions (M&As). To account of the effects of M&A, we construct two versions of our executive mobility measures – the first one accounts for all moves, and the second one excludes moves directly tied to M&As or subsidiary relations (see Frydman 2019 for a related discussion).

3.3.2 Trends in Executive Mobility

Figure 1, Panel A shows that the two measures of CEO mobility that are scaled by the number of CEOs ("A" in Eq. (1)), whether including or excluding M&A / subsidiary-related events, move 'in parallel' from 1920 through 2011 (ρ = 0.945). The dashed gray line showing the difference between the two measures indicates that the portion of mobility due to M&As or across subsidiaries is relatively stable across the century. That is, M&A trends do not drive aggregate mobility trends. Panel B presents the measures scaled by the number of CEO turnover events ("B" in Eq. (1)), which exhibit similar patterns with the mobility measures shown in Panel A. Given that M&A or subsidiary relations do not drive mobility in an important way, our analysis below relies primarily on the mobility measures that include executive moves associated with M&As or subsidiaries.

Note that our first mobility measure for CEOs in Eq. (1) can be re-written as:

$$Mobility_t = \frac{\#\ CEO\ moves_t}{\#\ CEOs_{t-1}}(A) = \frac{\#\ CEO\ moves_t}{\#\ CEO\ turnovers_{t-1}}(B) \times \frac{\#\ CEO\ turnovers_{t-1}}{\#\ CEOs_{t-1}}(C). \quad (2)$$

Panel C of Figure 1 presents this decomposition of the first mobility measure A into these two components: B the number of CEO moves scaled by the number of CEO turnovers (which is the second mobility measure in Eq. (1)), and C turnover (i.e., the number of CEO turnovers scaled by the number of CEOs). Thus, our mobility measure A nests the two main proxies for executive mobility employed in the literature–the propensity of departing executives to find new executive work B and turnover rate C (e.g., Huson, Parrino, and Starks 2001; Murphy and Zabojnik 2007; Frydman 2019)–and allows us to examine which approach is more informative in terms of measuring executive mobility.

Panel C shows that the components reinforce each other when mobility increases and then decreases from the 1980s through 2000s; nonetheless, the first component B, which captures the propensity of departing executives to find new executive work (e.g., Table 1), is the dominant driver of executive mobility: a statistical decomposition shows that the variation in the log of the first component drives approximately 77% of the variation in the log of the overall mobility measure (and the second component, turnover rate, and its covariance with the first term drive 23%). In addition, the first component is more similar to overall mobility in its steady increase from the mid-1980s to 1999. These results highlight one contribution of our paper relative to previous work: Showing that executive mobility involves departing executives finding new executive-level jobs B in addition to executive turnover C; and documenting that the former is empirically the more important element of mobility.

[Insert Figure 1 here.]

Both elements of mobility generally trended up throughout most of the sample period, consistent with the overall trends we presented in the previous sections. We find that a linear time trend accounts for nearly 30% of variation in aggregate CEO mobility, and explains about 40% of the increase in CEO mobility between 1925 and 2000. A new result in our paper however is that executive mobility, measured by the frequency of across-firm moves, declined through the first decade of the 2000s. This pattern is consistent with our finding in Section 3.1 that the propensity of sitting CEOs moving to other firms reversed in the last decade of our sample (2002 to 2011).

The mobility measures for CFOs shown in Figure 2 exhibit similarly increasing long-run trends until the late-1990s, when they began to decline as did the measures for CEOs. The key difference is that the magnitude of the increase during the late-1980s and 1990s, as well as the peak level in the late-1990s, is much higher for CFOs. As mentioned above, potential explanations for the greater increase in CFOs' mobility relative to CEOs' include the increased visibility of CFOs due to their changing roles (e.g., more like CEO's) and improved communication technology over the last two decades of the 20th century. Nonetheless, CFO mobility exhibits a familiar downward trend post-1999. In the next section, we turn to the analysis of what explains these mobility trends.

[Insert Figure 2 here.]

4. Explaining Executive Mobility Trends

The previous section documents generally increasing executive mobility in the past century, with the trend reversed in the last decade of the sample. In this section, we explore potential explanations for these trends, with a focus on explaining the increasing-then-decreasing pattern from the 1980s to the 2000s. Existing research argues and provides some evidence that increasing

importance of general managerial human capital can explain the increase in executive mobility during the 1980s and 1990s (e.g., Murphy and Zabojnik 2007; Frydman 2019). However, this research does not document the subsequent decline in mobility (partly of course because the samples used in the previous research end in the early-2000s).

4.1 General Managerial Skills and Executive Mobility

We first examine whether changing importance of general managerial human capital could explain executive mobility trends from the 1960s through 2000s by employing several measures. We initially show graphical evidence for a number of explanatory variables, then present regression evidence in Section 4.5.

The first measure of general skills is the ratio of new enrollment in MBA degree to engineering master's degree programs in the U.S., proxied by the number of degrees conferred two years after. We collect data on master's degrees conferred in business and related fields (rereferred to as "MBA" henceforth) and in engineering and engineering technologies (rereferred to as "engineering" henceforth) from the US Department of Education, National Center for Education Statistics from 1970 through 2011. Murphy and Zabojnik (2007) argue that the rising popularity of MBA education during the 1980s-1990s indicates increasing importance of general managerial skills for corporate executives, relative to firm- or industry-specific skills. Anecdotal evidence suggests that specialized, perhaps technical skills might have become more important for executives in the most recent decade in our sample given the rise of technology-oriented firms (see, e.g., Gartner 2019).[12]

[Insert Figure 3 here.]

[12] Gartner, 2019, Top 10 Emerging Skills for the C-Suite: https://www.gartner.com/smarterwithgartner/top-10-emerging-skills-for-the-c-suite.

Panel A of Figure 3 plots both the MBA-to-engineering degree enrollment ratio and our mobility measure from 1970 to 2011. Both variables increased during the 1970s and then decreased until the late-1980s. After that, both the relative number of MBA program enrollment and the mobility measure increased substantially through the late-1990s or early-2000s. During the 2000s, the mobility measure declined substantially, whereas the relative importance of MBA to engineering education experienced a relatively small decrease. Thus, the importance of general managerial skills (over technical skills) is a candidate explanation for executive mobility until about 2000 but probably not thereafter.

Second, a particular type of general management skill relates to managing complex organizations by acquiring and restructuring firms and divisions, often across different industries (e.g., Vancil 1987; Custodio, Ferreira, and Matos 2013). In particular, as the market for corporate control emerged in the early 1980s, these general skills were likely to become more valuable for corporate executives, especially those who oversee large, complex firms.[13] We measure the importance of the "restructuring-related" general management skills using the intensity of mergers and acquisitions (M&As) in the corporate sector.

Panel B plots the number of completed M&A transactions among US targets and acquirers (from the SDC) scaled by the lagged number of public firms in the NYSE, Amex, and Nasdaq, along with our mobility measure excluding moves associated with M&As or subsidiaries (this is to avoid any mechanical correlation between the two variables). The two series show very similar, increasing trends from 1982 to 1998.[14] Except for a brief divergence during the early- to mid-2000s, they also both exhibit downward trends in the last few years of the sample. The close co-

[13] See Murphy (2013, p. 267) for a historical account for the rise of the market for corporate control, and hostile takeovers in particular. He argues that corporate managers' pursuit of inefficient diversification and larger firm size in the previous decades had led to active corporate restructuring markets in the 1980s and 1990s.
[14] We begin the series in 1982 when SDC's data coverage becomes stable.

movements of the M&A intensity in the US corporate sector and executive mobility ($\rho = 0.784$) is consistent with changing importance of restructuring- or finance-related general managerial skills being one of the drivers of executive mobility in the past several decades.[15] [16]

The ability of executives to move across industries is intuitively an important component of mobility. We therefore examine whether trends in cross-industry moves is related to variation in executive mobility over time, using the HHI of the fraction of between-industry (one-digit SIC) CEO movements. For this analysis, we calculate the HHI using the past ten years of CEO moves beginning in 1960, when the calculation of the HHI becomes feasible due to a large enough number of moves. Panel C of Figure 3 plots the inverse HHI measure of between-industry movements and our mobility measure, and shows that they are positively correlated ($\rho = 0.500$). A dramatic increase in 1/HHI (which implies a higher degree of cross-industry mobility) since the mid-1980s coincides with a large increase in executive mobility. Also, both series remain relatively stable between the 1970s and early-1980s. During the 2000s, the inverse HHI measure plateaus while the mobility measure declines. Hence, propensity of cross-industry moves is a candidate explanation of executive mobility until about 2000 but probably not thereafter.

4.2 Labor Market Size, Nature of Executive Contracts, and Benefits of Executive Movements

The previous section shows evidence that general managerial skills and cross-industry moves are associated with aggregate trends in mobility, particularly the run-up until the early-2000s. What other factors may have contributed to the long-run trends? The past two decades

[15] Also consistent with the declining importance of finance- and restructuring-related skills for CEOs during the 2000s, recent work by Fuller et al. (2020) analyzes CEO job descriptions between 2000 and 2017 collected from a top executive search firm and finds that the importance of CEOs' ability to manage "financial and material resources" has declined steadily since the early-2000s.

[16] An alternative non-mutually-exclusive explanation is that outsider CEOs have an advantage in restructuring given little social or emotional ties to the stakeholders (such as employees) and particular lines of business. Under this explanation, increasing demand for "restructuring skills" from the CEO would lead to increased demand for outside CEOs and hence a more active external labor market (see, e.g., Khurana 2002).

observed a steady decline in the number of listed firms, reversing a long-run increasing trend before the 2000s (see, e.g., Doidge, Karolyi, and Stulz 2017). In addition, firm concentration has increased across many industries since the late-1990s (Grullon, Larkin, and Michaely 2019; Covarrubias, Gutiérrez, and Philippon 2019). We begin this section by analyzing whether these shifts in market structures are associated with time-series patterns in executive mobility.

The literature on search frictions shows that larger labor markets facilitate job search, leading to higher labor mobility and match quality (e.g., Diamond 1982; Petrongolo and Pissarides 2006). Thus, to the extent that the executive labor market is segmented between public and private firms, the changing number of public firms could affect the size of the labor market and in turn executive mobility. Following the literature, we measure the labor market size (or thickness) for public firm executives using the number of firms on the NYSE, Amex, and Nasdaq (see, e.g., Petrongolo and Pissarides 2006; Harmon 2013).

Panel D of Figure 3 shows that labor market size exhibits long-run trends similar to those for mobility over the entire sample period from 1921 to 2011, with a correlation of 0.546. As the number of public firms increased considerably in the early-1960s and early-1970s, the mobility measure also exhibited an increasing trend. Importantly, both the number of public firms and executive mobility experienced a pronounced increasing-then-decreasing pattern since the mid-1980s. Thus, the graphical analysis suggests that the changing size of executive labor markets could be a plausible explanation for changing mobility we document.[17]

[17] It is important to distinguish the labor market thickness explanation for declining mobility from a potentially mechanical relation in that our sample is made up of public firms. (So, for example, if the public firms that disappear are each replaced with a private firm, and executives continue to move to these private firms at the same rate as before so 'true' mobility has not changed, our measure might mechanically exhibit a decline in mobility). To eliminate this mechanical possibility, in Section 4.6 perform an analysis that also includes private firms and confirm that executive mobility does in fact decline post-2001.

In addition to these dynamics with respect to labor market thickness, the changing nature of labor contracts for executives could explain their mobility trends. Kini, Williams, and Yin (2020) find that the fraction of newly hired CEOs whose contracts are covered by non-compete agreements increased from about 45% in the mid-1990s and about 60% in the early 2000s to close to 70% by the late 2000s. Thus, the increasing prevalence of non-compete clauses, which limit their across-firm mobility, could explain the declining mobility since the early 2000s.

While changing executive labor market size and nature of labor contracts could explain long-run secular trends in mobility, including the decline since the early-2000s, what might account for variations at a higher frequency, such as business cycles? A potentially important driver of aggregate executive mobility at this frequency relates to benefits to reallocating executives across firms. Existing research on reallocation of labor and capital argues that large cross-sectional dispersion of outcomes (such as productivity and wages) are plausible measures of the benefits of reallocation (see, e.g., Saks and Wozniak 2011; Eisfeldt and Rampini 2006). The idea is that larger differences in firm performance provide opportunities for productive reallocation of executives between firms. Following this line of research, we employ the standard deviation of return on assets (ROA) across firms in the NYSE and Amex as a measure of the reallocation benefits. Panel E of Figure 3 plots it along with the CEO mobility measure.[18]

The panel shows that ROA dispersion covaries positively with CEO mobility ($\rho = 0.415$), particularly around important business cycle events such as the Great Depression, the recession of 1948-49, and the peak in the late-1990s. In addition, both the dispersion and executive mobility increased from the mid-1980s to the late-1990s. These findings are consistent with the notion that

[18] To avoid mechanical relations between the dispersion measure and executive mobility due to capital reallocation (which includes M&A and sales of subsidiaries), we use the mobility measure that excludes M&A- and subsidiary-related moves.

CEOs tend to move across firms when the benefits of such reallocation are high. Interestingly, this pattern of executive mobility contrasts with reallocation patterns for general workforce and capital assets, which either do not covary (workers) or negatively covary (capital) with dispersion measures (Saks and Wozniak 2011; Eisfeldt and Rampini 2006).

4.3 Executive Mobility and Executive Pay

What are the implications of the dynamics of executive mobility documented above for executive compensation? Existing research shows that equity-based incentive pay could be related to executive mobility. On the one hand, equity-based pay with vesting periods, stock options in particular, could work as a retention tool for executives (e.g., Oyer 2004; Jochem, Ladika, and Sautner 2018; Lie and Que 2019). This mechanism implies that firms may want to use more equity-based pay when labor market mobility is high, to retain their executives. On the other hand, the retention effect of equity-based executive pay implies that a high fraction of equity-based pay would negatively affect executive mobility.

Panel F of Figure 3 plots the average equity-based CEO pay (i.e., option and stock grants) as a fraction of total pay, along with our mobility measure. CEO compensation data are from Frydman and Saks (2010) and ExecuComp covering 1936-2011.[19] The panel shows that the increasing-then-decreasing pattern of mobility since the mid-1980s almost exactly coincides with the same pattern of the fraction of option grants among the average CEO's total compensation. This positive correlation is consistent with option-based incentives becoming more important during the 1980s and 1990s in response to increasing executive mobility (we explore this in more detail in Section 6). The fraction of stock plus option grants also shows a similar trend, although less so since 2005 when stock grants became quantitatively more important (Murphy 2013).

[19] We thank Carola Frydman for making her dataset available on her website. Pay data from ExecuComp are adjusted for backfilling following Gillan et al. (2020).

4.4 Geographical Mobility of Executives

The previous sections examine determinants of aggregate executive mobility under the (implicit) assumption that the US executive labor market is national. Along these lines, existing research has found that the modern labor market for executives is largely national, although there is considerable geographical concentration of movement within a given area such as a state and county (e.g., Kedia and Rajgopal 2009; Yonker 2017; Sauvagnat and Schivardi 2020). However, little is known about geographic mobility earlier in the century. In this section, for the first time in the literature we explore trends in geographical mobility of executives over the past century. In particular, we examine whether executive mobility across (vs. within) geographical areas could explain the overall mobility patterns shown above.

A plausible hypothesis would be that mobility of corporate executives across geographic areas increased over the century due to considerable improvements in transportation and communication technologies.[20] On the other hand, the literature on worker mobility shows that geographical mobility of rank-and-file employees has declined in the U.S. since the 1980s (e.g., Molloy, Smith, and Wozniak 2011, 2014). Therefore, we explore whether executive mobility to new jobs in different geographical areas has also declined in the past several decades. Thanks to our century-long data, we are able to test these competing hypotheses regarding trends in executives' geographical mobility.

[20] One particular effect of improved technologies on executives' mobility is on their propensity to commute long distance or telecommute. See "Lands' End CEO Federica Marchionni Is Pushed Out," *The Wall Street Journal*, September 26, 2016 for an example of a public company CEO whose permanent residence (New York City) is long distance away from its headquarters (Dodgeville, WI). Furthermore, the recent COVID-19 pandemic appears to have accelerated this trend. For example, a recent survey by PwC (2020) finds that more than three-quarters of CEOs think there will be an enduring shift towards remote work as a result of the pandemic.

For our analysis, we employ two definitions of local labor markets: states and counties,[21] and define the location of a given CEO as the location of her employer's headquarters.[22] Over the full sample period, the average fraction of cross-state and cross-county moves among all CEO moves are 68.0% and 80.5%, indicating that the vast majority of executive moves in the US in the past century are across (as opposed to within) local labor markets. Executives' high cross-local labor market mobility is consistent with the existing evidence that geographical mobility is greater for high-skill workers (Topel 1986; Bound and Holzer 2000).[23]

Importantly, Panel G of Figure 3 shows that the fraction of across-state and across-county CEO moves have increased along with CEO mobility in the early part of the sample period. This finding is consistent with our hypothesis that CEO mobility has become more diverse in terms of geographical dispersion along with improvements in transportation and communication technologies. However, this positive co-movement has been reversed in more recent years. For example, the fraction of across-state and across-county CEO moves have declined since the early 1990s, while CEO mobility increased.

Taken together, the increasing geographical mobility in the early sample period is consistent with an overall increasing propensity of executives moving to other firms as we document. However, recall that earlier we showed an overall increase in executive mobility from the mid-80s until the late-1990s, then a reduction in the most recent decade. Compared with this trend in mobility, geographic mobility does not show substantial change over this time period.

[21] We do not use commuting zones (CZs) or metropolitan areas, other commonly used definitions of local labor markets, given the difficulty of using these geographical units in a consistent manner over the long sample period. For example, CZs are officially defined since 1980 only (Source: US Department of Agriculture).

[22] We identify headquarter locations using various sources including Moody's (for 1920-1989), "The Corporate Directory of U.S Public Companies," "SEC Digest," and 10-K filings (for 1990-2011).

[23] For example, the approximately two-thirds fraction of across-state CEO moves almost doubles the average fraction of across-state movements for overall workforce during the 1950s-1970s shown in Molloy, Smith, and Wozniak (2014).

Therefore, we conclude that changes in geographical mobility alone do not suffice to explain the large changes in mobility since 1986.

4.5 Time-Series Regression Analysis

The previous sections use graphs to establish relations between executive mobility and various economic variables. In particular, some of these variables appear to comove with the increasing-then-decreasing pattern of executive mobility around the mid-1980s. In this section, we use a regression framework to formally analyze the time-series relation between variables in Figure 3 and CEO mobility with a focus on whether the variables explain the increasing and/or decreasing patterns of the mobility. Specifically, we estimate the following equation:

$$Mobility_t = \alpha + t + \beta_1 X_t \times Pre\ 2000 + \beta_2 X_t \times Post\ 2000 + \beta_3 Post\ 2000 + \gamma M_t + \varepsilon_t, \quad (4)$$

where $Mobility_t$ represents our measure of aggregate executive mobility in year t defined in Eq. (1); t represents a linear time trend; X_t includes explanatory variables that capture the importance of general managerial skills, executive labor market thickness, or benefits of reallocating executives as introduced in Sections 4.1 and 4.2; *Pre 2000* (*Post 2000*) is an indicator variable that is equal to one if year t is before 2000 (equal to or after 2000);[24] M_t represents a vector of macroeconomic variables including the growth rate in real GDP, BAA-AAA credit spread, aggregate productivity, and three-month T-bill rate; and ε_t represents random errors. To account for serial correlation both in the mobility measure and explanatory variables, we use Newey-West (1987) standard errors with four years of lag.

Table 5 summarizes the regression results based on the mobility measure capturing the propensity of sitting executives to find new executive work ("A" in Eq. (1)), and reveals the

[24] We choose year 2000 to define the indicators as the CEO mobility measures peak in 1999 (see Figure 1). Our results are similar if we slightly change the year to define the indicators.

following patterns.[25] First, consistent with the graphical evidence in Section 4.1, the proxies for the importance of general management skills – (1) the ratio of the number of MBA and engineering master's degree program new enrollment (column 1), (2) the number of M&A transactions scaled by the lagged number of firms on major exchanges (column 2), and (3) the inversed HHI of CEO moves across one-digit SIC industries (column 3) – are all significantly positively correlated with CEO mobility before 2000. In contrast, the M&A intensity and inversed HHI of cross-industry movements are not correlated with executive mobility after 2000, whereas the relative number of MBA program enrollment continues to be positively correlated with CEO mobility.

In addition to general managerial skills, the size of the overall executive labor market could facilitate labor mobility. Proxying for executive labor market size using the log number of firms in the NYSE, Amex, and Nasdaq, we find that the variable is positively correlated with aggregate CEO mobility at the 1% level after 2000 (column 4), when mobility shows a decreasing trend. The coefficient of 0.038 indicates that a 100-log point decrease in the measure of labor market size for corporate executives is associated with a 3.8-percentage point decrease in executive mobility (which has a mean of 4.9%) in the 2000s. However, there is little relation between the measure of executive labor market size and CEO mobility before 2000.

[Insert Table 5 here.]

In column 5, we include the cross-sectional standard deviation of ROA as a measure of benefits of executive movements across firms (see, e.g., Eisfeldt and Rampini 2006; Saks and Wozniak 2011 for similar approaches). We find that the cross-sectional dispersion measure is significantly positively associated with mobility across the sample period, with the association more pronounced during the last decade. These results support the notion that CEOs tend to move

[25] We find quantitatively similar results when we use an alternative mobility measure that captures the propensity of departing executives to find new executive work ("B" in Eq. (1)) (see Table A2).

across firms when the benefits of such reallocations are greater, measured by high dispersion of firm profitability, throughout the near-century. Relatedly, the coefficients on macroeconomic variables for the full sample in columns 4 shows that CEO mobility is negatively associated with economic growth and productivity (the latter is significant at the 1% level). This result shows that CEO movements are more frequent in "bad times," when the benefits of reallocation tend to be greater (Bloom 2009).

In column 6, we find that mobility is significantly positively correlated with the fraction of option and restricted stock grants among total pay, consistent with firms using incentive pay as a retention tool for executives. Moreover, estimates in columns 7 and 8 show that the fraction of option grants but not stock grants is significantly associated with mobility (especially after 2000), consistent with the former being a more effective retention tool (Oyer and Schaefer 2003; Gopalan et al. 2014). Lastly, column 9 shows a negative correlation between CEO mobility and the fraction of across-state CEO moves, which is statistically significant before 2000. A plausible explanation is that executives are more willing to search for jobs out of their local labor markets when overall mobility is low.

In sum, the time-series regression analysis identifies several variables that explain the aggregate trends in executive mobility – proxies for importance of general managerial (vs. technical) skills, executive labor market size, and time-varying benefits to reallocating executives. Taken together, the results in Table 5 suggest that the increasing trend in mobility before 2000 is explained by increasing importance of general management skills, whereas the decreasing trend post 2000 is related to the decreasing size of executive labor markets. The benefits of executive movements are associated with mobility across the entire sample period.

4.6 Robustness: The Impact of Executives Moving to Private Firms

A potential explanation for the measured trends in executive mobility concerns a changing fraction of executives moved from public to private firms, which we do not observe because private firms are not accounted for in our data. For example, the decline in the executive mobility measures during the 2000s may be due to an increasing fraction of executives moving from public to private firms. To investigate this possibility, we randomly select approximately 10% of the final observed year of firm-CEO pairs in our sample and track out-of-our-sample career paths of these CEOs after their departure using Marquis Who's Who (which contains information on private firm employment).

We first confirm that this alternative data source also indicates increasing propensities for public firm CEOs to move to public firms over the past century. During the 1920-1949, 1950-1985, and 1986-2011 periods, 1.6%, 4.2%, and 6.3% of departing CEOs moved to public companies. These trends align with our previous findings. Important for this robustness check, Who's Who allows us to document the rate at which departing public firm CEOs move to private firms, which has increased from 3.3%, 4.5%, and to 5.5% across the three eras.

Importantly, we do not find evidence that the recent decline in mobility is due to an increase in the public to private firm moves of CEOs. We find that the rate of public firm CEOs moving to public firms is 7.9% (4.7%) during the 1986-2001 (2002-2011) period, confirming the pattern in our data. Also, the rate of public firm CEOs moving to private firms decline slightly (from 5.8% to 5.2%) across the periods. Therefore, increasing propensity of movements from public to private firms does not account for the decline in our mobility measures during the last ten years of the sample period.[26]

[26] It is also possible that if CEOs are on average older in the 2002-2011 period because they continue to work later in life, then mobility might decline. However, we do not find evidence of this possibility: average ages of CEOs are similar between 1986-2001 (56.3) and 2002-2011 (58.1).

5. Cross-Sectional Determinants of Executive Mobility

The previous two sections document time-series trends in aggregate executive mobility in the past century and propose plausible explanations for the trends. In this section, we explore drivers of executive mobility in the cross-section of firms. This analysis sheds light on whether some of the drivers of aggregate executive mobility, as well as key firm and CEO characteristics, explain heterogeneity in executive mobility across different firms. Specifically, we estimate the following logistic regression using a panel of firms from 1921-2011:[27]

$$1(move)_{i,t} = \alpha + \gamma X_{i,t} + \delta_t + \varepsilon_{i,t}, \quad (5)$$

where $1(move)_{i,t}$ is an indicator variable that is equal to one when the CEO of firm i as of year t moved to another firm in our sample by year $t+1$ or $t+2$ (i.e., within next two years), and zero otherwise; $X_{i,t}$ represents a vector of firm, CEO, and industry characteristics including firm ROA, Tobin's q, size (measured by log book assets), CEO tenure, and the two-digit SIC industry average and standard deviation (SD) of ROA for firm i in year t; δ_t represents year fixed effects; and $\varepsilon_{i,j,t}$ represents random errors double clustered both at the two-digit SIC industry and year levels. All the variables are Winsorized at 1% and 99% to mitigate any influence of outliers.

[Insert Table 6 here.]

Table 6, Panel A presents estimation results for Eq. (5) based on the full sample, and Panel B for a subsample of firm-years in which there is CEO departure. Thus, Panel A estimates the cross-sectional determinants of CEO mobility for sitting CEOs, similar to the mobility measure in Eq. (2) ("A"), which scales the number of CEO moves by the number of CEOs. Panel B shows the cross-sectional determinants of CEO mobility conditional on turnover, similar to the first

[27] We obtain quantitatively similar results using a linear probability model.

component of the mobility measure in Eq. (2) ("B"), representing the propensity of departing executives to find new executive work.

The two panels document several cross-sectional patterns of CEO mobility. First, firm performance measured by ROA and Tobin's *q* is negatively associated with the CEO's propensity to move to other firms as executive. In addition, industry-level average ROA is also negatively correlated with CEO mobility. These results are consistent with our time-series finding that executives tend to move in "bad times" (Table 5). Second, consistent with CEO reallocation being more frequent when the benefits are greater, as shown above for aggregate mobility, column 2 of the two panels shows that the coefficients on the across-firm SD of ROA in a given industry are significantly positive. Third, the coefficients on firm size are significantly positive in Panel A, suggesting that sitting CEOs of larger companies exhibit higher mobility. This result supports the assumption that larger firms offer better career opportunities, explaining executives' general tendency of moving to larger firms (Table 2). Lastly, the negative coefficients on CEO tenure suggest that short-tenure CEOs are more likely to move across firms than long-tenure CEOs.

Panel C presents estimation results for a version of Eq. (5) that uses an indicator for CEO turnover as dependent variable on the full sample. Thus, the panel shows the cross-sectional determinants of CEO turnover, similar to the second component of the mobility measure in Eq. (2) ("C"). The estimates confirm that the portion of CEO mobility due to turnover largely reinforces the cross-sectional patterns we find in Panels A and B – CEOs depart more when the firm or industry performs worse and the benefits of reallocation is larger; and larger firm CEOs experience more churning in the labor market.

Overall, the evidence in Table 6 shows that firm and industry performance and its dispersion are key determinants of mobility in the cross-section, consistent with our time-series

evidence. Also, these results are consistent with Fee and Hadlock's (2003) prediction that the probability of a given CEO' moving increases in the difference between the value of an executive to her current firm relative to a potential new firm, which is likely high when the firm or industry's performance is low and the dispersion is high.

6. Changes to CEO Pay When Executive Mobility Increases

Our analysis of the aggregate executive mobility, as well as existing evidence (e.g., Murphy and Zabojnik 2007; Custodio, Ferreira, and Matos 2013), suggests a link between mobility and compensation. In particular, it is plausible that in response to an increase in a given CEO's mobility, her firm may want to increase her pay, particularly by increasing option grants with a vesting period, in an attempt to retain the CEO (Oyer 2004). The direction of causality and economic mechanisms are not always clear in the time-series analyses above (e.g., in Section 4.3). Therefore, to study the empirical link between executive mobility and compensation policy, in this section we exploit turnovers of other firms' CEOs due to death and health issues as plausibly exogenous shocks to CEOs' labor market mobility and firm-level data.

6.1 The Instrumental Variable: CEO Deaths and Health-Related Resignations in Connected Industries

We employ an instrumental-variables approach that exploits variation in mobility due to CEO deaths and health-related turnovers (see Jenter, Matveyev, and Roth 2019; Graham, Kim, and Leary 2020) elsewhere in the labor market, in particular outside a given CEO's own industry. This approach mitigates omitted-variable concerns (in which executive mobility may be correlated with industry conditions or firm performance, as shown above).[28] Specifically, we instrument

[28] See also Saks and Wozniak (2011); Jenter and Kanaan (2015); and Chodorow-Reich and Wieland (2020).

executive mobility using the weighted average number of CEO deaths and health-related resignations during a given firm's fiscal year across connected two-digit SIC industries divided by the number of CEO turnovers in a given industry in the previous fiscal year.[29] We measure connectedness (and the associated weight) by the fraction of CEO moves from a given ("origin") two-digit SIC industry to each of the other ("destination") industries in the past three years.[30] Presumably, a pair of industries that shares executives is likely to share managerial human capital.[31] Thus, a sudden increase in demand for top executives in connected industries would lead to improved across-firm mobility for executives in a given industry.

The main identifying assumption underlying our instrument is that executive deaths and health-related resignations in other industries affect CEO pay only through labor mobility. The resulting instrumental variable and industry-level mobility measure are defined as follows:

$$Death\ and\ Health_{i,j,t} = \frac{\sum_{k \neq j} w_{j \to k,t-1}\ \#Death\&Health_{i,k,t}}{\#CEO\ turnover_{j,t-1}}, \quad (6)$$

$$Mobility_{j,t} = \frac{\#CEO\ moves_{j,t}}{\#CEO\ turnover_{j,t-1}}, \quad (7)$$

where $Death\&Health_{i,j,t}$ is an instrumental variable for the mobility measures in Eq. (7), representing a shock to mobility due to CEO deaths and health-related turnovers in industry k connected to industry j during firm i's fiscal year t; $\#Death\&Health_{i,k,t}$ represents the number of CEO deaths and health-related resignations in industry k during firm i's fiscal year t; and $w_{j \to k,t-1}$ is the 'connectedness weight' and represents the fraction of CEO hires from industry j to industry

[29] To best align the timing of CEO deaths with pay changes, we count the number of CEO deaths in connected industries that happen during the fiscal year of a given firm. For example, for a firm with a fiscal year ending in April 2002, we count the number of CEO deaths from May 2001 through April 2002.

[30] Our results are robust to using an alternative time window to measure connectedness (e.g., five years). The following example illustrates how we measure the connectedness. From 1986 through 1988, 3.3% of CEO moves from 'primary metal' (two-digit SIC = 33) are to firms in 'coal mining' (two-digit SIC = 12). Thus, for primary metal, we define coal mining as a connected industry for 1989 and use 3.3% as the weight of the industry in constructing the death instrument.

[31] See Tate and Yang (2017) and Kim (2020) for approaches to defining labor markets using worker moves within and across industries based on the US Census Bureau's worker-level data.

k, among all moves from industry *j*, from year *t-3* to year *t-1*; $Mobility_{j,t}$ is a measure of mobility for industry *j* in year *t*; $\#CEO\ moves_{j,t}$ is the number of moves by CEOs in years *t-2* or *t-1* to become officers in another firm in year *t*; $\#CEO\ turnovers_{j,t-1}$ is the number of CEO turnover events in year *t-1*. Figure A1 illustrates construction of the *Death&Health* instrument using a hypothetical example. We employ the mobility measure (B) and the instrument scaled by the number of CEO turnovers, instead of the number of CEOs, in the analysis that follows. This is because the turnover rate could also be affected by other factors than labor market mobility, such as forced turnovers and retirement due to age. We also find above that departing executives' propensity to find new executive-level jobs is empirically the more important element of mobility than executive turnover (see Section 3.3.2).

To implement the instrument in Eq. (6), we collect CEO turnover events due to death and health-related resignations from 1962-2010. All variables are Winsorized at 1% and 99% to mitigate any influence of outliers. Appendix A describes the process to collect the events. In total, we match 228 death events and 68 health events from 1962 to 2010 to our database, 105 of which we classify as sudden deaths. Though based on 296 CEO death and health events, our instrument is likely to provide a significant shock to the executive labor market for a couple of reasons. First, approximately half of new CEO hires in our sample are from outside the firm (defined as non-current or previous officers), indicating active external CEO hiring during the sample period.[32] Second, even when firms do not end up hiring particular outside executives as CEO, the threat of potential hiring would also make firms respond to retain their CEOs by, for example, increasing equity-based pay. Khurana (2002) documents that for a typical outside CEO search, executive

[32] Related, Cziraki and Jenter (2020) find that about 28% of CEOs hired by S&P500 companies from 1993-2011 are external hires (which exclude current board members). We confirm their finding in the highest decline of firm size (measured by total assets) in our sample. We find that the fraction of external hires generally decreases with firm size.

search firms would contact about 20 candidates, on average, suggesting the "threat effect" could be considerably larger than what the number of realized external CEO hires would indicate.

6.2 Sample Construction and Descriptive Statistics for Firm Characteristics

We conduct our analysis of CEO pay from 1962 to 2011 using a sample that combines our data on executive mobility, CEO death and health-related resignation, and pay from Frydman and Saks (2010) and ExecuComp.[33] The resulting sample includes 18,640 firm-year observations for 2,398 unique firms and 4,172 CEOs. Industry-level GDP growth is from the Bureau of Economic Analysis and firm characteristics are from Compustat and Moody's. Table A1 describes definitions and sources of CEO and firm characteristic variables.

[Insert Table 7 here.]

Table 7 presents descriptive statistics for characteristics of firm-years in our sample for the instrumental-variable analysis. For an average sample firm's two-digit SIC industry, there are 37.4 departing CEOs per year, 3.1 of whom become executives (including CEOs) in other firms, in line with our finding in Table 1. In addition, the mean and standard deviation of the *Mobility* measure are 7.07% and 5.88%, respectively, suggesting that there is considerable executive mobility and cross-sectional variation. The average number of CEO deaths and health-related resignations in connected industries is 0.45 per year. Given the average number of CEO moves (3.1) at the industry level, this magnitude of death should induce a meaningful shock to executive mobility. Other CEO characteristics of are comparable to those from previous research (e.g., Graham, Kim, and Leary 2020).

6.3 Executive Mobility and Compensation

[33] Our empirical results are robust if we limit the analyses to an ExecuComp sample from 1992-2011.

We explore the prediction that an increase in a given CEO's mobility, which reflects increased outside labor market opportunities, would lead firms to adopt compensation policies that help retain the CEO. We test the prediction by using the instrumental-variables approach in Section 6.1. Specifically, we estimate the following two-stage least square (2SLS) regressions:

$$Mobility_{j,t} = \alpha + \beta Death\&Health_{i,j,t} + \gamma X_{i,j,t} + \delta_t + \omega_j + \theta_i + \varepsilon_{i,j,t}, \quad (8)$$

$$Pay_{i,j,t+1} = \mu + \varphi \widehat{Mobility}_{j,t} + \rho X_{i,j,t} + \pi_t + \nu_j + \tau_i + \sigma_{i,j,t}, \quad (9)$$

where $Mobility_{j,t}$ represents our measure of executive mobility for industry j in year t in Eq. (7); $Death\&Health_{i,j,t}$ represents the weighted average number of CEO deaths and health-related resignations in connected industries during firm i's fiscal year t scaled by the number of CEO turnovers in industry j in year t-1; $Pay_{i,j,t+1}$ is a variable for CEO pay, including the log of option grants, restricted stock grants (and their indicator variables for positive value), salary and bonus, and the total pay that is the sum of the four in year t+1;[34] $X_{i,j,t}$ represents a vector of control variables including two-digit SIC industry GDP growth rates and average Tobin's q, CEO tenure, firm size (measured by log book assets), ROA, Tobin's q, and excess stock returns for firm i in industry j and year t; δ_t and π_t represent year fixed effects; ω_i and ν_j industry fixed effects; θ_i and τ_i firm fixed effects; and $\varepsilon_{i,j,t}$ and $\sigma_{i,j,t}$ represent random errors double clustered both at the industry and year levels. Given that we include firm fixed effects, we identify the effect of mobility on CEO pay using within-firm variation.

[Insert Table 8 here.]

Table 8 presents estimation results. Column 1 shows that the instrument *Death&Health* is significantly positively correlated with *Mobility* at the 1% level in the first-stage regression,

[34] We focus on year t+1 compensation instead of year t to account for the possible time lag between the labor market movements and changes in CEOs' compensation package. In an untabulated analysis, we find that year t compensation results show a directionally similar yet an economically smaller magnitude compared with Table 8.

indicating that executive mobility increases with the death of connected industry CEOs. A one-standard deviation (SD) increase in *Death&Health* (7.06) is associated with a 0.54% (= 7.06 × 0.076) increase in *Mobility,* which is 7.6% of the average level of *Mobility* (7.07). The *F*-statistic of 43.31 that far exceeds the conventional threshold of 10 (Bound, Jaeger, and Baker 1995; and Staiger and Stock 1997).

Building upon the literature that argues that equity-based pay with vesting periods, option grants in particular, is an effective tool to retain executives (e.g., Oyer 2004; Jochem, Ladika, and Sautner 2018), we first examine whether firms change option-based CEO pay when her outside opportunities improve due to other CEOs' death. Consistent with the Table 5 result, column 2 of Table 8 (second stage) shows that the coefficient on *Mobility* is significantly positive at the 1% level for (log) option grants, consistent with firms increasing option-based pay to retain the CEO. The estimate implies that a one-SD increase in executive mobility (7.98) leads to a 119-log point (= 7.98 × 0.149) increase in a CEO's option pay. Column 3 shows that firms are more likely to grant options to the CEO when her external mobility increases, suggesting that the estimated effect in column 2 is driven by the extensive margin.[35]

Interestingly, column 4 and 5 show that firms insignificantly reduce restricted stock grants when mobility increases. A plausible explanation for this composition change in pay is that options provide a more effective means to retain the CEO than stock grants, given that option values are more sensitive to outside labor market opportunities and option grants more often have time-based vesting (see Oyer and Schaefer 2003; Gopalan et al. 2014).[36] Column 6 shows that the CEO's

[35] We find that an insignificant estimated effect at the intensive margin (unreported).
[36] Gopalan et al. (2014) find that executive option grants almost always (95.3%) have simple time-based vesting, whereas more than a third of stock grants (35.3%) are contingent on performance. If granted, these stocks would have time-based vesting. This implies that, all else equal, option grants would provide a stronger incentive to stay relative to stock grants.

salary and bonus do not change significantly in response to increased mobility, although the positive coefficients point toward an increase in CEO cash pay. Column 7 shows evidence that total CEO pay increases when mobility increases (significant at the 10% level). A one-SD increase in the mobility measure increases CEO total pay by 18.2% (= exp(7.98 × 0.021) - 1). Overall, the results in this section are consistent with the prediction that when a CEO's outside opportunities improve due to the death or health-related departure of connected industry CEOs, the firm not only increases total pay but also change the composition of her pay toward option grants in an attempt to retain her. We find that our results are robust to a placebo instrument and hold up when using CEO deaths or sudden deaths only as alternative instruments (see Appendix C).

7. Conclusion

Researchers have observed notable trends in the U.S. executive labor market over the past few decades. The level and dispersion of executive pay have increased considerably as the frequency of CEO moves and external-to-the-firm CEO hires have increased. In this paper, we uncover several new long-run trends in mobility of executives by constructing a new dataset of executive movements during 1920-2011. First, movements of executives to new jobs across firms became more common in recent decades (e.g., 1986-2001) relative to previous decades. Second, executives moved across an increasingly diverse set of industries over time. Third, we show for the first time that many of these trends have reversed over the last ten years of the sample period (2002-2011), indicating declining executive mobility in the recent decade. We offer several plausible explanations for the evolution of mobility over the century, including changing importance of general managerial ability, labor market size, and benefits to reallocating executives across firms.

Given the substantial variation in executive mobility that we document, it is important to understand what firms would do to retain executives when their mobility increases. To this end, we use CEO deaths in connected industries as an instrument for executive mobility. We find that in response to increased CEO mobility, firms both increase total pay and change the composition of CEO pay toward option grants with vesting periods, which arguably have the strongest retention effect relative to other pay components. We interpret this finding as evidence that increased executive labor mobility leads firms to reshuffle compensation package in an attempt to retain the executive.

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Appendix A – Data collection for CEO death events

This appendix explains how we collect CEO death events from 1962-2010. We start with CEO death events from Salas (2010), Fee, Hadlock, and Pierce (2013), Quigley, Crossland, and Campbell (2017), and Karolyi (2018).[37] We supplement these data with our own data collection as follows. First, we collect names of CEOs who died as reported in the obituary section of Standard and Poor's Register of Corporations, Directors, and Executives ('S&P Register') from 1962 through 2010. Second, we perform news searches to collect additional CEO changes due to death at public firms from 1962 through 2010. Third, we supplement this set by examining all CEO turnover events in our database from 1962 through 2010 that are not identified above, and determine whether they are due to the death of a CEO by searching for news articles in Factiva and Google. We keep track of which CEOs passed away suddenly (e.g., due to accident, heart attack, etc.).

[37] We thank Charlie Hadlock, Steven Karolyi, Timothy Quigley, and Jesus Salas for sharing their datasets on CEO death events.

Appendix B - Examples of CEO to non-CEO moves

- Source: https://www.orlandosentinel.com/news/os-xpm-1993-06-29-9306290610-story.html
- **Previous Firm Name**: Stride Rite Corp. (SIC 3149)
- **New Firm Name**: Borden Inc. (SIC 2026)
- **Executive's name**: Ervin R. Shames

Mr. Shames served as president and CEO in Stride Rite from 1990 to 1993 and joined Borden first as president and COO in 1993 and soon after became president and CEO of the firm in the same year. In fiscal year 1993, Stride Rite had about 3,300 employees and total asset of $412 million while Borden had about 39,500 employees and total asset of $3.87 billion.

- Source: https://www.sec.gov/Archives/edgar/data/841466/0001012870-99-000917.txt
- Previous Firm Name: Copley Pharmaceutical Inc. (SIC 2834)
- New Firm Name: Catalytica Inc. (SIC 2819)
- Executive's name: Gabriel R. Cipau, Ph.D.

Dr. Cipau served as president and CEO of Copley Pharmaceutical from 1995 until 1996. He moved to Catalytica in 1996 as a consultant and became President and COO one year after the move. He was eventually promoted to CEO in 1998. In fiscal year 1998, Copley Pharmaceutical had about 400 employees and total asset of $150 million while Catalytica had about 1,400 employees and total asset of $250 million.

- Source: https://investor.harley-davidson.com/news-releases/news-release-details/thomas-bergmann-selected-harley-davidson-chief-financial-officer
- Previous Firm Name: USF Corp. (SIC 4231)
- New Firm Name: Harley-Davidson Inc. (SIC 3751)
- Executive's name: Thomas E. Bergmann

Mr. Bermann served as CEO of USF until 2005 and Joined Harley-Davison as vice president and CFO in 2006. Before he left for another firm as vice president and CFO, he maintained his title as vice president and CFO in Harley-Davison. In fiscal year 2004, USF had about 20,000 employees and total asset of $1.44 billion while Harley-Davison had about 10,000 employees and total asset of $5.48 billion.

- Source: https://ruthshospitalitygroupinc.gcs-web.com/management/michael-odonnell
- Previous Firm Name: Champps Entertainment Inc. (SIC 5812)
- New Firm Name: Ruth's Chris Steak House Inc. (SIC 5812)
- Executive's name: Michael P. O'Donnell

Mr. Bermann served as CEO and President of Champps Entertainment from 2005 until 2007 and joined Ruth's Chris Steak House (later changed its name to Ruth's Hospitality Group) in 2008 as CEO and President. In fiscal year 2007, Champp had about 4,700 employees and total asset of $260 million while Ruth's Hospitality had about 5,400 employees and total asset of $129 million.

Appendix C – Robustness Tests

This appendix examines the robustness of the baseline results for CEO pay composition using complementary empirical approaches including additional data.

C.1 CEO Death in Unrelated Industries: A Placebo Test

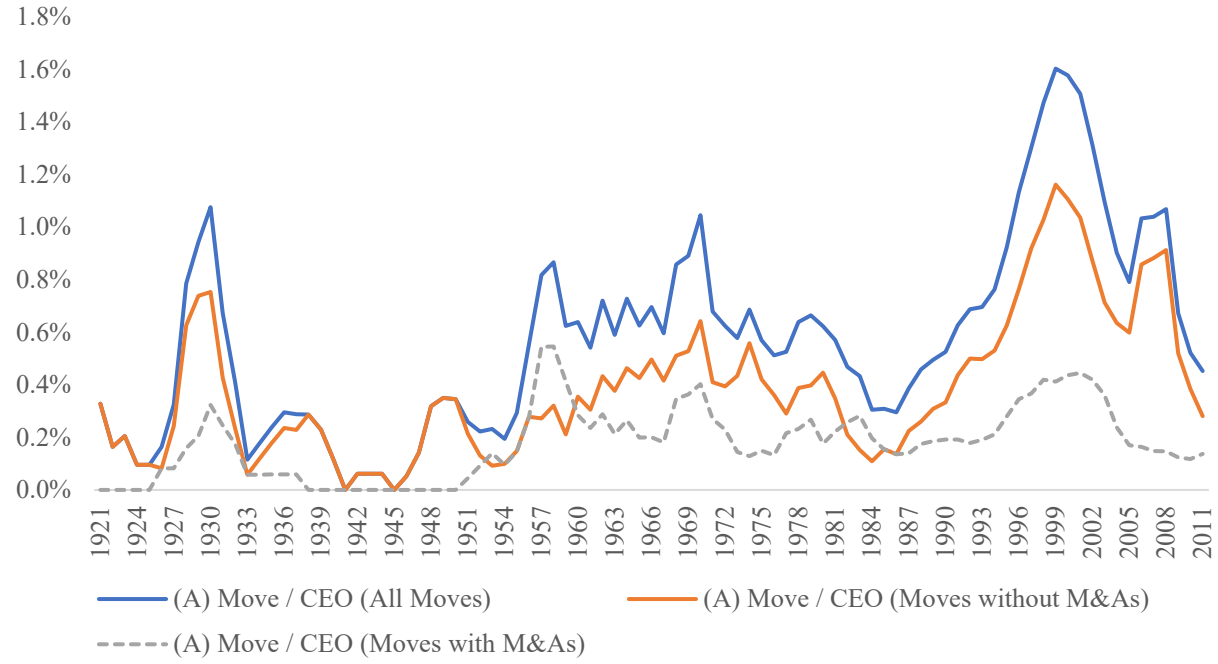
As a first robustness test, we examine the role of connectedness in tying CEO deaths in other industries to pay policies to retain CEOs. Specifically, we create a placebo instrument that equally weights CEO death events from non-connected industries (given that there is no past executive move to those industries). If the effect of death-induced mobility is driven by the labor market, we expect that (1) non-connected CEO deaths are not associated with executive mobility, and (2) the instrumented mobility has no effect on CEO pay. Consistent with these expectations, we find an insignificant first stage regression and no resulting change in CEO pay (Table A3).

C.2 Alternative Instruments for Mobility

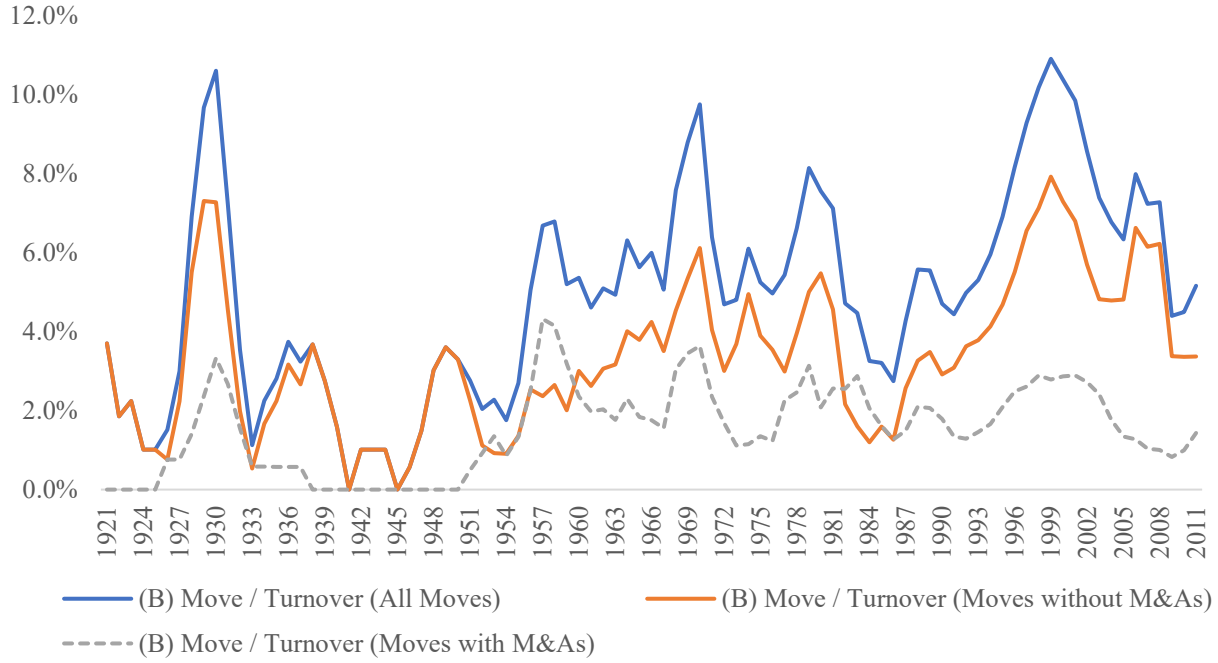
We employ two alternative instruments: (1) the number of CEO death events and (2) the number of CEO sudden death events. Panel A of Table A4 shows qualitatively similar results with the baseline in Table 8 using the number of CEO turnover events due to CEO deaths (228 events) scaled by the number of CEO turnovers in a given industry as an alternative instrument. Panel B shows that the results using only sudden death (105 events) in the instrument are statistically weaker, which is likely due to a much smaller sample. Nonetheless, the economic magnitude remains similar across the columns compared with the main results.

Figure 1. Measures of Executive Mobility for CEOs. This figure plots three measures of executive mobility for CEOs from 1920 through 2011 (three-year moving average). *Move* indicates the number of CEOs in year *t-1* or *t-2* who become CEOs or other executive officers at other firms in our sample in year *t*. *CEO* indicates the total number CEOs in year *t-1*. *Turnover* indicates the number CEOs who leave firms in year *t-1*. "All Moves" includes all the CEOs movements around firms while "Moves without M&As" excludes M&A or subsidiary-related moves. "Moves with M&As" indicates M&A or subsidiary-related moves. Panel C decomposes (A) *Move/CEO* into (B) *Move/Turnover* and (C) *Turnover/CEO* as in equation (2) and shows how each component evolves over time.

Panel A: CEO moves scaled by the number of CEOs



Panel B: CEO moves scaled by the number of CEO turnovers



Panel C: Decomposition of Mobility for CEOs

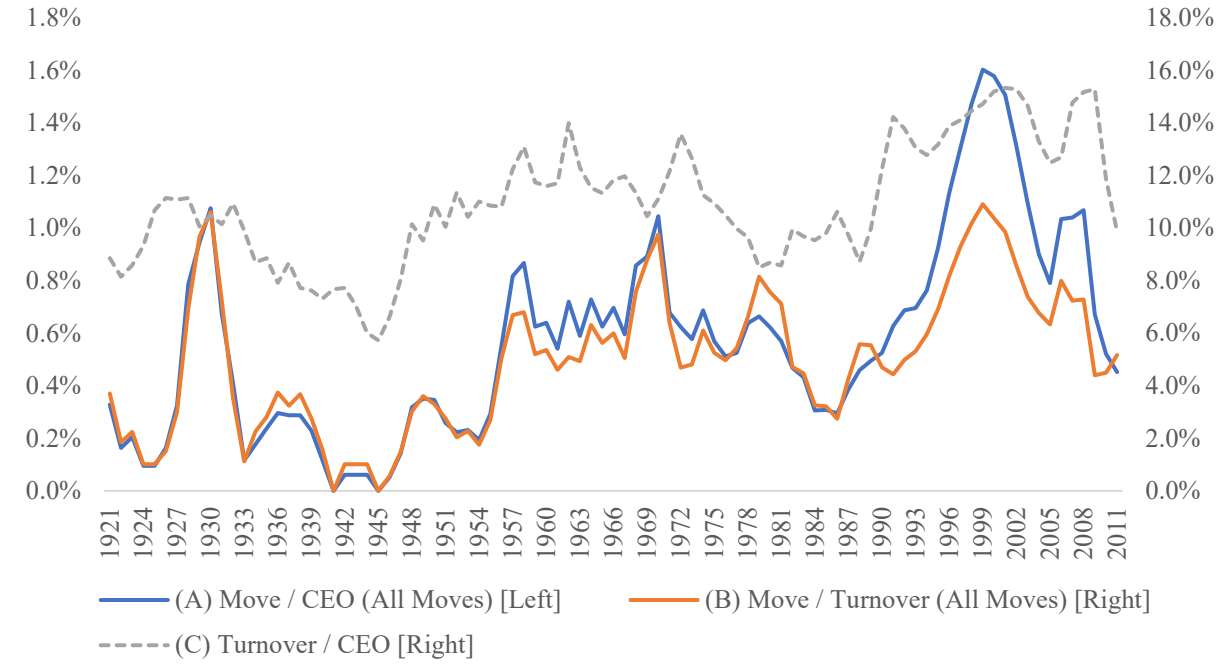
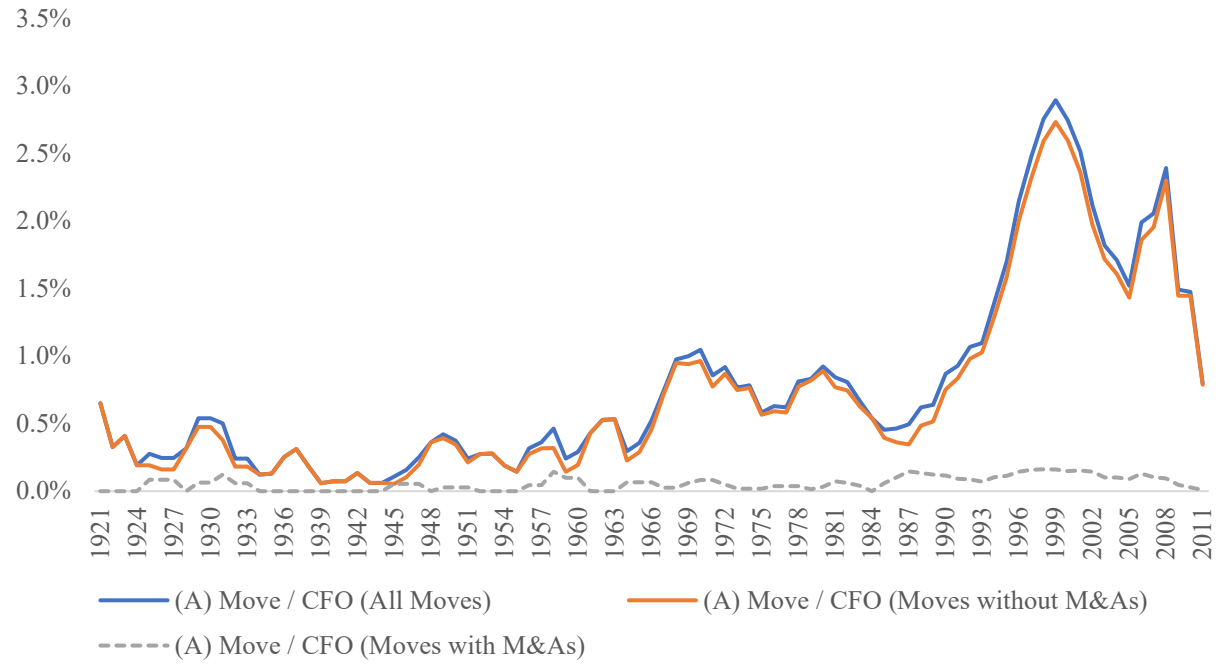
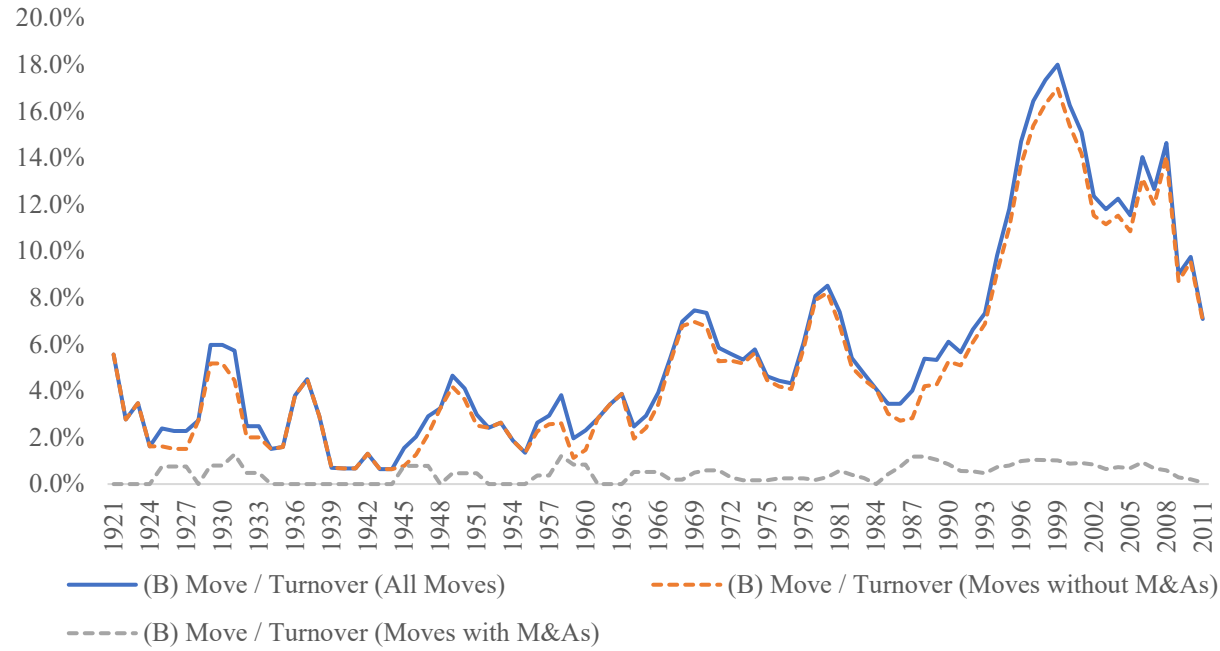


Figure 2. Measures of Executive Mobility for CFOs. This figure plots three measures of executive mobility for CFOs from 1920 through 2011 (three-year moving average). *Move* indicates the number of CFOs in year *t-1* or *t-2* who become CFOs or other executive officers at other firms in our sample in year *t*. *CFO* indicates the total number CFOs in year *t-1*. *Turnover* indicates the number CFOs who leave firms in year *t-1*. "All Moves" includes all the CEOs movements around firms while "Moves without M&As" excludes M&A or subsidiary-related moves. "Moves with M&As" indicates M&A or subsidiary-related moves. Panel C decomposes (A) *Move/CFO* into (B) *Move/Turnover* and (C) *Turnover/CFO* as in equation (2) and shows how each component evolves over time.

Panel A: CFO moves scaled by the number of CFOs



Panel B: CFO moves scaled by the number of CFO turnovers



Panel C: Decomposition of Mobility for CFOs

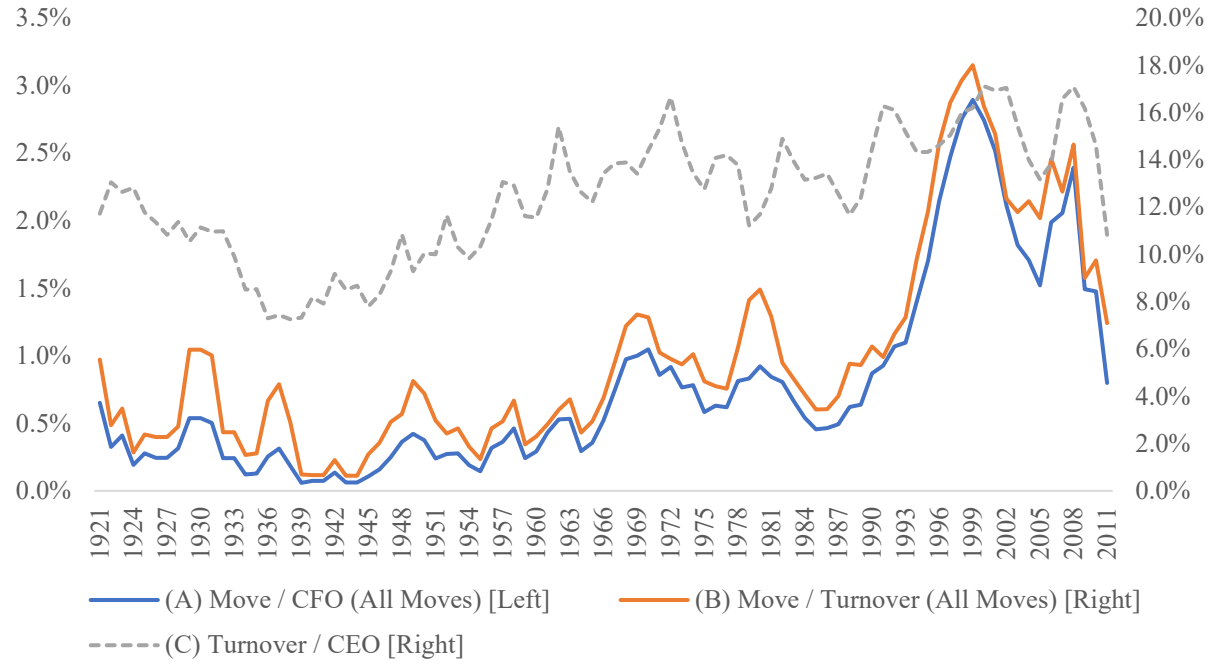
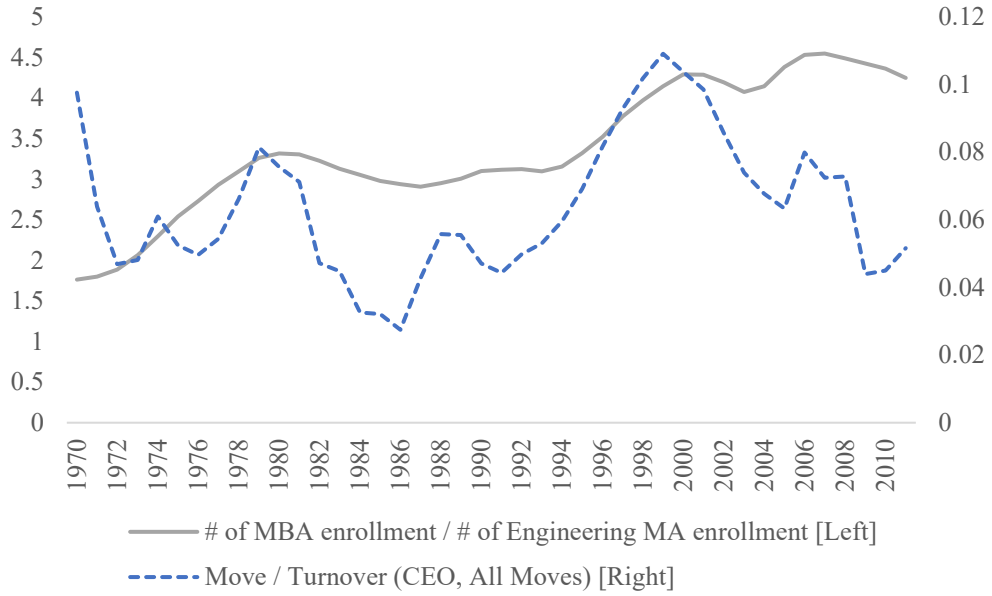
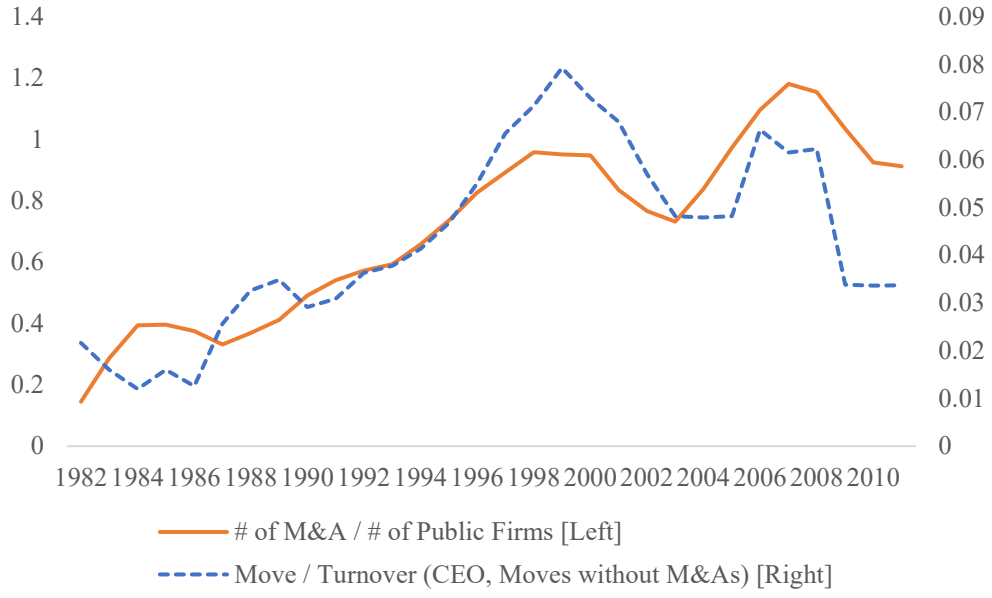


Figure 3. Executive Mobility and Underlying Factors. This figure compares the trends in variables that potentially explain executive mobility with our mobility measure (three-year moving average). "All Moves" includes all the CEOs movements around firms while "Moves without M&As" excludes M&A or subsidiary-related moves. Panel A shows the number of business master's degree programs enrollment over the number of engineering master's degree programs enrollment in the US and the mobility measure. Panel B shows the number of completed M&A deals among the US acquirors and targets over the number of NYSE, Amex and Nasdaq listed public firms and the mobility measure. Panel C shows the inverse of the Herfindahl-Hirschman Index (HHI) of the fraction of past ten-year CEO moves across one-digit SIC industries and the mobility measure. Panel D shows the number of NYSE, Amex and Nasdaq listed public firms and the mobility measure. Panel E shows the average standard deviation of NYSE and Amex listed firms' ROA and the mobility measure. Panel F shows the fraction of equity pay (stock and option grants) and option grants over the total pay (salary and bonus plus equity pay) and the mobility measure. Panel G shows that fraction of past ten-year across-state and across-county CEO moves. "All Moves" includes all the CEOs movements around firms whereas "Moves without M&As" excludes M&A or subsidiary-related moves.

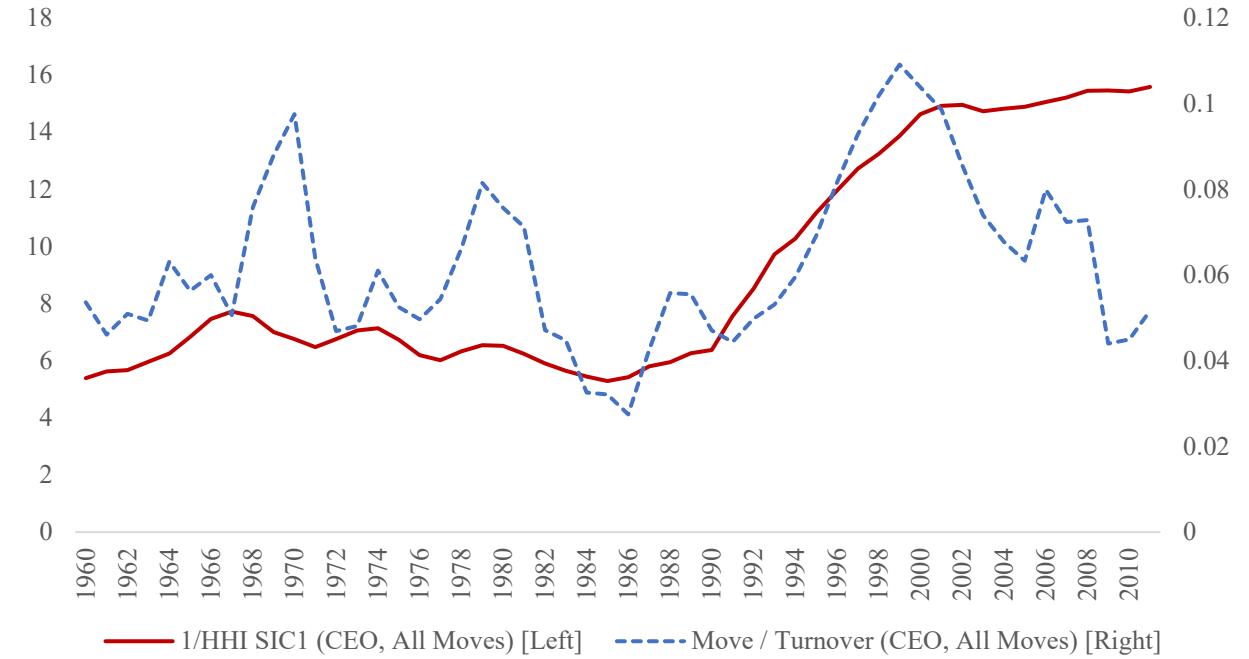
Panel A. MBA relative to engineering degree program enrollment



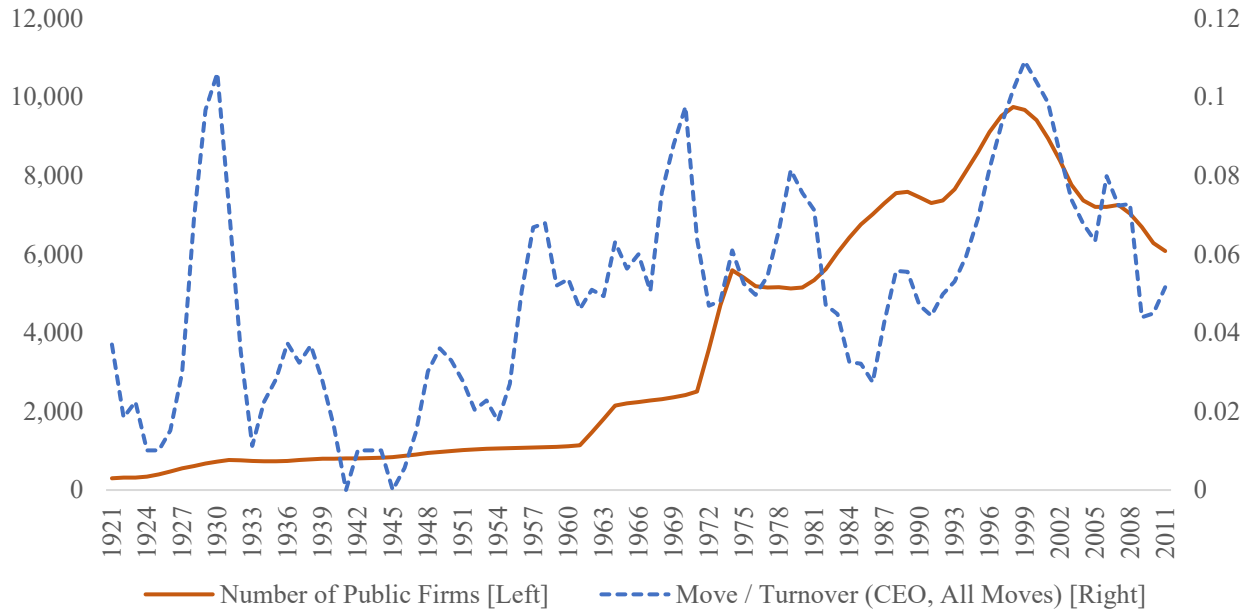
Panel B. M&A deals



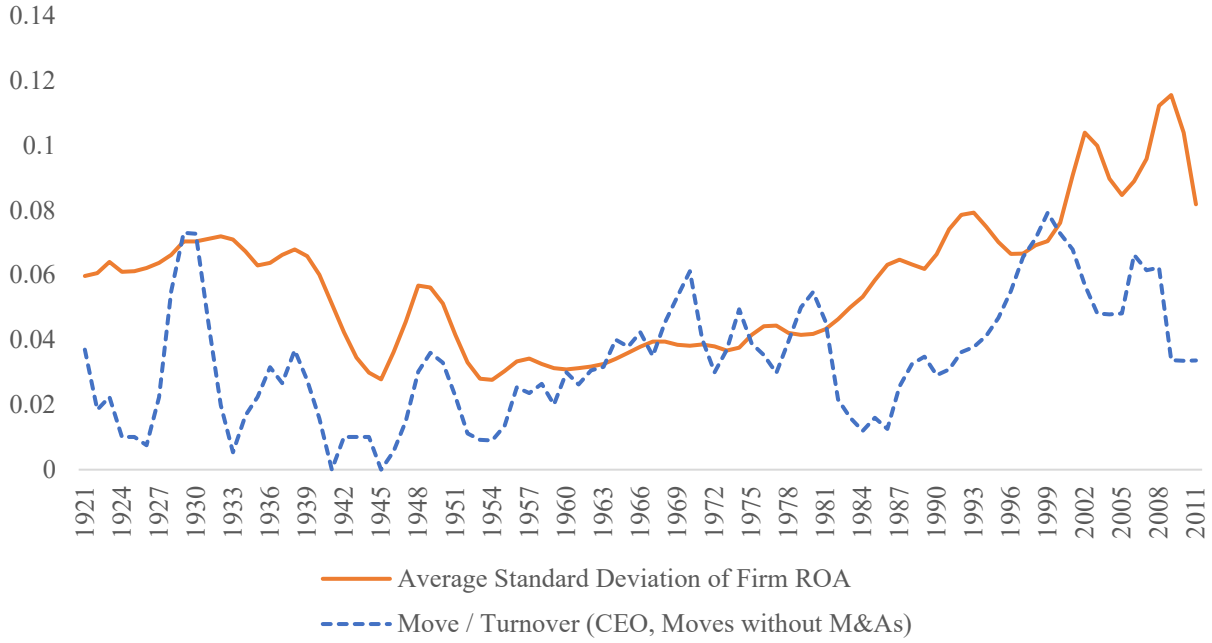
Panel C. Concentration of between-industry moves



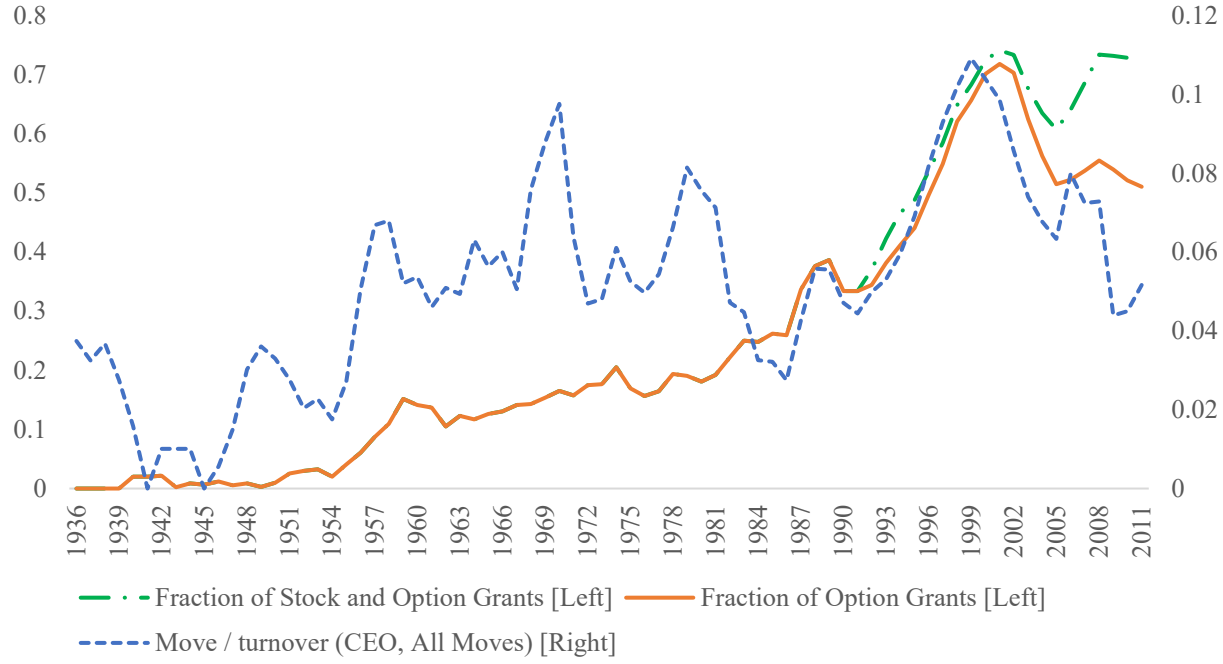
Panel D. Labor market thickness



Panel E. Dispersion of firm performance



Panel F. Fraction of equity-based pay



Panel G. Fraction of across-state and across-county moves

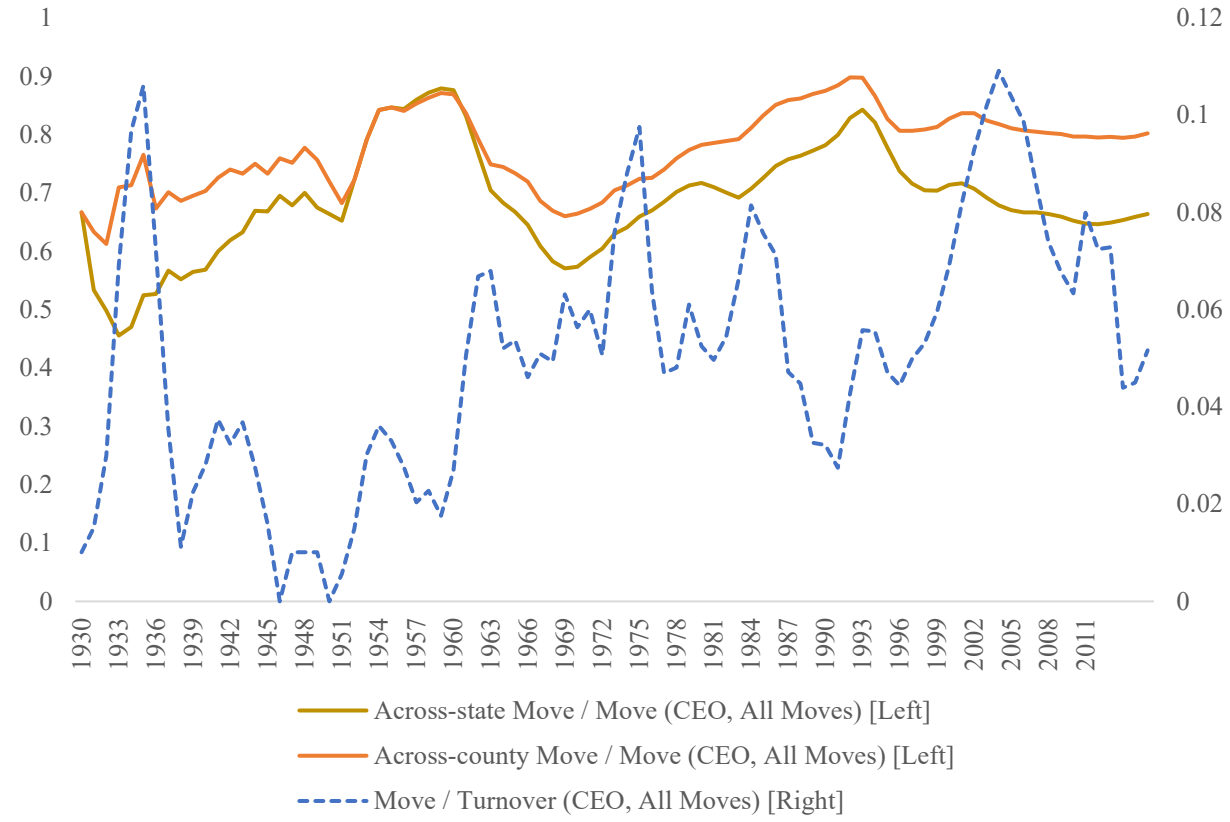


Table 1. CEO and CFO Moves and New Job Titles

This table presents the number of CEOs and CFOs who leave office and the number of these CEOs and CFOs who are hired at new firms (move) in our sample from 1920 through 2011. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. The new title is the first new job title of an former CEO (CFO) who moves to a new firm in Panel A and former CFO in Panel B, with Non-CEO (Non-CFO) indicating a move to a non-CEO (non-CFO) role at the new firm (e.g., COO). Numbers in parentheses indicate the number of externally hired former CEOs or CFOs divided by the number of CEO or CFO turnovers in each period.

Panel A. CEO Departures and New Job Titles

	(1)	(2)	(3)	(4)	(5)
	All era	1920-1949	1950-1985	1986-2001	2002-2011
CEO Turnovers	22,167	1,496	4,916	10,807	4,948
- Become officer of new firm (%)	1,476	45	261	819	351
	(6.7%)	(3.0%)	(5.3%)	(7.6%)	(7.1%)
- Become CEO of new firm (%)	537	18	58	314	147
	(2.4%)	(1.2%)	(1.2%)	(2.9%)	(3.0%)
- Become Non-CEO officer of new firms (%)	939	27	203	505	204
	(4.2%)	(1.8%)	(4.1%)	(4.7%)	(4.1%)

Panel B. CFO Departures and New Job Titles

	(1)	(2)	(3)	(4)	(5)
	All era	1920-1949	1950-1985	1986-2001	2002-2011
CFO Turnovers	24,628	1,552	6,163	16,913	11,869
- Become officer of new firm (%)	2,450	42	291	2,117	1,418
	(11.1%)	(2.8%)	(5.9%)	(13.4%)	(13.1%)
- Become CFO of new firm (%)	1,839	21	161	1,657	1,092
	(8.3%)	(1.4%)	(3.3%)	(10.5%)	(10.1%)
- Become Non-CFO officer of new firms (%)	611	21	130	460	326
	(2.8%)	(1.4%)	(2.6%)	(2.9%)	(3.0%)

Table 2. Firm Size and Compensation at Moving CEO and CFO's New Firm

For CEOs and CFOs who move to other firms from 1920 through 2011, this table reports the relative size of the new firm and the mover's change in compensation. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. Not all CEOs (CFOs) are hired as CEO (CFO) at their new firm, and 'New title' indicates the first new job title of an externally hired former CEO (CFO). '*Larger Firms*' indicates the proportion of former CEOs whose new firms are larger than their previous firms in terms of total assets. For example, for 55.5% of CEOs who became CEO of a new firm, their new firm is larger than their previous firm in the full sample ("All" column). 'Pay Change' indicates the percentage change in an externally hired CEO's (CFO's) first salary and bonus plus option and stock grants, relative to that from the previous employment. We do not present pay change results for 1950-1985 given that only a handful of executives' pay is observed both before and after moves. The numbers in parentheses indicate the total number of observations in each category.

	CEO Moves			CFO Moves		
	(1)	(2)	(3)	(4)	(5)	(6)
New Title:	All	CEO	Non-CEO	All	CFO	Non-CFO
Larger Firms						
All era	66.2%	55.5%	72.6%	48.0%	46.7%	51.9%
	(1,167)	(436)	(731)	(1,970)	(1,488)	(482)
1920-1949	65.9%	66.7%	65.4%	63.4%	57.1%	70.0%
	(44)	(18)	(26)	(41)	(21)	(20)
1950-1985	73.0%	52.8%	78.7%	48.9%	48.4%	49.5%
	(163)	(36)	(127)	(219)	(124)	(95)
1986-2011	65.1%	55.2%	71.6%	47.5%	46.4%	51.5%
	(960)	(382)	(578)	(1,710)	(1,343)	(367)
Pay change						
1986-2011	87.9%	74.3%	108.0%	428.4%	522.7%	120.1%
	(166)	(99)	(67)	(269)	(206)	(63)

Table 3. Frequency of CEO Moves between Industries

This table presents the frequency of CEOs moving from a firm in the origination industry to another firm in the destination industry for three time periods from 1920 through 2011. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. *SIC-From* indicates the one-digit SIC industry of the firm that a given CEO departs and *SIC-To* indicates the one-digit SIC industry of the firm to which the CEO moves as CEO or another executive position. *HHI* indicates Herfindahl-Hirschman Index of the fraction of moves across one-digit SIC1 industries. The mean fractions are calculated cells with non-zero values, while the *HHI* is calculated by assuming zeros for cells with missing values.

Panel A. 1920-1949: 45 moves (*Mean* 6.25%, *HHI* 16.54%)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SIC-From \ SIC-To	SIC0 Agric., Forestry, Fishing	SIC1 Mining & Constr.	SIC2 Light Manuf.	SIC3 Heavy Manuf.	SIC4 Transport. & Public Utilities	SIC5 Wholesale & Retail Trade	SIC6 Finance, Insurance, Real state	SIC7 Services	SIC8 Health Services	SIC9 Public Admin.	Total
0.Agriculture, Forestry, Fishing											0.0%
1.Mining & Construction				4.44%		2.22%					6.7%
2.Light Manufacturing		2.22%	17.78%	2.22%	2.22%	2.22%					26.7%
3.Heavy Manufacturing		4.44%	8.89%	33.33%			2.22%	2.22%			51.1%
4.Transportation & Public Utilities					2.22%						2.2%
5.Wholesale & Retail Trade			2.22%			6.67%					8.9%
6.Finance, Insurance, Real Estate		4.44%									4.4%
7.Services											0.0%
8.Health Services											0.0%
9.Public Administration											0.0%
Total	0.0%	11.1%	28.9%	40.0%	4.4%	11.1%	2.2%	2.2%	0.0%	0.0%	100.0%

Panel B. 1950-1985: 261 moves (*Mean* 2.56%, *HHI* 15.73%)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SIC-From \ SIC-To	SIC0 Agric., Forestry, Fishing	SIC1 Mining & Constr.	SIC2 Light Manuf.	SIC3 Heavy Manuf.	SIC4 Transport. & Public Utilities	SIC5 Wholesale & Retail Trade	SIC6 Finance, Insurance, Real state	SIC7 Services	SIC8 Health Services	SIC9 Public Admin.	Total
0.Agriculture, Forestry, Fishing											0.0%
1.Mining & Construction		1.15%	0.77%	1.15%		0.77%			0.38%		4.6%
2.Light Manufacturing		2.30%	11.88%	8.43%	0.38%	1.53%	0.38%	1.15%			26.0%
3.Heavy Manufacturing		0.38%	8.05%	34.87%	0.77%	4.60%	1.53%	0.38%	0.77%		51.1%
4.Transportation & Public Utilities		0.38%				0.77%		0.38%			1.5%
5.Wholesale & Retail Trade		0.38%	2.68%	3.83%		3.83%		0.38%	0.38%		11.5%
6.Finance, Insurance, Real Estate			0.38%		0.38%	0.38%			0.38%		1.5%
7.Services			0.77%	0.38%		0.38%		1.53%			3.1%
8.Health Services			0.38%					0.38%			0.8%
9.Public Administration											0.0%
Total	0.0%	5.0%	24.8%	48.5%	1.5%	12.2%	1.9%	4.2%	1.9%	0.0%	100.0%

indicates top 10%, top 20%, top 30% and top 50% industry pairs in terms of frequency of moves

Panel C. 1986-2011: 1,170 moves (*Mean* 1.43%, *HHI* 6.54%)

SIC-From \ SIC-To	(1) SIC0 Agric., Forestry, Fishing	(2) SIC1 Mining & Constr.	(3) SIC2 Light Manuf.	(4) SIC3 Heavy Manuf.	(5) SIC4 Transport. & Public Utilities	(6) SIC5 Wholesale & Retail Trade	(7) SIC6 Finance, Insurance, Real state	(8) SIC7 Services	(9) SIC8 Health Services	(10) SIC9 Public Admin.	(11) Total
0.Agriculture, Forestry, Fishing				0.09%				0.17%			0.3%
1.Mining & Construction	0.09%	4.10%	0.60%	0.68%	0.17%	0.43%	0.09%	0.43%	0.26%	0.09%	7.0%
2.Light Manufacturing	0.26%	0.34%	6.67%	3.25%	0.94%	1.11%	0.09%	0.68%	1.45%		15.0%
3.Heavy Manufacturing	0.09%	0.51%	3.08%	17.69%	1.88%	1.71%	0.09%	2.99%	1.37%	0.09%	29.3%
4.Transportation & Public Utilities		0.09%	0.17%	1.11%	3.93%	0.09%	0.09%	1.11%	0.17%		6.8%
5.Wholesale & Retail Trade		0.09%	0.68%	2.39%	0.43%	5.64%	0.17%	1.37%	0.68%		11.3%
6.Finance, Insurance, Real Estate		0.17%					0.17%	0.34%	0.43%		1.1%
7.Services		0.34%	0.60%	3.16%	1.37%	1.28%	0.17%	11.97%	1.11%	0.09%	20.1%
8.Health Services	0.09%	0.17%	2.48%	1.97%	0.09%	0.34%	0.09%	1.20%	2.65%		9.0%
9.Public Administration									0.09%		0.2%
Total	0.5%	6.0%	14.5%	30.2%	8.8%	10.6%	0.9%	20.3%	8.1%	0.2%	100.0%

indicates top 10%, top 20%, top 30% and top 50% industry pairs in terms of frequency of moves

Table 4. Frequency of CFO Moves between Industries

This table presents the frequency of CFOs moving from a firm in the origination industry to another firm in the destination industry for three time periods from 1920 through 2011. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. *SIC-From* indicates the one-digit SIC industry of the firm that a given CFO departs and *SIC-To* indicates the one-digit SIC industry of the firm to which the CFO moves as CFO or another executive position. *HHI* indicates Herfindahl-Hirschman Index of the fraction of moves across one-digit SIC1 industries. The mean fractions are calculated cells with non-zero values, while the HHI is calculated by assuming zeros for cells with missing values.

Panel A. 1920-1949: 42 moves (*Mean* 5.88%, *HHI* 12.58%)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SIC-From \ SIC-To	SIC0 Agric., Forestry, Fishing	SIC1 Mining & Constr.	SIC2 Light Manuf.	SIC3 Heavy Manuf.	SIC4 Transport. & Public Utilities	SIC5 Wholesale & Retail Trade	SIC6 Finance, Insurance, Real state	SIC7 Services	SIC8 Health Services	SIC9 Public Admin.	Total
0.Agriculture, Forestry, Fishing											0.0%
1.Mining & Construction				4.76%			2.38%				6.7%
2.Light Manufacturing		2.38%	21.43%	11.90%	2.38%			2.38%			26.7%
3.Heavy Manufacturing		2.38%	9.52%	21.43%	2.38%	2.38%					51.1%
4.Transportation & Public Utilities											2.2%
5.Wholesale & Retail Trade			2.38%	2.38%		4.76%					8.9%
6.Finance, Insurance, Real Estate		2.38%	2.38%								4.4%
7.Services											0.0%
8.Health Services											0.0%
9.Public Administration											0.0%
Total	0.0%	11.1%	28.9%	40.0%	4.4%	11.1%	2.2%	2.2%	0.0%	0.0%	100.0%

Panel B. 1950-1985: 291 moves (*Mean* 2.32%, *HHI* 11.07%)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SIC-From \ SIC-To	SIC0 Agric., Forestry, Fishing	SIC1 Mining & Constr.	SIC2 Light Manuf.	SIC3 Heavy Manuf.	SIC4 Transport. & Public Utilities	SIC5 Wholesale & Retail Trade	SIC6 Finance, Insurance, Real state	SIC7 Services	SIC8 Health Services	SIC9 Public Admin.	Total
0.Agriculture, Forestry, Fishing											0.0%
1.Mining & Construction		1.03%	1.37%	2.06%		1.72%		0.34%			4.6%
2.Light Manufacturing	0.34%	2.75%	12.71%	7.90%	0.34%	2.75%	0.69%	0.34%	0.34%		26.0%
3.Heavy Manufacturing		2.75%	7.22%	26.80%	1.03%	3.09%	2.41%	1.37%	1.03%		51.1%
4.Transportation & Public Utilities			0.34%	0.34%	0.34%	0.34%		0.34%			1.5%
5.Wholesale & Retail Trade		0.34%	1.72%	4.12%		5.84%	0.34%	0.34%			11.5%
6.Finance, Insurance, Real Estate		0.34%	0.34%	0.34%							1.5%
7.Services			0.34%	1.72%		0.34%	0.34%	0.34%			3.1%
8.Health Services				0.69%				0.34%			0.8%
9.Public Administration											0.0%
Total	0.0%	5.0%	24.8%	48.5%	1.5%	12.2%	1.9%	4.2%	1.9%	0.0%	100.0%

indicates top 10%, top 20%, top 30% and top 50% industry pairs in terms of frequency of moves

Panel C. 1986-2011: 2,117 moves (*Mean* 1.43%, *HHI* 6.08%)

SIC-From \ SIC-To	(1) SIC0 Agric., Forestry, Fishing	(2) SIC1 Mining & Constr.	(3) SIC2 Light Manuf.	(4) SIC3 Heavy Manuf.	(5) SIC4 Transport. & Public Utilities	(6) SIC5 Wholesale & Retail Trade	(7) SIC6 Finance, Insurance, Real state	(8) SIC7 Services	(9) SIC8 Health Services	(10) SIC9 Public Admin.	(11) Total
0.Agriculture, Forestry, Fishing								0.05%			0.3%
1.Mining & Construction		2.60%	0.47%	0.71%	0.43%	0.24%		0.47%	0.19%	0.09%	7.0%
2.Light Manufacturing	0.09%	0.28%	4.72%	3.59%	0.61%	1.23%	0.14%	1.65%	1.32%	0.05%	15.0%
3.Heavy Manufacturing	0.05%	0.94%	3.07%	17.15%	1.18%	2.03%	0.09%	7.42%	1.94%	0.05%	29.3%
4.Transportation & Public Utilities		0.05%	0.38%	1.04%	2.74%	0.43%		2.03%	0.38%	0.09%	6.8%
5.Wholesale & Retail Trade		0.38%	0.85%	1.70%	0.43%	5.10%	0.14%	2.08%	0.43%	0.05%	11.3%
6.Finance, Insurance, Real Estate		0.05%		0.05%	0.05%	0.05%	0.19%	0.24%			1.1%
7.Services		0.28%	1.56%	4.49%	0.94%	1.65%	0.33%	10.11%	1.46%		20.1%
8.Health Services	0.05%	0.05%	1.32%	1.61%	0.19%	0.47%	0.09%	1.42%	2.17%		9.0%
9.Public Administration									0.05%		0.2%
Total	0.5%	6.0%	14.5%	30.2%	8.8%	10.6%	0.9%	20.3%	8.1%	0.2%	100.0%

indicates top 10%, top 20%, top 30% and top 50% industry pairs in terms of frequency of moves

Table 5. Explaining the Recent Trend in Executive Mobility

This table reports panel regression estimation results for the determinants of aggregate executive mobility from 1921 through 2011. *Mobility* indicates the number of CEO moves at *t* divided by the number of CEOs at *t-1*. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. *Number of public firms* indicates the total number of firms listed in NYSE, Amex and Nasdaq. *Avg. Stddev. of ROA* indicates the average standard deviation of ROA of the NYSE and Amex listed firms. *Avg. Option + Stock Granted / Total Compensation* indicates the average fraction of option and restricted stock grants in a total compensation (= salary + bonus + option and restricted stock grants). *1/HHI across SIC1 industries* indicates the average inversed Herfindahl-Hirschman Index (HHI) of the fraction of past ten-year moves across one-digit SIC industries in *t*. % of *Across-state Moves* indicates the proportion of past ten-year across state CEO moves divided by the past ten-year total number of CEO moves in *t*. *Number of New MBAs* (*New Engineering Masters*) indicates the total number of business master's (engineering master's) degree programs enrollment in *t* proxied by the degrees conferred in *t+2*. *Number of M&As* indicates the total number of completed M&A deals among U.S. acquirors and targets at *t*. *Real GDP growth* is the growth rate of real GDP in the U.S. *Credit spread (BAA - AAA)* indicates the average yield difference of BAA and AAA rated 30-year U.S. corporate bonds. *Productivity* indicates nominal GDP at *t* over the total private non-residential fixed assets at *t-1*. *3-month T-bill (%)* indicates the 3-month U.S. Treasury bill rate. "Pre 2000" indicates that the variable of interest is multiplied by an indicator variable that is equal to one if year is less than 2000. "Post 2000" indicates that the variable of interest is multiplied by an indicator variable that is equal to one if year is greater than or equal to 2000. Numbers in the parentheses indicate *t*-statistics with Newey-West adjustment for four lags.

	(1)	(2)†	(3)	(4)	(5)†	(6)	(7)	(8)	(9)
Dep. Var.	CEO mobility:= # CEO Moves / # of CEOs								
Time Period	1970 -2011	1982 -2011	1960 -2011	1921 -2011	1921 -2011	1935 -2011	1935 -2011	1935 -2011	1930 -2011
Number of New MBAs / New Engineering Masters (Pre 2000)	0.009**								
	(2.52)								
Number of New MBAs / New Engineering Masters (Post 2000)	0.009*								
	(1.87)								
Number of M&As / Lagged number of pubic firms (Pre 2000)		0.017***							
		(3.23)							
Number of M&As / Lagged number of pubic firms (Post 2000)		0.000							
		(0.03)							
1/HHI across SIC1 industries (Pre 2000)			0.002***						
			(7.24)						
1/HHI across SIC1 industries (Post 2000)			-0.001						
			(-0.90)						
Log number of public firms (Pre 2000)				0.000					
				(0.13)					
Log number of public firms (Post 2000)				0.038***					
				(4.27)					
Avg. Stddev. of ROA (Pre 2000)					0.055*				
					(1.87)				
Avg. Stddev. of ROA (Post 2000)					0.095***				

	(1)	(2)†	(3)	(4)	(5)†	(6)	(7)	(8)	(9)
Dep. Var.	CEO mobility:= # CEO Moves / # of CEOs								
Time Period	1970 -2011	1982 -2011	1960 -2011	1921 -2011	1921 -2011	1935 -2011	1935 -2011	1935 -2011	1930 -2011
					(5.48)				
Avg. Option + Stock Granted / Total Compensation (Pre 2000)						0.024*** (3.09)			
Avg. Option + Stock Granted / Total Compensation (Post 2000)						0.022*** (2.66)			
Avg. Option Granted / Total Compensation (Pre 2000)							0.021** (2.41)		
Avg. Option Granted / Total Compensation (Post 2000)							0.015*** (3.35)		
Avg. Stock Granted / Total Compensation (Pre 2000)								0.052 (1.53)	
Avg. Stock Granted / Total Compensation (Post 2000)								-0.011 (-1.56)	
% of Across-state Moves (Pre 2000)									-0.012** (-2.20)
% of Across-state Moves (Post 2000)									-0.014 (-0.08)
Dummy (Post 2000)	-0.003 (-0.16)	0.014 (1.72)	0.039* (1.93)	-0.338*** (-3.75)	-0.004 (-1.26)	-0.000 (-0.03)	0.004 (0.79)	0.007*** (3.04)	0.001 (0.01)
Macroeconomic variables:									
Real GDP growth	0.002 (0.05)	-0.012 (-0.48)	0.024 (1.45)	-0.008 (-1.58)	-0.002 (-0.54)	-0.010 (-1.48)	-0.009 (-1.43)	-0.007 (-1.20)	-0.009 (-1.61)
Credit Spread (BAA - AAA)	-0.223 (-1.40)	-0.031 (-0.37)	0.052 (0.78)	-0.214*** (-3.49)	-0.205*** (-4.17)	-0.200** (-2.61)	-0.164* (-1.96)	-0.176* (-1.99)	-0.186*** (-3.97)
Productivity	-0.028 (-1.30)	0.013 (0.57)	-0.005 (-0.77)	-0.005*** (-3.20)	-0.003** (-2.34)	-0.002 (-0.76)	-0.002 (-0.78)	-0.003* (-1.81)	-0.003 (-1.55)
3-month T-bill (%)	-0.011 (-0.41)	0.040 (1.02)	0.050* (1.85)	0.010 (0.53)	0.024* (1.72)	0.054*** (2.99)	0.028* (1.79)	0.039* (1.91)	0.021 (1.16)
Linear Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	42	30	52	91	91	76	76	76	82
R2	0.47	0.69	0.63	0.46	0.44	0.57	0.57	0.52	0.47

*** p<0.01, ** p<0.05, * p<0.1, †CEO Moves exclude M&A or subsidiary-related events

Table 6. Determinants of Executive Mobility in the Cross-Section

This table reports logit regression estimation results for the determinants of executive mobility from 1921 through 2011. *Move dummy* takes 100 at year *t* if a CEO moves to another firm by year *t+1* or year *t+2*. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. *Turnover dummy* takes 100 at year *t* if a CEO leaves a firm by year *t+1* or year *t+2*. *Average Industry ROA* indicates the annual average of firm-level ROAs at two-digit SIC industry level. *Stddev of Industry ROA* indicates the annual standard deviation of firm-level ROA at two-digit SIC industry level. Firm characteristics are defined in Table A1. Panel A and C are on the entire sample, and Panel B is on the sample in which there is CEO turnover at year *t+1* or year *t+2* (*Turnover dummy* = 100). All variables are winsorized at 1% and 99% level. Numbers in parentheses are *t*-statistics based on standard errors double clustered at the two-digit SIC industry and year levels.

Panel A. Determinants of CEO moves (Entire sample)

Dep. Var.	(1)	(2)	(3)
	Move dummy		
ROA	-0.284**	-0.309*	-0.282**
	(-2.36)	(-1.89)	(-2.20)
Tobin's *q*	-0.055***	-0.054***	-0.057***
	(-2.99)	(-2.93)	(-3.11)
Size	0.029***	0.029***	0.031***
	(3.96)	(7.38)	(4.85)
Tenure	-0.087***	-0.088***	-0.087***
	(-6.26)	(-6.32)	(-6.28)
Average Industry ROA	-1.547***		-1.129
	(-2.95)		(-1.25)
Stddev of Industry ROA		0.877***	0.406
		(2.94)	(0.86)
Pseudo R^2	0.040	0.040	0.040
N	123,084	123,084	123,084
Year fixed effects	YES	YES	YES

Panel B. Determinants of CEO Moves (Turnover sample)

Dep. Var.	(1)	(2)	(3)
	Move dummy		
ROA	-0.137**	-0.137***	-0.132***
	(-2.55)	(-2.59)	(-2.61)
Tobin's *q*	-0.057***	-0.057***	-0.059***
	(-2.87)	(-2.81)	(-2.97)
Size	-0.009	-0.010	-0.008
	(-0.77)	(-0.96)	(-0.73)
Tenure	-0.073***	-0.074***	-0.073***
	(-6.28)	(-6.35)	(-6.29)
Average Industry ROA	-1.196**		-0.858
	(-2.16)		(-1.01)
Stddev of Industry ROA		0.709**	0.330
		(2.30)	(0.77)
Pseudo R^2	0.037	0.037	0.037
N	26,636	26,636	26,636
Year fixed effects	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Panel C. Determinants of CEO Turnovers (Entire sample)

Dep. Var.	(1)	(2)	(3)
	Turnover Dummy		
ROA	-0.504***	-0.511***	-0.507***
	(-7.15)	(-7.33)	(-7.21)
Tobin's *q*	0.004	0.004	0.004
	(1.22)	(1.14)	(1.15)
Size	0.076***	0.076***	0.076***
	(6.97)	(7.10)	(7.08)
Tenure	-0.005	-0.005	-0.005
	(-1.35)	(-1.35)	(-1.35)
Average Industry ROA	-0.282		-0.072
	(-1.38)		(-0.42)
Stddev of Industry ROA		0.231*	0.196*
		(1.75)	(1.95)
Pseudo R^2	0.010	0.020	0.020
N	123,084	123,084	123,084
Year fixed effects	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Descriptive Statistics – Sample for Instrumental Variables Analysis

This table reports descriptive statistics for a sample from 1962 through 2011 used in the instrumental-variables analysis. *N. of CEO Moves* indicates the number of CEOs in years *t-1* or *t-2* in a two-digit SIC industry who become CEOs or other executive officers at other firms in year *t*. *N. of CEO Turnovers* indicates the total number of two-digit SIC industry CEOs who leave firms each year. *N. of CEOs* indicates the total number of two-digit SIC industry CEOs each year. *Mobility (%)* indicates *N. of CEO Moves*$_t$ divided by *N. of CEO Turnovers*$_{t-1}$ in percentage. *Connected Industry Death&Health* is the weighted average number of CEOs in connected two-digit SIC industries who pass away or step down due to health-related reasons in a given year. Both the weight and connectedness are determined by the external CEO moves over the past three years between two-digit SIC industries. *Death&Health (%)* indicates *Connected Industry Death&Health*$_{t-1}$ divided by *N. of CEO Turnovers*$_{t-1}$ in percentage. Stock Grants indicates restricted stocks granted to a CEO. Option (Stock) Grant indicator takes one if a CEO receives option (restricted stock) grants, and zero otherwise. CEO Turnover takes the value of one if the CEO changes and zero otherwise. Compensation characteristics are in 2011 dollars. Firm and industry variables are defined in Table A1.

	N	Mean	Median	Stddev
Executive Mobility Characteristics				
N. of CEO Moves	18,640	3.06	1.00	4.52
N. of CEOs	18,640	257.04	158.00	257.01
N. of CEO Turnovers	18,640	37.36	20.00	43.18
Mobility (%)	18,640	7.07	5.88	7.98
Connected Industry Death&Health	18,640	0.45	0.38	0.42
Death&Health (%)	18,640	3.23	1.04	7.06
Compensation Characteristics				
Salary and Bonus ($ thousands)	18,640	1353.8	1010.1	1128.8
Option Grants ($ thousands)	18,640	1775.3	535.3	3491.4
Option Grant indicator = 1	18,640	0.67	1.00	0.47
Stock Grants ($ thousands)	18,640	742.0	0.0	1874.0
Stock Grant indicator = 1	18,640	0.33	0.00	0.47
CEO & BOD Characteristics				
CEO Turnover = 1	18,640	0.12	0.0	0.32
CEO Tenure (years)	18,640	6.04	5.0	4.86
Firm Characteristics				
Size	18,640	7.29	7.09	1.58
ROA	18,640	0.05	0.06	0.14
Tobin's q	18,640	2.12	1.61	1.56
Excess Return	18,640	0.12	0.04	0.52
Industry Characteristics				
Industry GDP Growth	18,640	0.047	0.051	0.057
Industry Tobin's *q*	18,640	2.060	1.914	0.692

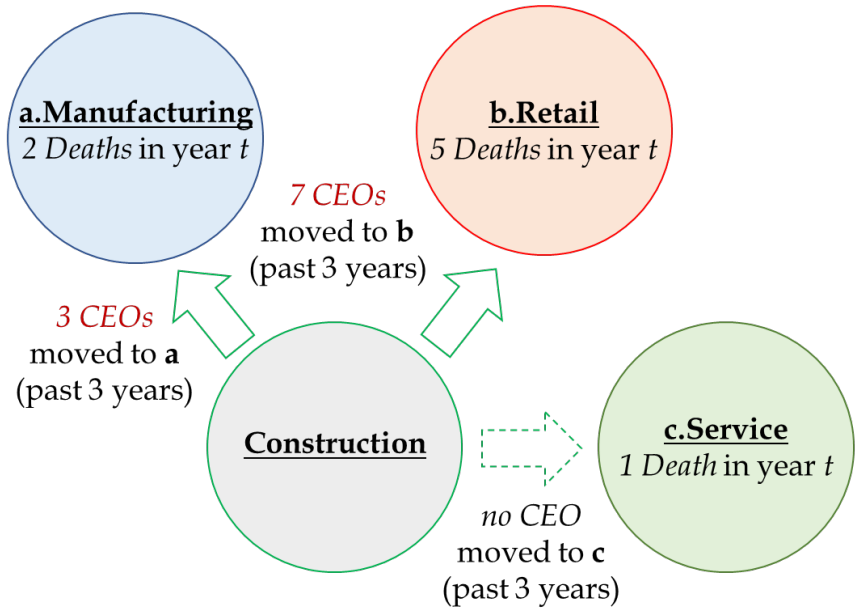
Table 8. Effect of Executive Mobility on CEO Pay

This table presents instrumental-variables estimation results for the effect of executive mobility on the CEO's compensation from 1962 through 2011. The instrumental variable is *Death&Health*, which is calculated as the weighted number of connected industry CEOs who passed away or step down due to health-related reasons during a given firm's fiscal year *t* divided by *N. of CEO Turnovers*$_{t-1}$. Both the weight and connectedness are determined by past three-year external CEO moves between two-digit SIC industries. *Excess Return* indicates the stock return at *t* less the return on S&P500 index at *t*. *Total Pay* indicates a CEO's salary, bonus, option and restricted stock grants. All variables are winsorized at 1% and 99% level. Numbers in parentheses are *t*-statistics based on standard errors double clustered at the two-digit SIC industry and year levels. *F*-stat indicates Kleibergen-Paap *F*-statistics. Firm and industry variables are defined in Table A1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.	*Mobility (%)*	*log(Option Grants) at t+1*	*Option Grant Indicator at t+1*	*log(Stock Grants) at t+1*	*Stock Grant Indicator at t+1*	*log(Salary + Bonus) at t+1*	*Log(Total Pay) at t+1*
	1st stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage
Death&Health (%)	0.076***						
	(5.48)						
Mobility		0.149***	0.022***	-0.047	-0.010	0.020	0.021*
		(3.08)	(2.71)	(-0.93)	(-1.59)	(1.59)	(1.68)
Size	0.357***	0.272***	-0.019**	0.486***	-0.039***	0.076***	0.201***
	(3.10)	(4.31)	(-1.97)	(7.12)	(-3.67)	(4.47)	(12.31)
ROA	-0.494	0.578***	0.057	-0.502	-0.068	0.118***	0.150***
	(-0.81)	(3.26)	(1.57)	(-1.45)	(-1.20)	(2.97)	(4.91)
Tobin's *q*	0.101*	0.049*	-0.012**	-0.102***	-0.023***	-0.009	0.037***
	(1.92)	(1.79)	(-2.41)	(-3.66)	(-4.50)	(-1.34)	(5.85)
Excess Return	-0.430**	0.125**	0.010	0.140*	0.013	0.072***	0.111***
	(-2.68)	(2.08)	(1.21)	(1.93)	(1.41)	(4.76)	(8.78)
Tenure	-0.021	-0.043***	-0.008***	-0.036***	-0.006***	0.008***	-0.002
	(-1.62)	(-4.05)	(-4.32)	(-4.86)	(-5.15)	(5.85)	(-1.04)
Industry GDP Growth	-0.135	0.692	0.225	-1.293*	0.143	0.237**	0.080
	(-0.02)	(0.73)	(1.55)	(-1.72)	(1.28)	(2.40)	(0.65)
Industry Tobin's *q*	1.332***	-0.049	-0.042**	0.253	-0.029	-0.003	0.063***
	(2.74)	(-0.46)	(-2.37)	(1.57)	(-1.51)	(-0.11)	(3.12)
R^2	0.138	-0.091	-0.095	0.166	0.147	0.052	0.082
N	18,640	18,640	18,640	18,640	18,640	18,640	18,640
F-stat		43.31	43.31	43.31	43.31	43.31	43.31
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Figure A1. CEO Deaths in Connected Industries. This figure illustrates how we define *Death* in Eq. (6) using a hypothetical example. Connectedness between two industries is defined using CEO moves between the industries in the past three years. *Death* of an industry is a weighted average number of CEO deaths in *t* where the weight of a given industry is determined by the industry pair's connectedness divided by the number of CEO turnovers in the industry in *t-1*.



CEO deaths in connected industries for Construction in year *t*
= 0.3 × 2 + 0.7 × 5 = 4.1

Table A1. Variable Definitions

Item	Method	Source
Macroeconomic Characteristics		
Number of public firms	Number of firms listed in NYSE, Amex, and NASDAQ	Moody's Industrial Manuals/CRSP
Number of New MBAs (New Engineering Masters)	Number of MBA (engineering masters) degrees conferred in year t-2 assuming the program length to be 2 years.	National Center for Education Statistics
Number of M&As	Number of completed M&A deals among U.S. acquirors and targets	SDC Platinum
Productivity	Nominal GDP divided by lagged aggregate stock of private non-residential fixed assets	BEA
*Compensation Characteristics**		
Salary + Bonus	TOTAL_CURR in 2011 dollar	Frydman and Saks (2010)/ Execucomp
Option Grants	OPTION_AWARDS_BLK_VALUE (1986-2005) and OPTION_AWARDS_FV (2006-2011) in 2011 dollar	Frydman and Saks (2010)/ Execucomp
(Restricted) Stock Grants	RSTKGRNT (1986-2005) and STOCK_AWARDS_FV (2006-2011) in 2011 dollar	Frydman and Saks (2010)/ Execucomp
Board and CEO characteristics		
CEO Turnover	1 if a CEO is replaced in a given year, 0 otherwise	Moody's Industrial Manuals/ Compact Disclosure/ Mergent/Board Analyst
CEO Tenure	The number of years a CEO has been CEO at her current firm	Moody's Industrial Manuals/ Compact Disclosure/ Mergent/Board Analyst
Firm & Industry Characteristics		
Size	logged AT converted to 2011-dollar value	Compustat
ROA	NI / AT	Compustat
Tobin's *q*	(AT + (PRCC_D * CSHO) - CEQ - TXDB) / AT	Compustat
Excess Return	1 year calendar year stock return - S&P500 return	CRSP
Industry Tobin's *q*	two-digit SIC average Q	Compustat
Industry GDP Growth	One-digit SIC GDP growth rate	BEA

*Logged compensation variables add one to account for missing or zero equity grants.

Table A2-1. Explaining the Recent Trend in Executive Mobility

This table reports panel regression estimation results for the determinants of aggregate executive mobility from 1921 through 2011. *Mobility* indicates the number of CEO moves at *t* divided by the number of CEO turnovers at *t-1*. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. *Number of public firms* indicates the total number of firms listed in NYSE, Amex and Nasdaq. *Avg. Stddev. of ROA* indicates the average standard deviation of ROA of the NYSE and Amex listed firms. *Avg. Option + Stock Granted / Total Compensation* indicates the average fraction of option and restricted stock grants in a total compensation (= salary + bonus + option and restricted stock grants). *1/HHI across SIC1 industries* indicates the average inversed Herfindahl-Hirschman Index (HHI) of the fraction of past ten-year moves across one-digit SIC industries in *t*. % of *Across-state Moves* indicates the proportion of past ten-year across state CEO moves divided by the past ten-year total number of CEO moves in *t*. *Number of New MBAs* (*New Engineering Masters*) indicates the total number of business master's (engineering master's) degree programs enrollment in *t* proxied by the degrees conferred in *t+2*. *Number of M&As* indicates the total number of completed M&A deals among U.S. acquirors and targets at *t*. *Real GDP growth* is the growth rate of real GDP in the U.S. *Credit spread (BAA - AAA)* indicates the average yield difference of BAA and AAA rated 30-year U.S. corporate bonds. *Productivity* indicates nominal GDP at *t* over the total private non-residential fixed assets at *t-1*. *3-month T-bill (%)* indicates the 3-month U.S. Treasury bill rate. "Pre 2000" indicates that the variable of interest is multiplied by an indicator variable that is equal to one if year is less than 2000. "Post 2000" indicates that the variable of interest is multiplied by an indicator variable that is equal to one if year is greater than or equal to 2000. Numbers in the parentheses indicate *t*-statistics with Newey-West adjustment for four lags.

	(1)	(2)†	(3)	(4)	(5)†	(6)	(7)	(8)	(9)
Dep. Var.	CEO mobility:= # CEO Moves / # of CEO turnovers								
Time Period	1970 -2011	1982 -2011	1960 -2011	1921 -2011	1921 -2011	1935 -2011	1935 -2011	1935 -2011	1930 -2011
Number of New MBAs / New Engineering Masters (Pre 2000)	0.046** (2.39)								
Number of New MBAs / New Engineering Masters (Post 2000)	0.023 (0.90)								
Number of M&As / Lagged number of pubic firms (Pre 2000)		0.068** (2.48)							
Number of M&As / Lagged number of pubic firms (Post 2000)		0.008 (0.12)							
1/HHI across SIC1 industries (Pre 2000)			0.010*** (6.68)						
1/HHI across SIC1 industries (Post 2000)			0.010 (0.89)						
Log number of public firms (Pre 2000)				0.011 (0.50)					
Log number of public firms (Post 2000)				0.101** (2.13)					
Avg. Stddev. of ROA (Pre 2000)					0.460* (1.79)				
Avg. Stddev. of ROA (Post 2000)					0.407**				

	(1)	(2)†	(3)	(4)	(5)†	(6)	(7)	(8)	(9)
Dep. Var.	CEO mobility:= # CEO Moves / # of CEO turnovers								
Time Period	1970 -2011	1982 -2011	1960 -2011	1921 -2011	1921 -2011	1935 -2011	1935 -2011	1935 -2011	1930 -2011
					(2.60)				
Avg. Option + Stock Granted / Total Compensation (Pre 2000)						0.137*** (2.90)			
Avg. Option + Stock Granted / Total Compensation (Post 2000)						0.137*** (3.28)			
Avg. Option Granted / Total Compensation (Pre 2000)							0.137** (2.54)		
Avg. Option Granted / Total Compensation (Post 2000)							0.022 (0.85)		
Avg. Stock Granted / Total Compensation (Pre 2000)								0.306 (1.61)	
Avg. Stock Granted / Total Compensation (Post 2000)								-0.011 (-0.34)	
% of Across-state Moves (Pre 2000)									-0.072* (-1.89)
% of Across-state Moves (Post 2000)									0.241 (0.44)
Dummy (Post 2000)	0.084 (1.09)	0.040 (0.78)	-0.015 (-0.09)	-0.789 (-1.37)	0.010 (0.46)	-0.001 (-0.01)	0.074* (1.96)	0.036*** (2.79)	-0.199 (-0.56)
Macroeconomic variables:									
Real GDP growth	0.040 (0.13)	0.120 (0.53)	0.177 (1.15)	-0.045 (-1.14)	-0.000 (-0.02)	-0.070 (-1.31)	-0.067 (-1.28)	-0.055 (-1.10)	-0.057 (-1.26)
Credit Spread (BAA - AAA)	-1.437 (-1.15)	-0.070 (-0.11)	-0.184 (-0.30)	-1.789*** (-3.24)	-1.462*** (-3.66)	-1.528** (-2.38)	-1.430** (-2.05)	-1.565** (-2.17)	-1.451*** (-3.24)
Productivity	-0.043 (-0.41)	-0.016 (-0.08)	0.004 (0.06)	-0.039*** (-3.09)	-0.019* (-1.90)	-0.019 (-1.24)	-0.019 (-1.24)	-0.029** (-2.22)	-0.026* (-1.80)
3-month T-bill (%)	0.005 (0.03)	0.366 (1.44)	0.454** (2.12)	0.332** (2.08)	0.314*** (2.75)	0.572*** (4.27)	0.481*** (3.45)	0.530*** (3.35)	0.384*** (2.91)
Linear Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	42	30	52	91	91	76	76	76	82
R2	0.41	0.60	0.49	0.36	0.34	0.52	0.50	0.46	0.46

*** p<0.01, ** p<0.05, * p<0.1, †CEO Moves exclude M&A or subsidiary-related events

Table A2-2. Explaining the Recent Trend in Executive Mobility

This table reports panel regression estimation results for the determinants of aggregate executive mobility from 1921 through 2011. *Mobility* indicates the number of CEO turnovers at *t-1* divided by the number of CEOs at *t-1*. Each move is determined if a CEO (CFO) who works at a firm in year *t-2* or *t-1* moves to another firm in year *t*. *Number of public firms* indicates the total number of firms listed in NYSE, Amex and Nasdaq. *Avg. Stddev. of ROA* indicates the average standard deviation of ROA of the NYSE and Amex listed firms. *Avg. Option + Stock Granted / Total Compensation* indicates the average fraction of option and restricted stock grants in a total compensation (= salary + bonus + option and restricted stock grants). *1/HHI across SIC1 industries* indicates the average inversed Herfindahl-Hirschman Index (HHI) of the fraction of past ten-year moves across one-digit SIC industries in *t*. % of *Across-state Moves* indicates the proportion of past ten-year across state CEO moves divided by the past ten-year total number of CEO moves in *t*. *Number of New MBAs* (*New Engineering Masters*) indicates the total number of business master's (engineering master's) degree programs enrollment in *t* proxied by the degrees conferred in *t+2*. *Number of M&As* indicates the total number of completed M&A deals among U.S. acquirors and targets at *t*. *Real GDP growth* is the growth rate of real GDP in the U.S. *Credit spread (BAA - AAA)* indicates the average yield difference of BAA and AAA rated 30-year U.S. corporate bonds. *Productivity* indicates nominal GDP at *t* over the total private non-residential fixed assets at *t-1*. *3-month T-bill (%)* indicates the 3-month U.S. Treasury bill rate. "Pre 2000" indicates that the variable of interest is multiplied by an indicator variable that is equal to one if year is less than 2000. "Post 2000" indicates that the variable of interest is multiplied by an indicator variable that is equal to one if year is greater than or equal to 2000. Numbers in the parentheses indicate *t*-statistics with Newey-West adjustment for four lags.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. Var.	CEO mobility:= # CEO turnovers / # of CEOs								
Time Period	1970 -2011	1982 -2011	1960 -2011	1921 -2011	1921 -2011	1935 -2011	1935 -2011	1935 -2011	1930 -2011
Number of New MBAs / New Engineering Masters (Pre 2000)	0.041 (1.39)								
Number of New MBAs / New Engineering Masters (Post 2000)	0.114* (1.74)								
Number of M&As / Lagged number of pubic firms (Pre 2000)		0.040 (0.44)							
Number of M&As / Lagged number of pubic firms (Post 2000)		-0.179 (-1.52)							
1/HHI across SIC1 industries (Pre 2000)			0.005** (2.10)						
1/HHI across SIC1 industries (Post 2000)			-0.021 (-0.96)						
Log number of public firms (Pre 2000)				-0.035** (-2.58)					
Log number of public firms (Post 2000)				0.228** (2.55)					
Avg. Stddev. of ROA (Pre 2000)					-0.242 (-1.28)				
Avg. Stddev. of ROA (Post 2000)					1.243**				

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. Var.	CEO mobility:= # CEO turnovers / # of CEOs								
Time Period	1970 -2011	1982 -2011	1960 -2011	1921 -2011	1921 -2011	1935 -2011	1935 -2011	1935 -2011	1930 -2011
					(2.56)				
Avg. Option + Stock Granted / Total Compensation (Pre 2000)						0.005			
						(0.07)			
Avg. Option + Stock Granted / Total Compensation (Post 2000)						0.055			
						(0.35)			
Avg. Option Granted / Total Compensation (Pre 2000)							-0.031		
							(-0.37)		
Avg. Option Granted / Total Compensation (Post 2000)							0.082		
							(1.15)		
Avg. Stock Granted / Total Compensation (Pre 2000)								0.127	
								(0.65)	
Avg. Stock Granted / Total Compensation (Post 2000)								-0.050	
								(-0.56)	
% of Across-state Moves (Pre 2000)									-0.005
									(-0.08)
% of Across-state Moves (Post 2000)									-1.432
									(-1.09)
Dummy (Post 2000)	-0.306	0.207***	0.401	-2.351***	-0.113**	-0.013	-0.033	0.043*	0.959
	(-1.32)	(3.39)	(1.22)	(-2.94)	(-2.33)	(-0.10)	(-0.55)	(1.95)	(1.10)
Macroeconomic variables:									
Real GDP growth	-0.548*	-1.071*	-0.556*	-0.086*	-0.105**	-0.096	-0.091	-0.102	-0.133***
	(-1.95)	(-1.90)	(-1.99)	(-1.74)	(-2.08)	(-1.44)	(-1.42)	(-1.51)	(-2.81)
Credit Spread (BAA - AAA)	-1.993**	-2.019**	-1.054	-0.539	-1.306*	-1.326**	-1.153**	-1.044**	-0.984**
	(-2.55)	(-2.29)	(-1.29)	(-1.41)	(-1.85)	(-2.51)	(-2.22)	(-2.00)	(-2.27)
Productivity	-0.192	0.746**	-0.015	-0.029*	-0.037**	-0.022	-0.022	-0.018	-0.024
	(-1.06)	(2.12)	(-0.21)	(-1.86)	(-2.28)	(-0.99)	(-1.04)	(-0.87)	(-1.09)
3-month T-bill (%)	-0.059	0.612	0.068	0.074	0.042	0.061	-0.035	0.070	0.020
	(-0.34)	(1.63)	(0.34)	(0.48)	(0.27)	(0.38)	(-0.25)	(0.41)	(0.15)
Linear Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	42	30	52	91	91	76	76	76	82
R2	0.37	0.55	0.36	0.37	0.37	0.31	0.32	0.32	0.32

*** p<0.01, ** p<0.05, * p<0.1

Table A3. Unrelated CEO Deaths as Placebo Instrument

This table presents instrumental-variables estimation results for the effect of executive mobility on CEO compensation using a placebo instrument from 1986 through 2011. The instrumental variable is *Unrelated Death&Health*, which is calculated as the equal-weighted number of unconnected industry CEOs who passed away or step down due to health-related reasons during a given firm's fiscal year *t* divided by *N. of CEO Turnovers*$_{t-1}$. Unconnected industries are two-digit SIC industries in which there was no CEO movement in the past three years. *Total Pay* indicates a CEO's salary, bonus, option and restricted stock grants. Control variables are the same as those reported in Table 8. All variables are winsorized at 1% and 99% level. Numbers in parentheses are *t*-statistics based on standard errors double clustered at the two-digit SIC industry and year levels. *F*-stat indicates Kleibergen-Paap *F*-statistics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.	*Mobility (%)*	*log(Option Grants) at t+1*	*Option Grant Indicator at t+1*	*log(Stock Grants) at t+1*	*Stock Grant Indicator at t+1*	*log(Salary + Bonus) at t+1*	*log(Total Pay) at t+1*
	1st stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage
Unrelated Death&Health (%)	-0.079						
	(-0.99)						
Mobility (%)		0.013	0.012	-0.016	0.011	-0.033	-0.023
		(0.16)	(0.86)	(-0.26)	(0.71)	(-0.74)	(-0.60)
R^2	0.135	0.052	0.012	0.179	0.128	-0.217	0.055
N	18,640	18,640	18,640	18,640	18,640	18,640	18,640
F-stat		0.56	0.56	0.56	0.56	0.56	0.56
Controls	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Table A4. Alternative Instruments

This table reports instrumental-variables estimation results for the effect of executive mobility on CEO compensation using alternative instruments from 1962 through 2011. The instrumental variable for Panel A is *Death*, which is calculated as the weighted number of connected industry CEOs who passed away during a given firm's fiscal year *t* divided by *N. of CEO Turnovers*$_{t-1}$. The instrumental variable for Panel B is *Sudden Death*, which is calculated as the weighted number of connected industry CEOs who suddenly passed away during a given firm's fiscal year *t* divided by *N. of CEO Turnovers*$_{t-1}$. Both the weight and connectedness are determined by past three-year external CEO hires between two-digit SIC industries. Control variables are the same as those reported in Table 8. All variables are winsorized at 1% and 99% level. Numbers in parentheses are *t*-statistics based on robust standard errors clustered at the two-digit SIC industry and year levels. *F*-stat indicates Kleibergen-Paap *F*-statistics.

Panel A. CEO Death

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.	*Mobility (%)*	*log(Option Grants) at t+1*	*Option Grant Indicator at t+1*	*log(Stock Grants) at t+1*	*Stock Grant Indicator at t+1*	*log(Salary + Bonus) at t+1*	*log(Total Pay) at t+1*
	1st stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage
Death (%)	0.097***						
	(3.55)						
Mobility		0.158**	0.022**	-0.063	-0.011	0.027	0.027
		(2.23)	(2.20)	(-1.11)	(-1.43)	(1.62)	(1.42)
R^2	0.137	-0.109	-0.102	0.153	0.141	-0.049	0.052
N	18,640	18,640	18,640	18,640	18,640	18,640	18,640
F-stat		12.58	12.58	12.58	12.58	12.58	12.58
Controls	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES

Panel B. CEO Sudden Deaths

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.	*Mobility (%)*	*log(Option Grants) at t+1*	*Option Grant Indicator at t+1*	*log(Stock Grants) at t+1*	*Stock Grant Indicator at t+1*	*log(Salary + Bonus) at t+1*	*log(Total Pay) at t+1*
	1st stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage
Sudden Death (%)	0.148**						
	(2.06)						
Mobility		0.102	0.017	-0.028	-0.005	0.023	0.023
		(1.51)	(1.48)	(-0.47)	(-0.62)	(1.24)	(1.07)
R^2	0.137	-0.013	-0.033	0.175	0.166	0.02	0.073
N	18,640	18,640	18,640	18,640	18,640	18,640	18,640
F-stat		4.23	4.23	4.23	4.23	4.23	4.23
Controls	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1