Career Concerns and the Busy Life of the Young CEO[*]

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Abstract

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1. Introduction

In this paper, we empirically examine how career concerns affect the investment activities of younger Chief Executive Officers (CEOs) compared to older CEOs. Career concerns matter because managers are expected to adjust their investment behavior to influence the labor market's perception of their abilities, and hence their reputation and future prospects. Indeed, the theoretical literature has long recognized that a firm's investment decisions are contaminated by its managers' career concerns (see, e.g., Holmstrom and Ricart i Costa (1986), Prendergast and Stole (1996), and Holmstrom (1999)). Yet, the limited available empirical evidence on career concerns is mostly about specialized labor markets, such as mutual fund managers (Chevalier and Ellison (1999)), security analysts (Hong, Kubik, and Solomon (2000)), and macroeconomists (Lamont (2002)). All of these studies find that younger decision-makers avoid bold decisions, preferring to "herd" rather than stand out and risk a negative outcome that could adversely affect their careers. The effect of career concerns on CEOs making corporate real investment decisions has not been examined so far, and there is reason to question if they too will behave conservatively.

The serious downside, forced terminations, are relatively infrequent for CEOs compared to executives in the specialized labor markets (Weisbach (1988), Huson, Parrino, and Starks (2001), Jenter and Kanaan (2010), Kaplan and Minton (2010), and Taylor (2010)), even while there is significant upside potential for younger CEOs who successfully signal superior ability. For example, Gudell (2010) reports that there is a sizeable market for serial CEOs, along with large increases in compensation across jobs. Also, with their long career horizons to reap benefits, younger CEOs have strong incentives to boldly signal ability. Using comprehensive data from the U. S. Census Bureau, we study real investment activities across all sectors of the economy and address questions dealing with the impact of career concerns on three salient aspects of investment behavior: the extent and type of investments activities, the associated productive efficiency, and the favored internal capital allocations made by CEOs of different ages. This helps us better understand the investment distortions that arise out of career concerns, and ultimately the fundamental issue in corporate finance - what impedes capital from being allocated to its most efficient investment opportunity (Stein, 2003).

We start our analysis by examining the two main contrasting positions offered in the literature regarding how career concerns affect the investment behaviors of the younger versus older CEOs. In one position, a manager's career concerns may result in conservatism and

underinvestment, as was first pointed out by Holmstrom (1982). The younger CEO, who does not have a track record to back him up, faces higher risks when making investment decisions and is likely to be perceived as incompetent if the investments turn out to be bad. Consequently, the younger CEO may shy away from making bold investments. Similarly, Scharfstein and Stein (1990) suggest that managers' career concerns, particularly for the younger CEOs, may lead them to avoid radical actions and to "herd" instead. We refer to these models as the *Market Learning Models*, since the driving force in these models is what the labor market can learn about CEO ability from the outcomes of their decisions.

In a contrasting position, modeled by Prendergast and Stole (1996), the younger CEO purposely adopts a more active investment strategy because of a difference in investment incentives in early and later periods. The young CEO tends to exaggerate his reactions to new information and act boldly on it in order to signal a superior ability to decipher information about the investment opportunity. The older CEO, however, is more conservative in his response to new information in order to signal that he has been in possession of precise information in the past, and that a change of course will reflect poorly on his past decisions and consequently on his abilities. In this view, a younger CEO who wants to establish a reputation for being talented is prone to taking riskier actions. We refer to this model as the *Managerial Signaling Model*. To test the predictions of these two types of models, we follow extant studies (e.g., Gibbons and Murphy (1992), and Chevalier and Ellison (1999)) and measure the extent of a manager's career concerns using his age. Given the age-related difference in incentives, we focus on whether the firm's investment decisions can be explained in part by its CEO's age.

As we employ micro-level data from the U.S. Census Bureau to carry out the analysis, we are able to characterize investments very generally to include all firm activities that increase or decrease or alter the composition of a firm's asset base, which comprises of the firm's business segments and establishments within each segment. We begin by using establishment-level information from the Longitudinal Business Database (LBD), which covers every U.S. private non-farm sector establishment, to construct a complete picture of all the plants and industry segments a firm operates in. We then construct real investment variables based on the year-to-year change in the composition of the firm's asset portfolio. This way, we can identify those substantial investment decisions, like entry and exit into new lines of business, in which the CEO is expected to play an important role. We match the LBD with COMPUSTAT to obtain accounting variables for publicly listed firms. From Compact Disclosure we extract the CEO's age, his tenure, and corporate governance variables. The matched sample leaves us with a sizeable sample of 62,414 firm-year observations (9,344 unique firms) from 1988 to 2005 with

complete information on CEO age, selected accounting variables, and real investment information.

We show that CEO's age has first order effects on a firm's investment decisions. In particular, we find that younger CEOs lead a "busy life". Driven by their desire to establish their reputations, younger CEOs are more likely to alter a firm's existing asset base by both entering new business segments and simultaneously withdrawing entirely from other existing business segments. In contrast, as CEOs get older, they seem to prefer a "quiet life" by refraining from churning their firms' existing business portfolios. Other things equal, firms with CEOs under 50 years of age are 6 percentage points less likely to keep the firm's complete business profile the same as that of the previous year, compared to firms with CEOs aged 60 and above. In contrast, firms with CEOs younger than 50 are 3 percentage points more likely to enter a new business segment and 4 percentage points more likely to exit from an existing business segment, relative to firms with CEOs aged 60 and above. These findings are statistically significant and economically relevant, even against a backdrop of fairly dynamic ongoing restructuring among our firms. In our sample, one quarter of the firms either enter a new segment or exit from an existing segment in any given year. Therefore, relative to the unconditional probability of restructuring, a young CEO increases the probability of restructuring by 10% to 15%.

Younger CEOs not only restructure more, they take on bigger and bolder projects consistent with the *Managerial Signaling Model.* A younger CEO is also more likely to undertake larger restructuring activity as proxied by the relative number of employees affected by the restructuring. In addition, these segment churning activities of younger CEOs are associated with faster asset and employment growth. Younger CEOs are also associated with increased investment in research and development expenditures, a type of investment that is often considered more risky. Between the two ways of initiating a plant, younger CEOs favor acquiring a plant from another firm over building a plant from scratch.

We perform additional analyses to ensure that the effect of CEO age on firm restructuring activities is not due to other confounding factors. One might argue that such effects are due to the fact that younger CEOs tend to manage different types of firms from older CEOs. We address this concern in several ways. First, younger CEOs tend to be associated with smaller, single-segment firms. If smaller and single-segment firms are more likely to restructure, the relation we find may be spurious. However, our results continue to hold in sub-samples of firms of different sizes and for single- versus multi-segment firms. Second, our results are robust to controlling for firm fixed effects which control for unobservable firm characteristics. Third, the CEO age effect may simply reflect the selection of young CEOs by firms that need more restructuring. But, when we delete

observations belonging to newly-hired CEOs, the results continue to hold in the remaining sample of long-tenured CEOs where the matching is less perfect. Finally, we also make use of a propensity score matching approach to ensure that our results are not driven by the nonlinear effects of certain firm characteristics on a firm's restructuring propensity. Therefore, our results are not driven by confounding firm characteristics. The relation between CEO age and investment activities may result from CEOs' other traits than career concerns. We find that the effects of age on investments are robust to the inclusion of CEO fixed effects and variables that proxy for CEO overconfidence and CEO compensation incentives.

Since we find that investments depend on CEO age, this raises questions about the distortive effects of career concerns in terms of firm performance. The *Market Learning* and *Managerial Signaling* models yield distinct contrasting predictions regarding the effect of career concerns on investment activities. Yet, both types of models imply that career concerns could distort the efficiency of corporate investments because CEOs' career concerns are not aligned with shareholders' best interests. However, Holmstrom (1999) shows that younger CEOs may exert more effort, as effort and talent may be substitute in the production function. Hence, younger CEOs may actually make relatively better investment decisions. Consequently, the net difference in productive efficiency between younger and older CEOs is an empirical issue. We examine the impact of CEOs' investment activities on plant-level efficiency using detailed plant-level input and output data from the Annual Survey of Manufactures (ASM) and the Census of Manufactures (CMF).[1] Using total factor productivity (TFP) and value-added per worker as metrics, we show that, on average, younger CEOs are associated with plants of equal efficiency as older CEOs. In a second test, we examine changes to a plant's productivity after an acquisition. In particular, we compare the outcomes of acquisitions made by CEOs of different ages. We do not find any evidence that younger CEOs are associated with a decrease in productivity in the post-acquisition period. Acquisitions made by younger CEOs experience at least as great an improvement as those made by older CEOs.

We further analyze the impact of career concerns on the allocation of capital in plants within a firm. To this end, we distinguish between plants that are "inherited" by the CEO, versus plants that are not. A "not-inherited" plant is either built from scratch or acquired from other firms during the current CEO's tenure. We find that managers tilt incremental capital expenditures towards plants that they themselves initiated. This type of managerial favoritism is,

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[1] The plants in the ASM and CMF are a subsample of those in the LBD, The LBD contains all plants from all industries while the ASM and CMF only contains plants manufacturing products in SIC codes 2011-3999. Our result that younger CEOs engage in more restructuring continues to hold in the ASM and CMF subsample.

however, not affected by CEO career concerns as older CEOs and younger CEOs are equally prone to such favoritism.

This paper highlights the important role that a CEO's career concerns plays in shaping corporate investment policies. A younger CEO is more likely to take bolder investment actions altering a firm's existing business portfolio. An older CEO prefers to maintain the status quo, consistent with Bertrand and Mullainathan's "quiet life" view of what CEOs want. More importantly, the investment churning behavior of the young CEO is not necessarily efficiency-destroying relative to older CEOs. This pattern of behavior is also consistent with the claims that young people have higher energy levels (Roberts and Rosenberg (2006)), are more confident (Taylor (1975)), and are more combative due to the presence of a hormone effect (Levi, Li, and Zhang (2010)).

Our paper is part of a growing body of research that shows that there is heterogeneity in CEO characteristics, and that these differences indeed matter for corporate policies. In particular, recent empirical work has shown that CEO characteristics matter for firm investments: e.g., firm investment and acquisition decisions are affected by CEO styles (Bertrand and Schoar (2003)), CEO overconfidence (Malmendier and Tate (2005, 2008)), managerial miscalibration (Ben-David, Graham, and Harvey (2010)), and CEO age (Yim (2010)). Our paper is most closely related to Yim (2010). She finds that younger CEOs are more likely to undertake acquisitions and she argues that this is partly because of the compensation benefits derived from managing bigger firms. However, our paper shows that not only do younger CEOs make more investments, but that they also make more divestitures. Our measures of investment activities are also more comprehensive as we examine not only acquisitions of whole firms, but more generally any activities that affect a firm's asset base. Finally, because of the use of detailed plant-level data, we are also able to examine how CEO age affects the productivity of plants acquired by young and old CEOs.

The rest of the paper is structured as follows: In section 2, we review the theoretical and empirical literature on how career concerns distort the behavior of decision makers and propose several testable hypotheses. We describe our data and key variables in section 3. We conduct the empirical analysis in section 4. Section 5 concludes.

2. Literature Review and Hypothesis Development

Fama (1980) is the seminal work advancing the notion that career concerns can influence corporate performance. He argues that managers are disciplined by an efficient managerial labor market where poor performance by a manager will prompt the market to revise its beliefs about

the manager's ability. Poor performance can thus lead to lower future wages and early dismissal; this disciplinary effect helps curb managerial agency problems. However, Holmstrom (1999) points out that there are circumstances where reputation effects cannot overcome agency problems. In his model, Holmstrom analyzes the nature of career concerns where the market is learning about the ability of the manager based on previous performance. Therefore, investment decisions and their subsequent performance provide information on managerial talent and ability. Perceptions about talent not only affect future wages but also affect whether the manager is fired or not. Therefore, from the manager's perspective, investment decisions can become especially risky. In a related learning model, Holmstrom and Ricart i Costa (1986) show that risk-averse managers are generally less likely to undertake new investment projects since performance about the new project will reveal information about the manager's ability. Our *Market Learning Hypothesis* implies that younger CEOs are more likely to act conservatively.

Alternatively, younger CEOs are more willing to undertake new projects as signals of their ability to the executive labor market. Prendergast and Stole (1996) examine the investment incentives of a manager over his career life cycle. They stress that young managers are more prone to taking bolder actions to signal that they have more precise information. In their model, talent is related to the ability to receive precise signals; therefore, a young manager who wants to establish a reputation for being talented is prone to taking risky actions. Older managers, in contrast, shy away from changing the course of action frequently, because such changes might reveal that their previous decisions were wrong. Similarly, Bebchuk and Stole (1993) point out that a manager's concern for his short-term reputation can lead to distortions in the investment behavior of the firm. They argue that when the investment is visible, a manager will over-invest to signal the ability to generate good growth opportunities. We refer to this argument as the *Managerial Signaling Hypothesis*.

In this paper, we examine plant-level activities to investigate the effects of career concerns on corporate investment behavior. A study of plant-level activities provides a proper experiment to test the effects of career concerns on firm investment activities because we are able to construct a complete picture of a firm's investment activities at this level: 1) firms can increase their asset base in an existing industry they are already operating in by increasing capital expenditures or buying assets from another company; 2) firms can enter into a new industry segment either through greenfield investments or through taking over another firm or buying assets from another firm; 3) firms can decrease their asset base by selling some of their assets; and 4) firms can stop operations in an industry segment altogether. As Maksimovic and Phillips (2001) point out, the merger market accounts for only half of the assets being traded, with partial-

firm asset transactions accounting for the rest. Thus, by using plant-level information, we are able to differentiate and also capture the full range of investment activities firm engages in. Furthermore, unlike capital expenditures which are difficult to differentiate between capital expenditures for maintenance purposes versus greenfield investments, we can gauge the importance of the investments.

Our null hypothesis is that managerial career concerns do not affect plant buying and selling, plant creation and shut down, or incremental investment. We state the null hypothesis in H1:

H1: The restructuring activities of a firm are not related to the age of its CEO.

The *Market Learning Hypothesis* predicts that young CEOs, relative to older ones, are less likely to make changes to their firm's portfolio of plants through restructuring activities, as stated in H1a below.

H1a: Younger CEOs are less likely to engage in restructuring activities.

In contrast, the *Managerial Signaling Hypothesis* predicts that younger CEOs are more likely to alter their firms' portfolio of plants through restructuring in order to signal their ability, as stated in H1b.

H1b: Younger CEOs are more likely to engage in restructuring activities.

Based on prior literature, it is unclear which of the above alternative hypotheses will be supported by data. Prior evidence from different job contexts supports the *Market Learning Hypothesis* (see e.g., Chevalier and Ellison (1999) for mutual fund managers, Hong, Kubik, and Solomon (2000) for security analysts, and Lamont (2002) for macroeconomists). However, other prior research is suggestive of the relevance of the *Managerial Signaling Hypothesis* for CEOs. Relative to other labor markets, arguably younger CEOs may prefer bolder decisions based on the incentives they face. Managers trade off the benefits from signaling superior ability, which leads to an increase in pay and career advancements, against the potential disadvantage, which is losing one's job. If the disadvantage is greater, then as the *Market Learning Hypothesis* predicts that the manager will desist from risky bold actions. However, the likelihood of job loss seems to be low for CEOs based on prior work, though most of this work does not differentiate between young

versus old CEOs, compared to terminations for mutual fund managers, security analysts, or macroeconomists. Based on Huson, Parrino, and Starks (2001), Taylor (2010), and Kaplan and Minton (2010), the forced termination rate for CEOs at large U.S. corporations is on average a mere 2%. According to Weisbach (1988, Table 2, p. 439), after accounting for retirements, deaths, and illnesses, the rate of terminations was 3.32% for CEOs of NYSE firms over 1974-1983. In Jenter and Kanaan (2010, Table 1), the rate of forced turnover is 2.3%. When differentiated according to CEO age, Yim (2010) finds that younger CEOs are not more likely to be fired for poorly performing acquisitions. In contrast, Hong, Kubik, and Solomon (2000, Table 2, p. 130) find the separation rate is 15.83% for security analysts on average, and 22% for the young and bold analysts, over ten years, 1986-1995. In Chevalier and Ellison (1999, Table II, p. 398), out of the 242 cases of separation for mutual fund managers over the years, 1992-1994, taking account of potential retirements and promotions, the separation rate is 15.2%. Furthermore, younger CEOs have powerful financial incentives to signal superior ability since it can translate into substantial extra compensation over their remaining careers. According to Gudell (2010), the median compensation for the first appointment as CEO is $2.6 million (in 2000 dollars). The figure jumps to $4.7 million for the second CEO job, and then to $8.2 million. This crude costs and benefits comparison is suggestive of CEO incentives consistent with the *Managerial Signaling Hypothesis*.

Any restructuring activities, induced by CEO's career concerns, might not be efficiency-improving. For instance, Narayanan (1985) shows that a manager hoping to enhance his reputation earlier will tend to make decisions that yield short-term gains at the expense of the long-term interests of the shareholders. Scharfstein and Stein (1990) find that career concerns lead managers to herding behavior in investments. Furthermore, reputational concerns may lead managers to hang on to underperforming projects, causing an escalation of commitment problem (Boot (1992)). However, Holmstrom (1999) argues that since effort and ability are substitutes, a young manager over-invests in labor to influence the market's perception of his ability whereas an older manager has already established a reputation based on past performance and is therefore no longer as concerned about improving reputation. Thus, younger managers may exert more effort when making investment decisions, leading to potentially more efficient decisions. Therefore, the predicted net effects of career concerns on efficiency are unclear, leading to our second hypothesis in the null form.

H2: Efficiency of restructuring activities is not affected by a CEO's career concerns.

It is likely that CEO career concerns not only have an impact on project initiation but also on subsequent project decisions. An implication of the signaling model of Prendergast and Stole (1996) is that managers may suffer from a so-called "trapped administrator" effect, first pointed out by Fox and Staw (1979). Managers who have established an unprofitable plant or acquired a bad plant suffer from an escalation of commitment problem, and may be reluctant to admit their mistakes and reverse their decisions. The admission of a mistake may indicate that their initial decision was bad and may taint their reputation (Boot (1992)). Weisbach (1995) provides some evidence consistent with such an escalation of commitment argument.[2] He finds that at the time of a change in management, there is an increased probability of divestment of poorly performing acquisitions. Thus, a manager may be more reluctant to cease investing in failing plants if he was the one who initiated the creation of that particular plant, compared to plants inherited from predecessors. In addition, managers may channel excessive capital expenditures to plants they have initiated in order to stave off failure.[3] To the extent that younger CEOs have greater career concerns, they may be particularly prone to divert extra capital to projects that they have initiated to ensure a favorable outcome. Therefore, our third hypothesis is as follows:

H3: A CEO with greater career concerns will channel excessive capital to projects he initiated, even if the project is not doing well.

3. Data

In this section, we discuss the formation of our sample, sources of data, and methodology to test the above hypotheses. We first describe how we classify the various plant-level activities using data from the U.S. Census Bureau.

3.1. Classification of Plant-level Activities

The LBD is a longitudinal database of all business establishments in the U.S. private non-farm economy that file payroll taxes with the IRS.[4] It is constructed from the Census Bureau's Business Register and enhanced with various survey data. As such, the LBD covers the universe of establishments in the U.S. non-farm business sector with at least one paid employee. It currently spans the years 1976 to 2005 (as of the time we conducted the analysis for this paper). In recent years, it contains over 6 million establishment records and almost 5 million firm records

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[2] Jin and Scherbina (2010) document similar behavior of hanging on to losers for mutual fund managers.

[3] Similarly, Goel, Nanda, and Narayanan (2004) propose that career concerns can distort allocations within internal capital markets.

[4] See Jarmin and Miranda (2002) for a detailed description of the LBD.

every year. An establishment is a specific physical location (e.g., a factory, store, and/or office) where business takes place. We refer to establishments and plants interchangeably throughout the paper. The LBD contains information on plant births, plant deaths, and plant acquisitions and divestures, which allow us to track the history of each plant. For each plant, we can therefore determine when it is built, and when it first becomes a part of a firm's portfolio. Importantly, the LBD is not restricted to plants in the manufacturing sector.[5] This allows us to construct a more complete picture of a firm's restructuring activities across different industries. One drawback of the LBD is that it contains only some basic data, i.e., ownership, employment, payroll, four-digit Standard Industrial Classification (SIC), and first/last year of operation. Therefore, in some tests, we also rely on the ASM and CMF for detailed data on plant productivity. We have checked that our main results work both on the broader LBD sample as well as the subsample of manufacturing firms in the ASM and CMF.

There are several advantages to using the Census Bureau databases relative to COMPUSTAT when examining firm investment behavior. Publicly available data such as COMPUSTAT only provide firm level aggregate capital expenditures. This does not allow us to capture the frequency of new projects being initiated since the capital expenditures can just go towards upgrading existing plants, properties and equipment. Furthermore, we cannot determine the characteristics and profitability of the projects where these capital expenditures have been put to use. The Census Bureau data allow us to differentiate between incremental investments and large changes to a firm's asset portfolio. Furthermore, since data are at the plant level, we can track the performance of plants over time, and especially after an acquisition.

We characterize investments mainly at the segment level where a segment is defined based on a collection of plants with the same three-digit SIC industry codes.[6] Establishment-level data are aggregated up to segments for each firm which gives us a portfolio of segments in which a firm operates (owns at least one establishment). We follow the number of establishments within each segment over the years. Investment activities are characterized by comparing current year's segment profile with last year's segment profile. We classify investments into five categories

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[5] Previous studies mostly use data from Longitudinal Research Database (LRD) to examine plant investment activities. See, e.g. Maksimovic and Phillips (2001, 2008). The LRD covers only plants in the manufacturing sector which is declining in importance in the U.S. economy. For instance, retail and whole trade, restaurants and hotel, banking, and business service industries combined account for over 70% of all the establishments in the LBD.

[6] The Census Bureau adopted the North America Industry Classification System (NAICS) in 1997 but maintained SIC codes on its business register until 2001. After 2001, we converted NAICS codes to SIC codes using a concordance table between SIC and NAICS provided by the Census Bureau. As segments births and deaths are characterized by comparing adjacent years, we check that our results do not change when we delete the years 2002 and 2003 since these years are most likely to be affected by the change in industry classification codes.

according to both the changes to segments as well as changes within a segment. In particular, we construct the following five indicator variables:

(1) Entry into a new segment (ENTRY). The indicator variable, ENTRY, is equal to one if at least one of the firm's current year segments was not present in the firm's portfolio last year, i.e., a firm just entered into a new segment. A firm's entry into a new segment can be a result of an acquisition of an establishment or building of a de novo establishment in a new segment.

(2) Exit from a segment (EXIT). The indicator variable, EXIT, is equal to one if at least one of last year's segments no long exists in the firm's portfolio in the current year. A firm's exit from a segment can be a result of the sale or closure of all the establishments in the segment.

(3) Increase investment in an existing segment (INCREASE). The indicator variable, INCREASE, is equal to one if the firm increases the number of establishments in at least one of the existing segments relative to last year. This could include creation of de novo establishment(s) or acquisition of establishment(s) in a segment in which the firm is already operating.

(4) Divestment from an existing segment (DECREASE). The indicator variable, DECREASE, is equal to one if the firm reduces the number of establishments in at least one of the existing segments compared with the previous year. This will include both the shut down and the divestiture of establishments in a segment in which the firm is already operating.

(5) No change in existing segments (NOCHANGE). The indicator variable, NOCHANGE, is equal to one if all of the above four variables take the value of zero, i.e., a firm's current year's portfolio is exactly the same as in the previous year.

We use an example to illustrate the above categorizations. Suppose that a firm owns 2 establishments in segment A, 3 establishments in segment B, and 4 establishments in segment C in year 2000. In year 2001, this firm owns 3 establishments in segment A, 2 establishments in segment B, and 1 establishment in segment D. In this case, in 2001, this firm has a ENTRY=1 because it ventures into a new segment - segment D. EXIT=1 because it sheds all of its establishments in segment C. INCREASE=1 because it increases the number of establishments in segment A from 2 to 3, and DECREASE=1 because it reduces the number of establishments in segment B from 3 to 2. As a result, NOCHANGE is equal to 0 in 2001. As one can see from the above example, it is entirely possible for a firm to have any combination of values among ENTRY, EXIT, INCREASE, and DECREASE, but NOCHANGE should be mutually exclusive relative to the former four activities.

We characterize investment in this manner to ensure that the investment decisions are substantial ones, in which the CEO would be expected to have a role in the decision-making

process. In particular, we would expect changes in the industry segments that the firm operates in, i.e., ENTRY and EXIT, to be primarily decided by the CEO. In Figure 1, we plot the yearly percentages of firms in our sample entering into a new segment, exiting from a segment, and firms with no change to their segment portfolios. In a typical year, on average, 40% of the firms keep the status quo relative to previous year (NOCHANGE), about one quarter of firms either enter a new segment (ENTRY) or exit an existing segment (EXIT). Restructuring activities are spread out across the years, although there is a slight trend towards less restructuring in the more recent years.

3.2. Plant Productivity and Capital Expenditures

Despite the comprehensive coverage and information on restructuring activities, the LBD covers limited data items. For detailed plant-level information on inputs and outputs, we turn to the ASM and CMF databases, which are also maintained by the Census Bureau. These two databases include information on the total value of shipments, expenditures on intermediate and primary inputs, and other input and output measures needed for performance analysis. These data are collected during the economic census, which takes place in years ending in 2 and 7, and covers approximately 350,000 manufacturing plants each time. The ASM typically samples about 60,000 plants in non-census years. All plants with more than 250 employees and all plants that are part of very large firms are included by design. Some 40,000 other plants are selected with a probability proportional to a composite measure of their size. Once a plant is surveyed, ASM continues surveying this plant to form a 5-year panel.

From the ASM and CMF, we construct two proxies of productivity to measure the performance of a plant. Our first measure of productivity is total factor productivity (TFP). Using all plants in the ASM and CMF databases, we follow Bertrand and Mullainathan (2003) and estimate the below equation separately for each industry and for each year:

$$Log(\text{Output}_i) = \alpha + \beta_1 Log(\text{Capital}_i) + \beta_2 Log(\text{Wagebill}_i) + \beta_3 Log(\text{Material}_i) + \varepsilon \qquad (1)$$

where i indexes plants; *Output* is measured by the total value of shipments; *Capital* is the value of the capital stock; *Wagebill* is the total of salaries and wages; *Material* is the cost of materials, parts, intermediate goods, energy and electricity. ASM no longer reports capital stock after 1988 and we compute capital stock using a perpetual inventory method. In particular, we begin with a plant's previous census year's capital stock, adding up reported capital expenditures year by year, and depreciated using the industry-wide investment deflators in the NBER-CES Productivity

Database.[7] TFP takes the actual amount of output a plant produces with a given amount of inputs and compares it to a predicted amount of output. The predicted output is what the plant is expected to produce given the amount of inputs it uses. The residual from the above estimation is used as the TFP measure. Since coefficients on capital, labor, and material inputs vary by industry and year, this specification allows for different factor intensities in different industries. The residual can be interpreted as the efficiency measure of a plant relative to other plants in that same industry in a given year.

Because the estimation of the TFP requires a particular functional form, we also check the robustness of our results by using the logarithmic transformation of value-added per worker where value-added is total output less intermediate inputs and cost of materials. This measure is better suited to capture the labor productivity of the plant.

3.3. Firm Financial Variables and CEO Age

The firm-level accounting information is obtained from COMPUSTAT.[8] Following prior literature on the determinants of investment policy, we use a set of variables that include firm size (measured by total book value of assets), firm performance (measured by stock returns and return on assets), cash (measured by ratio of cash to total assets), and firm's growth prospects (measured by Tobin's Q). Appendix 1 lists detailed definitions of these variables. CEO personal characteristics are obtained from Compact Disclosure Compact Discs, which collects information from firms' various financial reports. The first year in Compact Disclosure goes back to 1988. We extract two variables from it: CEO age and tenure. We count tenure as the number of years since the first time the person became the CEO of the firm according to Compact Disclosure. This creates a bias for CEOs who started prior to 1988, which happens to be the first year for our Compact Disclosure data set. To alleviate this concern, for all regressions which control for CEO tenure, we also perform the analysis on the sample in which we can determine exactly the CEO's tenure. The untabulated results show that our conclusions remain unaffected.

The main sample consists of all firm-year observations in the intersection of the LBD, COMPUSTAT, and Compact Disclosure databases. The matched sample contains 62,414 firm-year observations with non-missing information on all the accounting, and investment variables,

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[7] Available at http://www.nber.org/nberces/.
[8] Linkage between COMPUSTAT and the LBD, ASM, and CMF is performed using the COMPUSTAT-Standard Statistical Establishment List (COMPUSTAT-SSEL) Bridge File maintained at the Census Bureau.

as well as CEO age and tenure. The sample covers the period of 1988 to 2005. This matched sample forms the core of our analysis.

3.4. Summary Statistics

Table 1 presents the means and standard deviations for our key variables. Panel A describes the firm-level variables while panel B describes the establishment-level variables for manufacturing establishments only. We show statistics for all firms and also separately for firms which restructure and those that do not restructure. For the sample of all firms, on average, in a given year, 42% of firms do not engage in any restructuring activities (NOCHANGE=0.42). About 25% of firms enter a new business segment (ENTRY=0.25). A similar proportion of firms ceases operations entirely in some segment (EXIT=0.24). Some 33% of the firms increase the number of establishments within at least one of their existing segments (INCREASE=0.33), whereas 29% of firms reduces the number of establishments in an existing segment (DECREASE=0.29).

In our sample of all firms, the average age of a CEO is about 53.6 years old, and 46% of the CEOs have tenure of less than 3 years. Note, however, that CEO tenure is downward biased since we start counting tenure from the first year the CEO enters our database. When we restrict our CEOs to those for whom we can determine the tenure exactly, we also find that 46% of the CEOs have less than 3 years of tenure. The average firm owns some 64 establishments, and those establishments operate across 4 industry segments. In untabulated results, the average firm in the ASM/CMF has only 14 plants and operates across 2 industry segments. This is expected since the ASM/CMF only contains manufacturing plants operating in SIC codes 2011-3999. In Panel B, each manufacturing establishment employs about 343 employees and is about 17 years old.

In the second and third columns, we separate the firm-years based on whether they have any restructuring activities for the year and report the means and standard deviations for the two subsamples of firms. We also perform T-tests to compare the differences across the two subsamples. Conditional upon restructuring, 43% of the firms enter into a new segment, 42% exit from an existing segment, 58% increase the establishments of at least one of their segments, and 51% decrease the number of establishments in at least one of their segments.

Consistent with the *Managerial Signaling Hypothesis*, firms that change their asset base profiles are managed by CEOs about 1.2 years younger, compared with firms that maintain the status quo. This difference in age is significant at the 1% level. This preliminary analysis suggests that younger CEOs are more likely to lead a busy life by engaging in investment activities. In contrast, CEOs who prefer a quiet life are older. However, the two types of firms also differ significantly in other dimensions. Firms engaging in restructuring are significantly larger and

have better operating performance. In addition, firms that do not restructure have higher growth prospects, higher stock returns and higher cash ratio. These observations highlight the importance of controlling for firm size and performance measures, among other variables, when analyzing the investment activities. In the next section, we conduct multivariate regression analyses. Manufacturing plants operated by firms which restructure employ marginally less employees and have lower levels of capital expenditures relative to their capital stock. Using TFP as a measure of plant productivity, plants belonging to firms which keep the status quo have lower productivity although the alternative measure of productivity, value-added per employee, indicates otherwise.

4. Empirical Investigation

The *Market Learning* and *Managerial Signaling Hypotheses* described in Section 2 predict that managerial career concerns have an impact on firm investment activities. In this section, we first analyze how CEO career concerns affect the likelihood that a firm will undertake restructuring activities. Then, conditional upon having undertaken a restructuring activity, we examine the characteristics of the investment. After establishing a relation between firm investment and CEO age, we next examine the performance consequences of such career concerns.

4.1. The Effect of CEO Age on Investment

Following the literature on career concerns, we proxy for the degree of career concerns faced by a CEO with his age. Logistic regressions are used to analyze the likelihood of each type of investment activity:

$$\text{Prob}(\text{I}_{it}) = \alpha + \beta_1 \text{CEOAge}_{it-1} + \beta_2 \text{Tenure}_{it-1} + X_{it-1}\gamma + \varepsilon_{it} \tag{2}$$

In the above equation, I = ENTRY, EXIT, INCREASE, DECREASE, and NOCHANGE for each firm i in year t, X is a vector of firm i's characteristics. *Age* is the value of CEO's age. In other specifications, we also use three dummy variables to indicate whether the CEO is within the age intervals, under 50, between 50 and 59, and 60 years old and above, to capture the potential nonlinear effect of age. *Tenure*≤3 is a dummy variable equal to one during the first three years of the CEO tenure with the firm. Tenure not only controls for CEO skill but can also control for entrenchment effects. CEOs with longer tenure may be difficult to dismiss and thus have reduced career concerns. Firm level controls also include the number of establishments and the number of segments owned by the firm. All these regressors are lagged one year to avoid obvious endogeneity concerns. We also control for year and industry fixed effects. It is important to control for industry fixed effects as it is possible that young CEOs are risk-loving and are attracted to risky industries. To the extent that risky industries restructure more because of the

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nature of their business, a positive association between CEO age and restructuring activities could arise not because of career concerns but because of spurious correlations.

Baseline results on the relation between CEO age and investment activities are reported in Table 2. In this cross-sectional analysis, age is positively associated with NOCHANGE, but negatively associated with the remaining four investment variables. It is also statistically significant at the 1% level for NOCHANGE, ENTRY, EXIT, and INCREASE. This indicates that younger CEOs are more likely to enter a new segment, as well as cease operations in an existing segment. In contrast, older CEOs prefer to maintain the status quo. We do not find any effect of CEO age on decreases (DECREASE) in number of plants within a segment. This is understandable as such restructuring activities may fall more in the domain of divisional managers rather than that of the CEO.

The last row reports the marginal effect of a one-year increase in age associated with the percent change in the probability of each investment outcomes. A firm with a CEO ten years younger is about 1 percent and 2 percent more likely to enter into a new line of business and exit from an existing segment, respectively. It is also 1 percent more likely to increase as well as to reduce the number of establishments in at least one existing segment. CEOs who are ten years older are 3 percent more likely to maintain the status quo in each given year. Relative to the unconditional probability of retaining status quo (42%), for CEOs who are older by 10 years the probability of no restructuring activities increases by 7%. These findings offer support for the *Managerial Signaling Hypothesis*, according to which younger CEOs are more likely to lead a busy life altering the firm's existing business profile.

Note that the observed relation between CEO age and restructuring activities cannot be attributed to the fact that younger CEOs are likely to be new CEOs and restructuring is more likely to take place following a turnover (Weisbach (1995)). We find that during the first three years of the CEO's tenure, a firm is more likely to both withdraw either partially or entirely from an existing segment. This result implies that a CEO tends to reverse the past course of action when he first takes control of the firm. In contrast, new CEOs are not eager to enter into new segments, and they also are less likely to increase the number of plants within existing segments. In unreported results we also include an interaction term between *Tenure*≤3 and CEO age. This interaction term is not statistically different from zero, and the coefficient on age remains significant with the same sign, further reassuring us that the results are not driven by new CEOs in the sample.

The results on other determinants of investment activities are generally consistent with our expectations. A larger firm is more likely to engage in restructuring, although it is less likely

to exit altogether from its current segments. Firms with more segments and more establishments tend to restructure more actively, although firms with more plants are less likely to exit from a segment totally. When a firm has better investment prospects, as proxied by Tobin's Q, it scales up its investment in expansions. A better performing firm (better ROA and Stock Returns) is more likely to enter new business, and to increase the number of establishments in its existing segments; better performing firms are also less likely to downsize. A somewhat counterintuitive result is that a more cash-rich firm is associated with less expansionary activities. This could be because firms pile up cash in order to take advantage of future opportunities down the road.

The estimations in Table 2 assume that CEO age has a linear effect on investment activities. We remove this restriction and use two dummy variables for age cohorts: age under 50, and between 50 and 59. Table 3 reports the regression results using these two dummy variables, where the third category – age 60 and above – is used as the benchmark. Therefore, the coefficients on each of the dummy variables can be interpreted as the difference in investment activity relative to the oldest group of CEOs.

Relative to CEOs aged 60 and above, younger CEOs are more likely to restructure the firm's existing business segments, with the coefficients on the dummy variable for CEOs under 50 larger in absolute terms. In the bottom of Table 3, we report the p-value from a test for the equality of the two coefficients on the two dummy variables for age cohorts. Consistent with results in Table 2, of the two relatively younger CEO cohorts, firms having CEOs under age 50 tend to have significantly more business investment activities as indicated by the p-value. In terms of the marginal effects of these age cohort variables, we find that firms with CEOs younger than 50 are 5.9 percentage points less likely to maintain the status quo, 2.6 percentage points more likely to enter a new business segment, 3.7 percentage points more likely to withdraw from an existing business segment, and 3.7 percentage points more likely to increase the number of establishments in a segment than firms with CEOs aged 60 and above. Relative to the unconditional mean for ENTRY (25%), a CEO who is in the youngest age cohort increases the likelihood of entering a new industry segment by 10% relative to the CEOs aged 60 and above. The unconditional probability of EXIT is 24%, therefore, compared to the oldest group of CEOs, a CEO in the youngest cohort increases the likelihood of exiting from an existing segment by 15%. In contrast, the youngest group of CEOs decreases the probability of remaining status quo by 14%, relative to the unconditional probability of 42% (NOCHANGE = 1).

The effects for the age group 50 to 59 are slightly smaller economically. For example, compared to the oldest group of CEOs, CEOs who are aged 50 to 59 are 2.9 percentage points less likely to maintain the status quo, 1.1 percentage points more likely to enter into a new

segment, and 1.5 percentage points more likely to exit from an existing segment and increase the number of establishments in an existing segment. Results from Table 3 reinforce the conclusion that there is an inverse relation between CEO age and restructuring activities. As CEOs get older, they prefer the quiet life, while younger CEOs, perhaps concerned with their career prospects, are more likely to keep a busy life restructuring the firms they manage.

4.2 Alternative Hypotheses and Robustness Checks

We conduct a variety of checks to ensure that this age effect is not a result of other confounding firm characteristics. One might argue that such effects are due to the fact that younger CEOs tend to manage different types of firms from older CEOs. We address this concern in several ways. First, it is often the case that younger CEOs manage smaller, single-segment firms. If small, single-segment firms are more likely to restructure then our results could be spurious. Therefore, we carry out the same analysis within various different sub-samples. In one test, we distinguish between single-segment firms from multi-segment firms. In another test, we create three sub-samples based on the firm's total assets to check whether the results are driven by only the small firms or the big firms. The results found in these tests closely resemble those for the baseline results in Table 2. For brevity of space, we do not report the results here.

Second, an alternative explanation might be that the age effect reflects the selection of young CEOs by firms that need more restructuring. If such firms happen to hire young CEOs, the above results then are due to the firm's unobservable traits, not necessarily due to the CEO's age. To the extent that a firm's restructuring propensity is an ongoing trait, we alleviate this concern by controlling for firm fixed effects. Table 4 reports the related results using a linear probability model.[9] Basic findings on NOCHANGE, ENTRY, EXIT, and INCREASE continue to hold as in Table 2. The interpretation is slightly different, though. "Within" a firm, when the CEO is older, the firm becomes increasingly likely to maintain the status quo, and refrains from either entering into new segments or withdrawing from an existing segment. The economic effects are very similar to the ones in Table 2.

Third, we conduct a propensity score regression analysis to alleviate the concern that the age results are driven by differences in observable characteristics of firms that have young versus old CEOs (Hirano, Imbens, and Ridder, 2003). We follow Yim (2010) and first run a logit model where the dependent variable is "CEO age<50" on firm-level variables that also include firm's age which measures the stage in the life-cycle of the firm. As column (1) of Table 5 shows,

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[9] We opt for linear probability model due to the presence of a large number of fixed effects which would lead to the incidental parameters problem (see e.g., Wooldridge (2002, pp. 484)).

younger CEOs are more likely to serve on younger firms with fewer segments and plants. In columns (2) to (6), we re-weight the observations with the inverse of propensity score, which is defined as the predicted probability of having a young CEO according to the results in column (1).[10] The weighted OLS results confirm that younger CEOs are more likely to engage in restructuring activities. This empirical exercise further affirms that the age result is not driven by distributional differences in observed covariates between firms with old versus young CEOs.

Last, to address an inherent selection bias, we delete the newly-hired CEOs. The intuition is that at the time of the hire the CEO and the firm are most well matched, both having just voluntarily come together. The longer the CEO stays with the firm, the more likely it is that the firm's needs could deviate, so that matching between the CEO and the firm's needs may become less perfect. Yet, when we restrict the analysis to CEOs who have been in the position for at least five years, the results remain similar. This robustness check also shows that our results are not driven by the fact that young CEOs tend to be new hires and newly-hired CEOs tend to make more investment and do more restructuring.

To sum up, a battery of tests shows that other firm characteristics are not driving the relation between CEO age and firm investment activities. Next, we examine whether CEO age is proxying for other CEO traits rather than CEO career concerns.

Younger CEOs may become overconfident about their abilities because they were able to climb up to the top of the corporate ladder at a young age. Malmendier and Tate (2008) show that overconfident CEOs are more likely to undertake acquisitions. To take into account CEO overconfidence and other CEO personal characteristics that may be driving our results, we repeat our analysis after controlling for CEO fixed effects in Table 6. The purpose of running CEO fixed effects regressions is to remove any unobserved time-invariant CEO's personal characteristics that may affect firm investment decisions. Since we include CEO fixed effects and age at the same time, we exclude the year fixed effects to reduce issues of multicollinearity. The results closely resemble those in Table 2. The results imply that, "within" CEOs, as they grow older, they are less likely to engage in investment activities by changing the profile of a firm's segment. This also constitutes a more direct test of Prendergast and Stole (1996), who argue that CEOs are more reluctant to reverse past decisions as this would imply that they were wrong in the first place. In another direct test, we include the options-based measure of overconfidence used in Hirshleifer, Low, and Teoh (2010) as an additional control variable. This has the advantage that,

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[10] Treated and control observations are weighted by $1/p(X)$ and $1/(1-p(X))$, respectively, in the regressions. $P(X)$ is the predicted probability of being treated, i.e. having a CEO under age 50. We follow Imbens and Wooldridge (2007) by trimming observations with $p(X)$ outside of the interval [0.1, 0.9] to eliminate poor candidates for matching across the control and treatment samples.

if younger CEOs are more infected with overconfidence, we control for it directly. Although the sample is substantially reduced, our main results between CEO age and restructuring activities remain.

Gibbons and Murphy (1992) argue that older CEOs have less career concerns and that their explicit compensation contract would take into account this. They find evidence in support of their model that older CEOs have higher pay-performance sensitivity in their compensation contracts. Sundaram and Yermack (2007) show that older CEOs have more debt-like pension as compared to younger CEOs whose compensation are more equity-based. This may change the risk-aversion of older CEOs making them more likely to prefer the quiet life. In untabulated results, we control for CEO pay-performance sensitivity. In particular, we calculate the delta values of a CEO's portfolio of own-firm stock and stock options using the "one-year approximation" method outlined in Core and Guay (2002). Delta is defined as the dollar change in a CEO's stock and option portfolio for a 1% change in stock price. Although the sample is much reduced to those firms found in Execucomp, our results are robust to controlling for CEO delta. This robustness check also highlights the fact that CEO compensation contracts may not completely overcome the effects of career concerns on investments.

In untabulated results, we also examine whether the relation between CEO age and various restructuring activities are driven by differential corporate governance in firms managed by young CEOs versus old CEOs. We control for various corporate governance variables, e.g., board size, proportion of insider directors, an indicator variable for whether the CEO is also the chairman of the board, and also the governance index proposed by Gompers, Ishii, and Metrick (2003). Results are robust to the inclusion of these governance variables. That is, the effects of career concerns on investment decisions are not undone by these governance structures.

4.3 Characteristics of Investment Activities

So far, we have found that younger CEOs are more likely to change the firm's asset base, consistent with the *Managerial Signaling Hypothesis.* We emphasize the likelihood of various types of restructuring activity, such as entries and exits from lines of business or plant births and deaths. In this section, we approach the *Managerial Signaling Hypothesis* in a different manner, examining now the size and mode of these restructuring activities. If younger managers are indeed trying to signal their abilities, as the *Managerial Signaling Hypothesis* suggests, then they are also more likely to take on bolder, riskier, and more visible activities.

We first look at the size of the investment. Since our main analysis uses indicator variables, it does not allow us to capture the significance of these investment activities. To

overcome this shortcoming, we use changes in employment to measure the magnitude of the investment activities. Our earlier analysis shows that young CEOs are both more likely to enter a new segment and withdraw from an existing segment at the same time. We construct two related variables: Employment (Entry) and Employment (Exit) which measure the share of employment attributable to the segments a firm enters and withdraws from, respectively. The employment numbers are aggregated across all the new segments if the firm enters more than one segment, and are similarly aggregated across all the exiting segments. The regressions are at the firm-year level. When examining Employment (Entry), we restrict the sample to firms which enter into at least one new segment and when examining Employment (Exit), firms are required to have exited from at least one existing segment. The results are shown in columns 1 to 4 in Table 7. We show results using CEO age and also the CEO age cohorts. The results confirm that the segment-level investment activities that we used earlier also correspond to sizeable changes in terms of employment. Holding other things constant, firms managed by CEOs under the age of 50 enter into new segments which increase employment by 3.3 percentage points relative to CEOs aged 60 and above. CEOs between age 50 and 59 also are more likely to enter into segments with a bigger impact on employment than the oldest category of CEOs. When exiting from segments, younger CEOs are also more likely to exit from bigger segments. CEOs aged 50 and below exit from segments affecting 2.2 percentage points more of the employees, relative to the oldest group of CEOs.

One question that arises would be the overall impact on employment since we find that young CEOs enter into and exit from segments that affect more employees. We estimate the effect of CEO age on the firm's employment growth, measured by the difference between the firm's current year number of employees and previous year's divided by its previous year's number of employees. We obtain overall employment figures fromCOMPUSTAT. We find that, as shown in columns 5 and 6 of Table 7, younger CEOs are associated with a faster growth rate in the firm's employment. Other things equal, firms managed by CEOs under the age of 50 grow by nearly 6 percentage points faster than firms with CEOs aged 60 and above. CEOs aged between 50 and 59 grow their firms by about 2 percentage points faster than the oldest group of CEOs. In untabulated results, we find that young CEOs are associated with faster asset growth as well.

We now turn to two commonly-used measures of firms' investments: Capital expenditures and R&D expenditures fromCOMPUSTAT. As shown in the first two columns in Table 8, younger CEOs spend more resources on property, plant, and equipment. Other things equal, relative to CEOs aged 60 and above, a CEO younger than 50 years old is associated with 0.76 percentage points higher capital expenditures. R&D expenditures typically are viewed as

high-risk investments compared to capital expenditures on property, plant, and equipment (e.g., Coles, Daniel, and Naveen, 2006). In columns 3 and 4, we run regressions of R&D scaled by book assets on CEO age. We find that younger CEOs invest in more R&D than older CEOs, consistent with younger CEOs taking on riskier investments to signal their abilities. On average, a CEO younger than 50 spends about half of a percentage point more on R&D than CEOs 60 and above.

Another way to measure the boldness of the investment is to look at the way a CEO invests in new projects. A CEO can initiate a new project by either building a de novo plant or by acquiring a plant from another firm. Arguably, acquisitions can have an instantaneous, though more uncertain, impact on a firm's performance. On the other hand, building from scratch might take longer to affect performance, and hence not be observed by the market until later. The *Market Learning Models* suggest that CEOs with career concerns are more likely to build plants from scratch. In contrast, the *Managerial Signaling Model* suggests that CEOs with career concerns prefer acquisitions.

Within the sample of plants initiated by the CEO, we differentiate between plants built from scratch (de novo plants) versus plants acquired from another firm. We restrict the analysis to manufacturing plants only.[11] 20,231 distinct plants are initiated for the first time by the CEOs during our sample period. On average, 20% of these new plants are de novo investments. We estimate the impact of CEO age on the probability of setting up a de novo plant versus acquiring a plant from another firm in a logit model. The regressions are at the plant level. Results in Table 9 show that younger CEOs are more likely to initiate plants through acquisitions than older CEOs. In column 1, we use the continuous age variable, while in column 2 we show results using the age cohorts. CEOs age below 50 are less likely to stage a de novo investment than CEOs age 60 and above. This is consistent with younger CEOs trying to signal their abilities in order to influence labor market's perception of them. We show the marginal effects of age and age cohorts at the end of the table. On average, compared with CEOs 60 and above, younger CEOs below 50 years old are 3 percentage points less likely to build a plant from scratch.

We also find that newly-hired CEOs are more likely to undertake acquisitions than make green-field investments. Firms with better stock performance are also more likely to undertake acquisitions. This is consistent with the idea that well-performing equity can be used as a mode of payment during acquisitions. Consistent with the Q theory, firms with greater investment prospects (higher Q) are more likely to explore internal growth opportunities by building plants from scratch rather than acquiring plants from other firms. We also experiment by lagging CEO's

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[11] We repeat the analysis using the full LBD sample but the coefficient on CEO age is insignificant.

age two more years to account for the fact that it might take more than one year to build up a plant and our results continue to hold.

In sum, we find that, not only are younger CEOs more likely to restructure the existing business portfolios of their firms, they are also more likely to undertake bolder actions through acquisitions and making changes that have bigger impact on firm size.

4.4. The Effect of CEO Age on Plant Productivity

After examining the effects of managerial career concerns on corporate investment decisions, we proceed to investigate whether age impacts firm performance. As a first pass, we regress plant productivity measures on CEO age, controlling for other firm and plant level characteristics in the following specification:

$$Y_{ijt} = \alpha + \beta_1 \text{CEOAge}_{jt-1} + \beta_2 \text{Tenure}_{jt-1} + X_{ijt}\gamma + \text{Plant/IndustryFE} + \text{YearFE} + \varepsilon_{ijt} \qquad (3)$$

where Y_{ijt} denotes the productivity of plant i of firm j in year t. We use total factor productivity estimated in Equation (1) and the logarithmic transformation of value-added per worker to measure a plant's productivity. Other controls include plant size (measured by the logarithm of total number of employees in the plant), firm size, and firm's number of segments. We control for year fixed effects in all the regressions. In the even-numbered columns, we control also for plant fixed effects while we control for industry fixed effects in the odd-numbered columns. We estimate the above equation for a sizeable sample of 182,555 plant-years available from 1988 to 2005. Our null hypothesis is that the age of a CEO has no effect on a plant's productivity.

Results are presented in Table 10. We present results using the continuous age variable and also age cohort dummy variables. When using the continuous age variable, contrary to what one might expect, a plant is more productive, in terms of TFP, if managed by a young CEO. This result not only holds in cross-sectional regressions but also in within-plant regressions when we control of plant fixed effects. Thus, the results are not due to unobservable plant characteristics. When measuring productivity using value-added per worker, we find that young CEOs are associated with higher labor productivity only when using industry fixed effects. The coefficient on age in column 6, although negative, is not significant at conventional levels when we include plant fixed effects. We lose some statistical significance when we use age cohorts as covariates, with most of the coefficients on the dummy variables indicating younger CEOs positive but insignificant. Overall, there is some evidence that younger CEOs are associated with better plant productivity, although the results are weak.

In addition to the static effects of CEO age on productivity, we also analyze the performance of investment activities made by CEOs of different ages in a dynamic fashion. We investigate whether CEO age affects the changes in performance of the plants following an acquisition, conditional upon the CEO deciding on an acquisition. Although younger CEOs are influenced more by career concerns, Holmstrom (1999) argues that younger CEOs may also put in more effort to substitute for ability especially in the case when the CEO is unsure about his own talent. Therefore, it is unclear whether younger CEOs will make better acquisitions compared to older CEOs.

We construct a sample of plants that experience ownership changes and follow these plants from three years before to three years after the acquisition. Only plants that experience an ownership change are included.[12,13] We record the age of the CEO at the time of the acquisition and compare the post-acquisition performance made by CEOs of different ages. We estimate the following model at the plant level:

$$Y_{ijt} = \alpha + \beta_1 \text{After}_i + \beta_2(\text{After*CEOAge}_i) + X_{ijt}\gamma + \text{Plant/IndustryFE} + \text{YearFE} + \varepsilon_{ijt} \quad (4)$$

where Y_{ijt} denotes the productivity of plant i of firm j in year t. We use total factor productivity estimated in Equation (1) and the logarithm of value-added per worker to measure a plant's productivity. In the above equation, CEO age is the acquiring firm's CEO's age at the time of acquisition. "After" is a dummy variable equal to one for the three years after the acquisition, and is zero in the three years before the acquisition. The coefficient on "After" can be interpreted as the average productivity improvement from three years before the acquisition to three years after the acquisition. The coefficient on the interaction term of "After*CEO Age" estimates the differences in later performance for acquisitions made by CEOs of different ages. The baseline effect of CEO Age is absorbed by plant fixed effects.

Results are reported in Table 11. The odd-numbered columns report results using industry fixed effects while the even-numbered columns report results using plant fixed effects. We show results using the continuous age variable and age cohort dummy variables. Columns 1, 2, 5, and 6 include the interaction term between "CEO Age" and "After". All the coefficients on interaction terms are negative, which suggests that improvement in post-acquisition performance decreases with age of the acquiring firm's CEO. The effect is especially strong for value-added per worker as evidenced in column 6. Column 3, 4, 7, and 8 report results when we add

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[12] We are left with 37492 plant-year observations for this regression. In a similar regression, Schoar (2002) has 28118 plant-year observations from 1977 to 1995.

[13] To ensure that we get a comprehensive sample of plant ownership changes, we also obtain takeover information from SDC Platinum.

interaction terms of "After" with age cohorts – Age under 50 and Age 50-59. Coefficients on both interaction terms are positive but only significant for the interaction between "Age under 50" and "After" when measuring productivity using value-added per employee. In column 8 of Table 11, results indicate that compared with acquisitions made by CEOs 60 and above, plants acquired by CEOs younger than 50 enjoy a 10% premium in terms of labor productivity three years subsequent to the ownership change. However, the results of improved productivity for younger CEOs are not consistent across all specifications.

In sum, we find that plants managed by younger CEOs are at least as productive as those managed by older CEOs in the cross-section. Dynamically, acquisitions made by younger CEOs experience at least as great an improvement relative to that made by older CEOs. These results contradict the hypothesis that CEO career concerns have a distortive effect on investment performance. This is consistent with Yim (2010) who did not find that CEO age has any effect on acquisition profitability.

4.5. Capital Allocation across Plants

In this section, we investigate the effect of career concerns on internal capital allocation across plants. The "trapped administrator" hypothesis by Fox and Staw (1979) asserts that a decision maker may become over-committed to a previously chosen course of action and become reluctant to undertake change even though there may be a need to do so. Prendergast and Stole (1996) argue that a reversal of previous decisions is an admission of mistake and could lead to the CEO being viewed unfavorably by the labor market. We hypothesize that CEOs may become over-committed to the projects he started, leading to favoritism for those plants that he initiated. To the extent that this phenomenon is related to CEOs' need to protect their reputation, this effect is likely to be stronger among younger CEOs with more career concerns. In a related paper, Xuan (2009) finds that capital allocation across different divisions is affected by CEO's private incentives. In this paper, we examine whether capital allocation decisions across plants are affected by CEOs' favoritism towards projects they started.

First, we compare capital expenditures in plants inherited by a CEO with those in plants initiated by him.[14] On average, in our sample, a typical plant's capital expenditures in a given year are 10.7% of the value of total capital stock. An "Inherited" plant's investment intensity is slightly less than 10%, whereas that of a "Not-Inherited" plant's is about 12%. The univariate

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[14] We compare the first year a plant is owned by the firm with the year when a CEO first starts to manage the firm. If the former predates the latter, we code this plant as "Inherited" by the CEO, otherwise, the plant is "Not-inherited".

comparison provides support for the CEO favoritism story. Next, we examine whether CEOs are likely to allocate more resources to plants that he initiated in a multivariate analysis.

Table 12 reports regression results. The analysis is at the plant-year level. The dependent variable is the capital expenditures scaled by capital stock for the plant. The key variable of interest is *Not-Inherited*, an indicator variable equal to one if the plant is either built up or acquired from another firm by the current CEO, and zero otherwise. Across all specifications, the coefficient on *Not-Inherited* is positive and statistically significant. The coefficient of 0.016 implies that a plant that is either built from scratch or acquired from another firm during the CEO's tenure receives about 1.6% more capital than a plant "inherited" by the CEO. Results on other control variables are consistent with findings from prior literature. Large firms seem to spread capital more thinly across plants but bigger plants receive more capital. Firms with better investment prospects invest more heavily. More productive plants, as measured by plant TFP, are also investment intensive. After controlling for these variables, the age of the CEO does not affect the allocation of a plant's capital expenditures.

In column 2, we also examine how CEO age affects this favoritism phenomenon by including an interaction term between CEO age and Not-Inherited. We do not find that younger CEOs are more likely to practice favoritism. Therefore, this favoritism phenomenon seems to stem from a CEO's psychological bias rather than a rational concern for their labor outcomes. In column 3, we test whether CEOs are more likely to allocate capital to failing plants by including an interaction term between Not-inherit and TFP. Although the interaction is positive, it is insignificant. Hence, despite that CEOs tilt more capital towards plants they themselves initiated, there is virtually no evidence that such allocation is inefficient. In untabulated results, we repeat the analysis using CEO age cohorts instead. Again, the results show that CEO age do not affect the favoritism phenomenon, with both young and old CEOs equally likely to tilt investment towards plants they initiate.

5. Conclusions

Younger managers have greater concerns over their future careers. In this paper, we examine how real corporate investment decisions are affected by CEOs' career concerns. We characterize a firm's investment policy to encompass the acquisitions and sales of assets, as well as plant openings and closings. We document that a firm's propensity for investment activities is decreasing in the age of the CEO. Younger CEOs lead a busy life as they are more likely to alter a firm's existing business portfolio. Older CEOs prefer the quiet life and tend to maintain the status quo. We also find that the investment decisions of younger CEOs are bolder as they tend to

enter new industries through acquisitions, and that the restructuring activities they undertake are bigger in scale. The career concerns of young CEOs do not lead to detrimental effects on firm investment efficiency relative to older CEOs. We do not find that plant productivity improvements post-acquisitions are worse for younger CEOs. Taken together, these results suggest that younger CEOs are busy sending active signals to the managerial labor market by taking on bold and speedy, investment activities compared to those taken by older CEOs.

Appendix: Variable Description

Variable Name	Description	Unit of Obs.	Source
Dependent Variables			
NOCHANGE	Dummy variable is equal to one if there is no change in the firm's number of establishments and segments, and zero otherwise. A segment is defined as a collection of establishments with the same 3-digit SIC code.	Firm-year	LBD
ENTRY	Dummy variable is equal to one if the firm enters a new segment, and zero otherwise.	Firm-year	LBD
EXIT	Dummy variable is equal to one if the firm exits an existing segment, and zero otherwise.	Firm-year	LBD
INCREASE	Dummy variable is equal to one if the firm increases the number of establishments within an existing segment, and zero otherwise.	Firm-year	LBD
DECREASE	Dummy variable is equal to one if the firm decreases the number of establishments within an existing segment, and zero otherwise.	Firm-year	LBD
De Novo	Dummy variable is equal to one if the establishment is built from scratch and zero if the establishment is acquired from another firm.	Establishment-year	ASM/CMF
Employment Growth	Difference between current year's number of employees and previous year's number of employees divided by previous year's number of employees.	Firm-year	COMPUSTAT
Employment(Entry)	Ratio of total employment at new segments to firm's total employment in the previous year, conditional upon ENTRY = 1.	Firm-year	LBD
Employment(Exit)	Ratio of total employment at exiting segments to firm's total employment in previous year, conditional upon EXIT = 1.	Firm-year	LBD
Capital Expenditure	Ratio of capital expenditure to previous year's assets.	Firm-year	COMPUSTAT
R&D Expenditure	Ratio of R&D expenditure to previous year's assets.	Firm-year	COMPUSTAT
TFP	Total Factor Productivity, estimated as the residual from regressing output on wage bill, capital stock, and material cost.	Establishment-year	ASM/CMF
Log(Valued-added per worker)	Log (ratio of total output less cost of intermediate inputs and materials to	Establishment-year	ASM/CMF

	number of employees).		
Plant Capital Expenditure	Capital expenditure divided by capital stock.	Establishment-year	ASM/CMF

<u>Independent Variables</u>

CEO Age	CEO's age	Firm-year	Compact D
Age under 50	Dummy variable is equal to one if the CEO's age is below 50 years old, and zero otherwise.	Firm-year	Compact D
Age 50-59	Dummy variable is equal to one if the CEO's age is between 50 and 59, inclusive, and zero otherwise.	Firm-year	Compact D
Tenure≤ 3	Dummy variable is equal to one if it is during the first three years of the CEO's tenure, and zero otherwise.	Firm-year	Compact D
Log(Asset)	Log (book value of assets in 2005 millions of USD).	Firm-year	COMPUSTAT
ROA	Ratio of operating income before depreciation to previous year's assets.	Firm-year	COMPUSTAT
Tobin's Q	Ratio of market value of assets to book value of assets.	Firm-year	COMPUSTAT
Stock Returns	Buy-and-hold returns over previous fiscal year.	Firm-year	COMPUSTAT
Cash	Ratio of cash to book value of assets.	Firm-year	COMPUSTAT
Log(No. of Segments)	Log(total number of segments in which a firm operates with at least one establishment)	Firm-year	LBD
Log(No. of Plants)	Log (total number of plants a firm owns).	Firm-year	LBD
Log(Plant Age)	Log (age of establishment)	Establishment-year	LBD
Log(Plant Employment)	Log (number of employees in the establishment)	Establishment-year	LBD
Not-Inherited	Dummy variable is equal to one if the plant is either bought or started by the current CEO, otherwise zero.	Establishment-year	Compact D with ASM/CMF

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Figure 1 Real Investment Activities across Years

The below tables plots the annual percentages of firms in our sample that undergo restructuring activities.
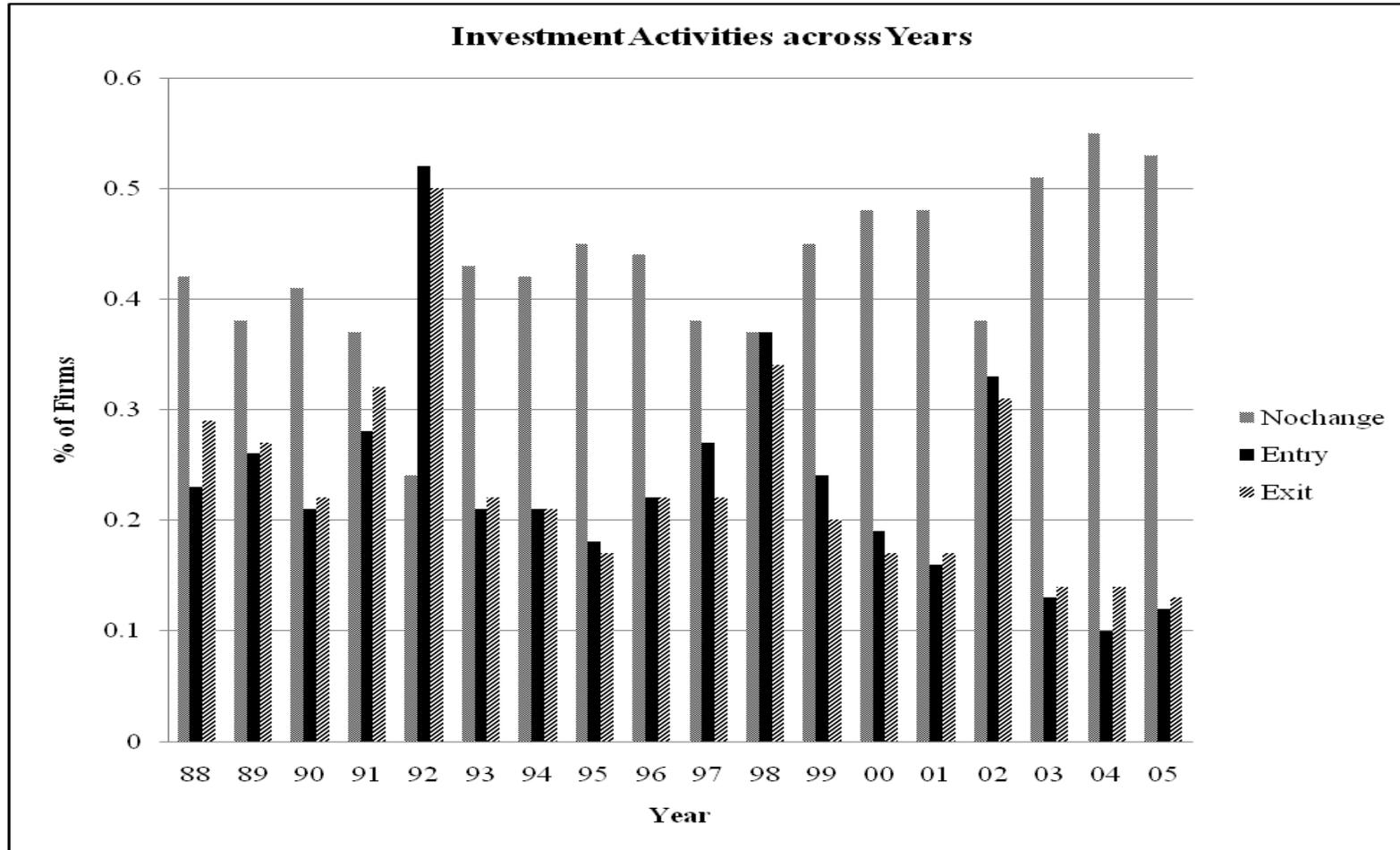
Table 1 Summary Statistics

The sample consists of 62,414 firm-years after matching data from Compustat, Compact Disclosure, and Longitudinal Business Database (LBD) over the period 1988 to 2005. Panel A describes the firm-level variables while Panel B describes the plant-level variables. Plant-level data in the LBD are aggregated up to form segment level data for each firm, where segments are defined at the 3-digit SIC code. We define four types of restructuring activities. ENTRY (EXIT) is an indicator variable that equals one when the firm enters into a new industry segment (exits from an existing industry segment), and zero otherwise. INCREASE (DECREASE) is an indicator variable that equals one when the firm increases (decreases) the number of plants within at least one of its segments, and zero otherwise. NOCHANGE is an indicator variable that equals one when the firm does not engage in any of the above four types of restructuring activities, and zero otherwise. The definition of the other variables can be found in the Appendix.

Panel A: Firm-level variables

	All Firms N=62414 Mean (SD)	NOCHANGE=1 N=26402 Mean (SD)	NOCHANGE=0 N=36012 Mean (SD)	NOCHANGE(1) – NOCHANGE (0) Difference	p-value
NOCHANGE	0.423 (0.494)				
ENTRY	0.248 (0.432)		0.429 (0.495)		
EXIT	0.241 (0.427)		0.417 (0.493)		
INCREASE	0.333 (0.471)		0.577 (0.494)		
DECREASE	0.291 (0.454)		0.506 (0.500)		
CEO Age	53.616 (8.693)	54.143 (8.345)	52.898 (9.121)	1.245	0.001
Tenure$\leq$ 3	0.460 (0.498)	0.466 (0.499)	0.457 (0.499)	0.009	0.010
Asset	1831 (5740)	388 (2032)	2890 (7172)	-2502	0.001
Tobin's Q	2.038 (2.735)	2.336 (2.295)	1.687 (1.352)	0.649	0.001
ROA	0.056 (0.317)	0.001 (0.424)	0.116 (0.183)	-0.115	0.001
Stock Returns	0.187 (0.870)	0.177 (0.843)	0.162 (0.630)	0.015	0.001
Cash	0.160 (0.205)	0.225 (0.247)	0.112 (0.150)	0.113	0.001
No. of Segments	3.976 (4.483)	1.803 (1.550)	5.569 (5.204)	-3.766	0.001
No. of Plants	63.936 (171.444)	6.497 (28.308)	106.062 (214.868)	-99.565	0.001

Panel B. Plant-level variables (Manufacturing plants only)

	All Plants N=182555 Mean	NOCHANGE=1 N=25660 Mean	NOCHANGE=0 N=156895 Mean	NOCHANGE(1) – NOCHANGE (0) Difference	p-value
Plant Employment	343.193 (836.909)	349.977 (630.228)	342.083 (866.029)	7.893	0.08
TFP	0.064 (0.337)	0.042 (0.346)	0.068 (0.335)	-0.026	0.001
Log(Value-added per worker)	4.430 (0.979)	4.438 (1.024)	4.429 (0.979)	0.009	0.08
Plant Capital Expenditures	0.107 (0.132)	0.124 (0.138)	0.105 (0.131)	0.019	0.001
Plant Age	16.695 (7.619)	17.264 (7.706)	16.602 (7.601)	0.663	0.001

Table 2 Effect of Age on Investment Activity

This table presents logistic regressions of firm restructuring activities on CEO age. Plant-level data in the LBD are aggregated up to form segment level data for each firm, where segments are defined at the 3-digit SIC code. We define four types of restructuring activities. ENTRY (EXIT) is an indicator variable that equals one when the firm enters into a new industry segment (exits from an existing industry segment), and zero otherwise. INCREASE (DECREASE) is an indicator variable that equals one when the firm increases (decreases) the number of plants within at least one of its segments, and zero otherwise. NOCHANGE is an indicator variable that equals one when the firm does not engage in any of the above four types of restructuring activities, and zero otherwise. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. The last row of the table calculates the marginal effect of age, evaluated at the mean values of the independent variables. All regressions include industry and year fixed effects. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

| | NOCHANGE | ENTRY | EXIT | INCREASE | DECREASE |
	(1)	(2)	(3)	(4)	(5)
CEO Age	0.011***	-0.008***	-0.009***	-0.006***	-0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Tenure≤3	-0.032	-0.012	0.055**	-0.063**	0.077***
	(0.027)	(0.025)	(0.028)	(0.026)	(0.028)
Log(Asset)	-0.147***	0.173***	-0.040***	0.165***	0.028**
	(0.011)	(0.010)	(0.011)	(0.011)	(0.013)
Tobin's Q	-0.020***	0.026***	-0.003	0.038***	-0.096***
	(0.005)	(0.005)	(0.006)	(0.007)	(0.016)
ROA	-0.220***	0.338***	-0.215***	1.781***	-0.468***
	(0.053)	(0.066)	(0.047)	(0.104)	(0.057)
Stock Returns	-0.008	0.031**	-0.021	0.057***	-0.071***
	(0.014)	(0.014)	(0.017)	(0.014)	(0.020)
Cash	0.231***	-0.132*	0.134	-0.263***	-0.475***
	(0.074)	(0.077)	(0.083)	(0.090)	(0.101)
Log(No. of Segments)	-0.877***	0.747***	2.366***	0.725***	0.890***
	(0.044)	(0.032)	(0.039)	(0.033)	(0.039)
Log(No. of Plants)	-1.013***	0.038***	-0.084***	0.431***	0.820***
	(0.023)	(0.015)	(0.017)	(0.016)	(0.023)
Observations	62414	62414	62414	62414	62414
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.41	0.18	0.29	0.31	0.35
ME of AGE	0.003	-0.001	-0.002	-0.001	-0.001

Table 3: Effect of Age on Investment Activity using Age Cohorts

This table presents logistic regressions of firm restructuring activities on CEO age. We create three cohorts of CEOs by age: Under 50, between 50 and 59, and 60 and above. In the regression, the omitted category is CEOs aged 60 and above. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. *p*-values are from testing for the equality of coefficients on indicator variable for CEO under 50 and CEO aged between 50 and 59. All regressions include industry and year fixed effects. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	NOCHANGE	ENTRY	EXIT	INCREASE	DECREASE
	(1)	(2)	(3)	(4)	(5)
Age under 50	-0.199***	0.151***	0.214***	0.117***	0.027
	(0.037)	(0.033)	(0.036)	(0.035)	(0.038)
Age 50-59	-0.112***	0.074***	0.105***	0.062**	0.016
	(0.034)	(0.028)	(0.032)	(0.030)	(0.033)
Tenure≤3	-0.042	-0.003	0.049*	-0.056**	0.079***
	(0.027)	(0.024)	(0.028)	(0.026)	(0.028)
Log(Asset)	-0.147***	0.173***	-0.040***	0.165***	0.028**
	(0.011)	(0.010)	(0.011)	(0.011)	(0.013)
Tobin's Q	-0.021***	0.026***	-0.003	0.038***	-0.096***
	(0.005)	(0.005)	(0.006)	(0.007)	(0.016)
ROA	-0.220***	0.338***	-0.215***	1.782***	-0.468***
	(0.053)	(0.066)	(0.047)	(0.104)	(0.057)
Stock Returns	-0.009	0.031**	-0.021	0.057***	-0.071***
	(0.014)	(0.014)	(0.017)	(0.014)	(0.020)
Cash	0.227***	-0.130*	0.132	-0.264***	-0.475***
	(0.075)	(0.077)	(0.083)	(0.090)	(0.102)
Log(No. of Segments)	-0.873***	0.744***	2.367***	0.723***	0.889***
	(0.044)	(0.032)	(0.039)	(0.033)	(0.039)
Log(No. of Plants)	-1.011***	0.037**	-0.084***	0.430***	0.820***
	(0.023)	(0.015)	(0.017)	(0.016)	(0.023)
Observations	62414	62414	62414	62414	62414
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.41	0.18	0.29	0.31	0.35
P-value	0.001	0.001	0.001	0.060	0.750
ME of Age under 50	-0.059	0.026	0.037	0.037	0.008
ME of Age 50 - 59	-0.029	0.011	0.015	0.015	0.004

Table 4: Effect of Age on Investment Activity: Firm Fixed Effects

This table presents ordinary least squares (OLS) regressions of firm restructuring activities on CEO age controlling for firm fixed effects. We define four types of restructuring activities. ENTRY (EXIT) is an indicator variable that equals one when the firm enters into a new industry segment (exits from an existing industry segment), and zero otherwise. INCREASE (DECREASE) is an indicator variable that equals one when the firm increases (decreases) the number of plants within at least one of its segments, and zero otherwise. NOCHANGE is an indicator variable that equals one when the firm does not engage in any of the above four types of restructuring activities, and zero otherwise. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. All regressions include year and firm fixed effects. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

| | NOCHANGE | ENTRY | EXIT | INCREASE | DECREASE |
	(1)	(2)	(3)	(4)	(5)
CEO Age	0.002***	-0.001***	-0.002***	-0.001***	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tenure≤3	-0.012***	0.020***	0.011**	0.003	0.003
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Log(Asset)	-0.003	0.012***	-0.034***	0.006	-0.015***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Tobin's Q	-0.003***	0.002***	-0.001*	0.006***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ROA	-0.015***	0.034***	-0.024**	0.082***	-0.054***
	(0.007)	(0.007)	(0.011)	(0.008)	(0.007)
Stock Returns	0.005**	0.002	-0.002	0.001	-0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Cash	0.003	0.036**	0.041***	0.002	-0.015
	(0.018)	(0.017)	(0.015)	(0.014)	(0.013)
Log(No. of Segments)	-0.093***	-0.154***	0.575***	0.225***	-0.015
	(0.005)	(0.013)	(0.011)	(0.012)	(0.012)
Log(No. of Plants)	-0.087***	0.037***	-0.066***	-0.033***	0.226***
	(0.005)	(0.006)	(0.005)	(0.007)	(0.007)
Observations	62414	62414	62414	62414	62414
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.48	0.16	0.28	0.37	0.42

Table 5: Effect of Age on Investment Activity: Propensity Score Matching
This table presents regressions of firm restructuring activities on CEO age using a propensity score matching method. We define four types of restructuring activities. ENTRY (EXIT) is an indicator variable that equals one when the firm enters into a new industry segment (exits from an existing industry segment), and zero otherwise. INCREASE (DECREASE) is an indicator variable that equals one when the firm increases (decreases) the number of plants within at least one of its segments, and zero otherwise. NOCHANGE is an indicator variable that equals one when the firm does not engage in any of the above four types of restructuring activities, and zero otherwise. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. Column (1) shows the logistic regression results where one regresses a dummy variable of "Age under 50" on explanatory variables including firm age ("the first stage"). The fitted values from the first stage constitute the propensity score, trimmed at propensity score values of [0.1,0.9]. Columns (2) to (6) show the weighted OLS regression results using inverse propensity scores as weights. All regressions include industry and year fixed effects. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	Age under 50	NOCHANGE	ENTRY	EXIT	INCREASE	DECREASE
	(1)	(2)	(3)	(4)	(5)	(6)
Age under 50		-0.009**	0.009**	0.017***	0.001	0.002
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Tenure≤3		-0.004	-0.001	0.012***	-0.004	0.015***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Log(Asset)	0.001	-0.022***	0.025***	0.001	0.023***	0.004**
	(0.014)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Tobin's Q	-0.009	-0.002	0.006***	0.001	0.012***	-0.006***
	(0.009)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ROA	-0.092	-0.078***	0.023***	-0.058***	0.106***	-0.090***
	(0.069)	(0.010)	(0.008)	(0.007)	(0.008)	(0.007)
Stock Returns	0.004	-0.002	0.007***	-0.001	0.012***	-0.007***
	(0.013)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)
Cash	0.408***	0.062***	-0.009	0.031***	0.004	-0.012
	(0.090)	(0.012)	(0.010)	(0.010)	(0.009)	(0.009)
Log(No. of Segments)	-0.216***	-0.139***	0.143***	0.361***	0.129***	0.135***
	(0.052)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
Log(No. of Plants)	-0.061***	-0.122***	0.003	-0.014***	0.089***	0.128***
	(0.023)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Firm Age	-0.034***	0.002**	-0.001***	-0.001**	-0.002***	0.001*
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	62414	57791	57791	57791	57791	57791
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo/Adj. R-squared	0.08	0.41	0.18	0.28	0.33	0.35

Table 6: Effect of Age on Investment Activity: CEO Fixed Effects
This table presents ordinary least squares (OLS) regressions of firm restructuring activities on CEO age controlling for CEO fixed effects. We define four types of restructuring activities. ENTRY (EXIT) is an indicator variable that equals one when the firm enters into a new industry segment (exits from an existing industry segment), and zero otherwise. INCREASE (DECREASE) is an indicator variable that equals one when the firm increases (decreases) the number of plants within at least one of its segments, and zero otherwise. NOCHANGE is an indicator variable that equals one when the firm does not engage in any of the above four types of restructuring activities, and zero otherwise. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. All regressions include CEO fixed effects. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	NOCHANGE	ENTRY	EXIT	INCREASE	DECREASE
	(1)	(2)	(3)	(4)	(5)
CEO Age	0.014***	-0.018***	-0.013***	-0.011***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Tenure≤3	0.018***	-0.019***	-0.024***	-0.010**	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Log(Asset)	-0.027***	0.052***	-0.014***	0.039***	-0.015***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Tobin's Q	-0.003***	0.002***	-0.001	0.006***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ROA	-0.001	0.013	-0.037***	0.064***	-0.051***
	(0.009)	(0.010)	(0.013)	(0.009)	(0.009)
Stock Returns	0.002	0.005**	-0.001	0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Cash	0.013	0.016	0.053***	0.001	-0.003
	(0.017)	(0.019)	(0.019)	(0.018)	(0.013)
Log(No. of Segments)	-0.074***	-0.268***	0.628***	0.214***	-0.030***
	(0.005)	(0.006)	(0.005)	(0.010)	(0.009)
Log(No. of Plants)	-0.093***	0.062***	-0.067***	-0.038***	0.232***
	(0.009)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	62414	62414	62414	62414	62414
CEO FE	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.49	0.19	0.29	0.38	0.42

Table 7: Effect of Age on Employment Growth

This table presents ordinary least squares (OLS) regressions of firm's employment growth on CEO age. Employment(Entry) is the ratio of number of employees in the new segments to the firm's total employment in the previous year. Only firms which enter at least one new segment are included. Employment(Exit) is the ratio of number of employees in the exiting segments to the firm's total employment in the previous year. Only firms which exit at least one new segment are included. Employment Growth is the difference between a firm's current year's employment and previous year's employment divided by previous year's employment. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. All regressions include industry and year fixed effects. *p*-values are from testing for the equality of coefficients on indicator variable for CEO under 50 and CEO aged between 50 and 59. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	Employment (Entry)		Employment (Exit)		Employment Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Age	-0.002***		-0.002***		-0.003***	
	(0.000)		(0.000)		(0.000)	
Age under 50		0.033***		0.022***		0.058***
		(0.006)		(0.006)		(0.005)
Age 50 −59		0.015***		0.014***		0.016***
		(0.005)		(0.005)		(0.004)
Tenure≤3	0.014***	0.015***	0.019***	0.021***	0.017***	0.021***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Log(Asset)	-0.010***	-0.010***	-0.009***	-0.010***	-0.017***	-0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Tobin's Q	0.011***	0.011***	0.008***	0.008***	0.025***	0.025***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
ROA	-0.115***	-0.115***	-0.158***	-0.158***	0.121***	0.120***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)
Stock Returns	-0.001	-0.001	-0.007**	-0.007**	0.043***	0.043***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
Cash	0.130***	0.130***	0.183***	0.185***	0.060***	0.060***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.014)	(0.014)
Log(No. of Segments)	-0.069***	-0.070***	-0.107***	-0.108***	0.006	0.005
	(0.003)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)
Log(No. of Plants)	-0.060***	-0.060***	-0.036***	-0.036***	-0.004*	-0.004*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Observations	15489	15489	15030	15030	59234	59234
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.37	0.37	0.39	0.39	0.07	0.07
p-value		0.001		0.001		0.001

Table 8: Effect of Age on Capital Expenditures and R&D Expenditures

This table presents ordinary least squares (OLS) regressions of firm's capital expenditures and research and development (R&D) expenditures on CEO age. Capital Expenditure is the ratio of firm's capital expenditures to previous year's assets. R&D Expenditure is the ratio of R&D to previous year's book assets. Both variables are from Compustat. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. All regressions include industry and year fixed effects. *p*-values are from testing for the equality of coefficients on indicator variable for CEO under 50 and CEO aged between 50 and 59.Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

| | Capital Expenditure*10 | | R&D Expenditure*10 | |
	(1)	(2)	(3)	(4)
CEO Age	-0.004***		-0.002***	
	(0.001)		(0.001)	
Age under 50		0.076***		0.053***
		(0.014)		(0.016)
Age 50-59		0.015		0.055***
		(0.011)		(0.012)
Tenure≤3	-0.004	-0.001	-0.035***	-0.034***
	(0.009)	(0.009)	(0.011)	(0.011)
Log(Asset)	0.067***	0.067***	0.047***	0.047***
	(0.005)	(0.005)	(0.006)	(0.006)
Tobin's Q	0.071***	0.072***	0.129***	0.129***
	(0.004)	(0.004)	(0.007)	(0.007)
ROA	0.341***	0.341***	-1.587***	-1.587***
	(0.035)	(0.035)	(0.061)	(0.061)
Stock Returns	0.019***	0.020***	0.047***	0.047***
	(0.006)	(0.006)	(0.008)	(0.008)
Cash	-0.350***	-0.351***	0.878***	0.880***
	(0.029)	(0.029)	(0.052)	(0.052)
Log(No. of Segments)	-0.123***	-0.124***	-0.092***	-0.092***
	(0.014)	(0.014)	(0.012)	(0.012)
Log(No. of Plants)	-0.040***	-0.040***	-0.001	-0.002
	(0.007)	(0.007)	(0.006)	(0.006)
Observations	62414	62414	62414	62414
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj. R-squared	0.28	0.28	0.56	0.56
p-value		0.001		0.88

Table 9: De Novo vs. Acquisition
The table shows results from logistic regressions that examine how CEO age affects firm's choice between acquiring a plant from another firm and building one from scratch. The sample consists of all manufacturing plants the first year that were started by the CEO during our sample period. The dependent variable is a dummy variable that equals one if the plant is built from scratch, i.e., De Novo = 1, and zero if the plant is acquired from another firm. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. All specifications control of industry and year fixed effects. *p*-values are from testing for the equality of coefficients on indicator variable for CEO under 50 and CEO aged between 50 and 59. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	De Novo	
	(1)	(2)
CEO Age	0.015***	
	(0.003)	
Age Under 50		-0.214***
		(0.059)
Age 50-59		-0.253***
		(0.043)
Tenure≤3	-0.287***	-0.303***
	(0.046)	(0.046)
Log(Asset)	-0.075***	-0.075***
	(0.016)	(0.016)
Tobin's Q	0.067***	0.065***
	(0.020)	(0.020)
ROA	0.004	0.023
	(0.164)	(0.162)
Stock Returns	-0.262***	-0.257***
	(0.046)	(0.046)
Cash	-0.271	-0.257
	(0.208)	(0.207)
Log(No. of Segments)	0.083***	0.098***
	(0.033)	(0.033)
Observations	20231	20231
Industry FE	Yes	Yes
Year FE	Yes	Yes
Pseudo R-squared	0.08	0.08
ME of AGE	0.002	
p-value		0.62
ME of Age under 50		-0.030
ME of Age 50-59		-0.035

Table 10: Effect of CEO Age on Plant Productivity

This table presents OLS regressions of plant productivity on CEO age at the plant-year level. Only manufacturing plants are considered. Total factor productivity (TFP) is the residual from estimating a log linear Cobb-Douglas production function for each industry and year at the plant level, where one regresses the value of output on total payroll, capital stock and material cost. Value-added per worker is the ratio of total output less costs of intermediate inputs and materials to the number of employees. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. *p*-values are from testing for the equality of coefficients on indicator variable for CEO under 50 and CEO aged between 50 and 59. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	TFP				Log(Value-added per worker)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO Age	-0.001*	-0.001**			-0.003**	-0.001		
	(0.000)	(0.000)			(0.001)	(0.001)		
Age under 50			0.001	0.007			0.017	0.006
			(0.008)	(0.007)			(0.025)	(0.017)
Age 50-59			0.005	0.008**			0.032**	0.009
			(0.005)	(0.004)			(0.016)	(0.010)
Tenure≤3	-0.004	-0.005	-0.001	-0.003	-0.001	-0.011	0.007	-0.008
	(0.005)	(0.004)	(0.005)	(0.003)	(0.015)	(0.011)	(0.015)	(0.011)
Log(Asset)	0.019***	0.003	0.019***	0.002	0.089***	0.008	0.088***	0.008
	(0.003)	(0.002)	(0.003)	(0.002)	(0.009)	(0.006)	(0.008)	(0.006)
Log(No. of Segments)	-0.009	0.006	-0.009	0.006	-0.134***	-0.003	-0.135***	-0.003
	(0.007)	(0.005)	(0.007)	(0.005)	(0.022)	(0.014)	(0.022)	(0.014)
Log(Plant Employment)	-0.025***	-0.017***	-0.025***	-0.017***	-0.022**	-0.115***	-0.022**	-0.115***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.010)	(0.012)	(0.010)	(0.012)
Observations	182555	182555	182555	182555	182555	182555	182555	182555
Industry FE	Yes		Yes		Yes		Yes	
Plant FE		Yes		Yes		Yes		Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.03	0.51	0.03	0.51	0.28	0.65	0.28	0.65
p-value			0.58	0.86			0.48	0.87

Table 11: Effect of CEO Age on Acquired Plant's Productivity

The sample contains only observations for manufacturing plants that change owners. Only the three years before and after the acquisition are included. Total factor productivity (TFP) is the residual from estimating a log linear Cobb-Douglas production function for each industry and year at the plant level, where one regresses the value of output on total payroll, capital stock and material cost. Value-added per worker is the ratio of total output less costs of intermediate inputs and materials to the number of employees. CEO Age is the age of the CEO of the acquiring firm. After is an indicator variable equal to one for the three years after the acquisition, and zero otherwise. Definitions of the variables can be found in the Appendix. The regressions are at the plant-year level. *p*-values are from testing for the equality of coefficients on indicator variable for CEO under 50 and CEO aged between 50 and 59. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	TFP				Log(Value-added per worker)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After	0.030	0.041	0.008	0.001	0.196	0.266***	-0.020	-0.041
	(0.046)	(0.029)	(0.012)	(0.008)	(0.123)	(0.090)	(0.037)	(0.026)
CEO Age	-0.001**				-0.004**			
	(0.000)				(0.002)			
CEO Age*After	-0.001	-0.001			-0.003	-0.005***		
	(0.001)	(0.001)			(0.002)	(0.002)		
Age under 50			0.022**				0.036	
			(0.011)				(0.036)	
Age 50-59			0.003				0.011	
			(0.009)				(0.028)	
Age under 50 * After			0.007	0.014			0.075	0.104***
			(0018)	(0.011)			(0.053)	(0.032)
Age 50-59 *After			0.002	0.004			0.023	0.036
			(0.014)	(0.008)			(0.042)	(0.025)
Log(Asset)	0.017***	0.001	0.017***	0.001	0.064***	0.013	0.063***	0.013
	(0.003)	(0.004)	(0.003)	(0.004)	(0.009)	(0.012)	(0.009)	(0.012)
Log(No. of Segments)	-0.007	0.006	-0.007	0.005	-0.065***	0.017	-0.066***	0.014
	(0.006)	(0.008)	(0.006)	(0.008)	(0.020)	(0.025)	(0.020)	(0.025)
Log(Plant Employment)	-0.016***	-0.049***	-0.016**	-0.049***	0.070***	-0.064	0.070***	-0.064
	(0.006)	(0.015)	(0.006)	(0.015)	(0.016)	(0.040)	(0.016)	(0.040)
Observations	37492	37492	37492	37492	37492	37492	37492	37492
Industry FE	Yes		Yes		Yes		Yes	
Plant FE		Yes		Yes		Yes		Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.03	0.44	0.03	0.44	0.26	0.60	0.26	0.60
p-value			0.76	0.33			0.27	0.01

Table 12: Capital Expenditure: Inherited vs. Not-Inherited Plant
This table presents OLS regressions of capital expenditures on an indicator variable, Not-Inherited, controlling for other plant and firm level characteristics. The dependent variable is plant-level capital expenditures scaled by capital stock. Not-Inherited is equal to one if the current CEO either builds the plant from scratch, or acquires the plant from another firm, and zero if the CEO inherits the plant from his predecessor. Only manufacturing plants are considered. CEO age and other accounting variables are lagged by one year. Definitions of the variables can be found in the Appendix. Standard errors clustered at the firm level are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	Plant Capital Expenditure		
	(1)	(2)	(3)
Not-Inherited	0.016***	0.024**	0.016***
	(0.001)	(0.010)	(0.001)
CEO Age	0.001	0.0001	
	(0.002)	(0.0001)	
Not-Inherited*Age		-0.0001	
		(0.0001)	
Not-inherited*TFP			0.002
			(0.002)
Tenure≤3	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)
Log(Asset)	-0.003***	-0.001***	-0.003***
	(0.001)	(0.001)	(0.001)
Tobin's Q	0.004***	0.004***	0.003***
	(0.001)	(0.001)	(0.001)
ROA	0.063***	0.061***	0.061***
	(0.007)	(0.007)	(0.007)
Log(No. of Segments)	-0.006***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)
Log(Plant Employment)	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)
TFP	0.008***	0.008***	0.007***
	(0.001)	(0.001)	(0.002)
Log(Plant Age)	-0.011***	-0.010***	-0.010***
	(0.001)	(0.001)	(0.001)
Observations	182555	182555	182555
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj. R-squared	0.06	0.06	0.06