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SPECIFICITY OF CEO HUMAN CAPITAL AND COMPENSATION

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Much research on top management compensation has focused on the relationship between pay and firm performance. Firms, however, may compensate executives for inputs such as skills, as well as for outputs such as firm performance. This study refocuses attention on the links between managerial abilities and compensation by examining pay differences between types of CEO successors who have differential skills—namely, internal and external successors. © 1997 John Wiley & Sons, Ltd.

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INTRODUCTION

Much research on management compensation has focused on the relationship between pay and firm performance. The studies as a group have produced mixed results; overall, they show perhaps a small positive relationship of pay to performance (Jensen and Murphy, 1990). A focus on incentives to elicit management performance—by tying compensation to firm performance—has motivated the pay-for-performance studies. In some instances, however, firms may compensate executives for inputs such as skills, as well as for outputs such as firm performance. We analyze the implications for compensation of the specificity, and thus the fit of CEO skills to the firm. More generally, we aim to refocus attention on managerial abilities (Donaldson and Davis, 1991) and on the links to compensation (Henderson and Fredrickson, 1996).

Following the human capital literature (e.g., Becker, 1964), we examine the relationship of CEO compensation to three types of skills: firm-specific, industry-specific, and generic (i.e., non-specific) skills. We do this by comparing the pay of three types of CEO successors who also differ in their skill specificity, namely: internal successors, all of whom have at least some firm-specific human capital; external successors from within the industry, all of whom lack firm-specific human capital; and external successors from outside the industry, all of whom lack both firm-specific and industry-specific human capital.

We argue that external successors will earn greater initial compensation than internal successors for reasons related to skills. When executives switch firms, they forego the future value of their firm-specific skills in their old firms, and also bear risk connected to the lack of firm-specific skills in their new jobs. To induce an executive to switch firms, therefore, a firm may have to pay a premium up-front to an external successor. We also posit that outside-of-industry external successors will earn greater initial compensation than within-industry external successors, as compensation for the return that outside-of-industry successors forego to their old industry-specific skills and for risk arising from lack of industry-specific skills in their new jobs.

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Studies of executive compensation and of executive succession have paid relatively little attention to the human capital specificity of CEOs. Only a few empirical studies of the determinants of executive compensation have distinguished between internal and external successors. Each study provides just a brief rationale for including an external successor dummy variable in the regressions; the rationale often differs between studies. In addition, the studies do not differentiate between within-industry and outside-of-industry external successors.

Our empirical analysis deals with initial CEO salary and bonus, because differential skill specificity of CEOs should most clearly affect this measure of compensation. Prior studies of executive compensation in for-profit firms do not provide conclusive results regarding initial pay premiums to external successors. In research closest to ours in its empirical specification, Rose and Shepard (1994) found that external successors earned significantly *less* salary and bonus in their first full year as CEO than did internal successors. A study of CEO pay raises (Hambrick and Finkelstein, 1995), however, found that new external successors obtained *greater* increments to pay—above that of the former CEO—than did new internal successors.

We present the first integrated conceptual discussion and empirical test related to CEO skill specificity and compensation, and draw on a wide range of literature from strategy, organizations, economics, and compensation. We first discuss the types of managerial skills analyzed in this study, describe the labor market for CEOs, and draw implications for compensation. Then we describe the data and empirical methodology, and present results. Finally, in a discussion of the results and conclusion, we address nonfinancial rewards to CEOs and their effect on pay differentials.

MANAGERIAL SKILLS

In this study, the term 'skills' denotes expertise, abilities, and knowledge. We use the terms 'skills' and 'human capital' interchangeably. The management literature contains various categorizations of management skills. For example, Katz (1974) proposes three categories of skills: technical, human, and conceptual. Mintzberg (1973) identifies eight basic sets of managerial skills involving peer relationships, leadership, conflict resolution, information-processing, decision-making under ambiguity, resource allocation, entre- preneurship, and introspection.

The foregoing classifications deal with generic skills, not unique to a particular firm or type of business. In addition, managers in different industries may require specialized varieties of generic skills. As Katz (1974) points out, the chief executive needs enough industry background to know the right questions to ask subordinates, and to know how to evaluate the answers. Similarly, management skills have a firm-specific dimension as well, involving an in-depth understanding of factors such as a company's history, culture, and internal strengths and weaknesses (Puffer and Weintrop, 1991). Becker's (1964) three-way classification of human capital in general suggests that, at a basic level, the management function consists of three types of skills: (a) generic skills, transferable across industries, businesses, or firms; (b) industry-specific skills; and (c) firm-specific skills (Castanias and Helfat, 1991 and 1992).[1] The management of a diversified firm also may require special skill, which may involve a type of generic skill or several different industry-specific skills (Rajagopalan and Prescott, 1990).

The skills in the three-way classification form a hierarchy, based on the degree of specificity of the skills to the organization in which the manager works. *Generic skills* form the base of the hierarchy; all chief executives have them and can transfer them across all businesses and firms, even though the nature and extent of the skills vary from person to person. An executive can transfer *industry-specific skills* only to firms that operate in the same industry. An executive cannot transfer *firm-specific skills* outside of the firm.

Some sorts of managerial knowledge and skills may have components that fit in different skill classifications. Consider the example of a manager who has knowledge of a successful practice, but tacit knowledge makes it difficult to transfer the practice across firms in its entirety. Another firm still might find knowledge of the practice useful, for example, in benchmarking. Within the hierarchy of skill specificity, the transferable aspects of such managerial knowledge involve industry-

[1] Pennings, Lee, and van Witteloostuijn (1995) also use this classification to assess the effect of human capital on firm survival and growth.

specific or generic skills, depending on the range of firms to which the knowledge has applicability, and aspects not transferable outside the firm involve firm-specific knowledge.

The three-level hierarchy constitutes a relatively simple categorization of managerial skills. In the first empirical study of the relationship between CEO human capital specificity and compensation, however, we begin with a relatively simple set-up. The next section examines the linkages between the three categories of skills and compensation in the context of the market for CEOs, since CEO compensation is determined in this market.

THE MARKET FOR CEOs

For the most part, managers learn and perfect their skills through prior work experience. Although books and other sources of information can impart knowledge relevant to managerial tasks, effective management—like other skills such as teaching—involves learning-by-doing and requires practice (Mintzberg, 1973). Since firms usually promote CEOs from within the firm (Jensen and Murphy, 1990), most chief executives will have all three types of skills in the hierarchy, gained through prior work experience. A minority of firms, however, hire CEOs from outside the firm. When a company hires an external successor, the new CEO lacks firm-specific skills. If an external successor has no work experience in the industries in which the hiring firm operates, the new CEO lacks industry-specific as well as firm-specific skills. This study compares the compensation of external successors who lack firm-specific skills and perhaps industry-specific skills as well with the compensation of internal successors who have such skills.

From an economic perspective, the demand side of the market for CEOs consists of firms that seek to hire a new CEO. The supply side of the market consists of CEO candidates. On the demand side of the market, when the board of directors of a firm seeks to hire a new CEO, it generally considers only a few candidates from within or outside the firm or both. Based on interviews with the candidates and other information, the board of directors selects its top choice for CEO. Then, if the candidate expresses strong interest in the job, the board undertakes pay negotiations with that individual. On the supply side, all internal and most external CEO candidates do not hold the position of CEO in their current firms.

Factors related to skill specificity that may affect compensation in the market for CEOs include risk and return to CEO human capital, market power, and adverse selection. The following discussion addresses each of these factors in turn. Since prior research has yet to consider the impact on compensation of the specificity of CEO human capital or of market power in the CEO labor market, our discussion constitutes a first cut on these issues.

CEO skills and compensation

Several factors suggest that due to differences between CEOs in the specificity of human capital, external CEO successors may earn both a risk and a return premium relative to internal successors. Initially, we distinguish only between firm-specific and non-firm-specific human capital. We later distinguish between industry-specific and generic skills. The discussion begins with analysis of the return to skills premium, and then deals with risk and the specificity of human capital. Next, we draw implications for pay contingent on firm performance, as compared with pay not contingent on firm performance. Then we discuss market power and adverse selection. Table 1 summarizes our conclusions.

Return to skills premium

The economic return to skills of external successors relative to internal successors, with the level of risk held equal, depends on factors on both the demand and supply sides of the market. First, on the supply side of the market, lack of human capital specific to the hiring firm may affect the compensation desired by new external successors. When managers switch employers, their old firm-specific skills have no value in the new firms. The labor economics literature suggests that when workers switch jobs to new firms, they require compensation for the loss of future return to firm-specific skills (e.g., Topel, 1991). Similarly, external CEO successors may desire compensation for the loss of return to their firm-specific skills.

The loss of future return to firm-specific skills for an external successor, and any resulting compensation for such loss from the hiring firm, may

Table 1. Initial compensation of external successors relative to internal successors

	Market for CEOs		Initial non-contingent pay	
	Supply (CEO candidates)	Demand (hiring firms)	All external successors	External outside-of-industry successors
Return to CEO skills	An external successor requires compensation up-front for loss of future return to firm-specific and industry-specific skills in the old firm. Likely to affect non-contingent pay.	A firm that hires externally may or may not be willing to pay a premium above what internal successors receive for scarce non-firm-specific skills. Does not necessarily affect noncontingent pay.	Pay premium (supply side effect due to loss of return to skills)	Pay premium relative to within-industry successors (supply side effect due to loss of return to skills)
Risk associated with CEO skills	An external successor bears greater risk due to lack of firm-specific and industry-specific knowledge about the hiring firm, and therefore requires compensation up-front for such risk and as a symbol of his or her value to the hiring firm. Likely to affect non-contingent pay.	(See adverse selection below for risk due to information problems)	Pay premium (supply side effect due to greater risk)	Pay premium relative to within-industry successors (supply side effect due to greater risk)
Market power	Similar for both external and internal successors	A firm that hires externally faces competition from the current employer of a CEO candidate, which raises the firm's willingness to pay. May or may not affect non-contingent pay.	No net effect of market power and adverse selection together (or possible negative premium if adverse selection effect dominates)	
Adverse selection	(See risk associated with CEO skills above for risk due to information problems)	A firm has less information about the abilities of an external successor, which reduces the firm's willingness to pay non-contingent compensation up-front.		

not equal the full value of these skills. The previous employer may have extracted some of the return to firm-specific skills. These skills produce quasi-rents, defined as the difference between the value of an asset in its first best and next best alternative use (Klein, Crawford, and Alchian, 1978). Because firm-specific skills have no value in another firm, the employer can extract some or all of the rents. A firm, however, may share the quasi-rents with managers for two reasons: first, to induce the managers to remain employed at the firm and therefore to allow the firm to continue to obtain some of the quasi-rents; and second, to provide an incentive for lower-level managers to develop firm-specific skills, without fear that the firm will expropriate the full value of these skills in the future (Castanias and Helfat, 1991, 1992; Furtado and Rozeff, 1987). Thus, to the extent that external successors receive a return to firm-specific skills in their prior jobs, they may require

compensation for the loss of future return to these skills.

In addition to firm-specific skills, the non-firm-specific skills of a successor may affect compensation. Different executives have different amounts of various generic skills, because each manager has tailored his or her generic skill development to the needs of the current employer. When a firm hires internally, it obtains not only firm-specific skills, but also generic skills well suited to the needs of the firm. If the board of directors desires a major change in strategy or operations, however, a firm may have no internal candidates with the requisite generic skills. Furthermore, in the general population of potential CEO candidates, scarcity may characterize the desired skills, such as 'turnaround' skills. The question then arises: does an external successor who possesses scarce skills receive a premium for such skills above what an internal successor who possesses such skills receives? The answer depends on a variety of factors. If a firm that hires an internal successor finds the scarce skills valuable, then the firm will try to induce the executive to remain employed by the firm. An internal successor, therefore, may receive the same amount as an external successor receives for scarce non-firm-specific skills. If, however, a firm hires externally at a time of crisis or for other reasons places a higher value on the scarce skills than do other firms, external successors may receive a premium.

Firms that hire externally also may view firm-specific skills as detrimental (Hambrick, Geletkanycz, and Fredrickson, 1993), and therefore seek a fresh perspective. Researchers have proposed that firms with poor financial performance have a greater likelihood of external CEO recruitment, because external successors may have a greater ability to instigate change. Empirical studies provide mixed results regarding the likelihood that poorly performing firms will hire external successors (Allen, Panian, and Lotz, 1979; Boeker and Goodstein, 1993; Dalton and Kesner, 1985; Friedman and Singh, 1989; Pfeffer and Salancik, 1978; Schwartz and Menon, 1985). But if a firm does seek a fresh perspective from an outsider, the executive will need a particularly astute fresh perspective to rescue a firm in crisis. Essentially, the firm requires a scarce non-firm-specific skill. As previously discussed, external successors may or may not receive a premium relative to internal successors for a scarce skill. The outcome depends on whether firms that hire externally have a greater willingness to pay for a fresh perspective than firms that hire internally are willing to pay for any new ideas and approaches of an internal successor.

Risk premium connected to skills

Not only the return to skills but also risk connected to skill specificity may affect compensation. In particular, an external CEO successor may face greater risk due to lack of firm-specific skills and knowledge about the hiring firm. Compensation theorists have noted that a worker bears risk when switching jobs, due to lack of detailed information about working conditions specific to the new job and firm (Wallace and Fay, 1988). Similarly, externally recruited CEOs bear risk: they have less knowledge about the hiring firms than do internal successors (Hambrick and Finkelstein, 1995), and therefore have less of an ability to ascertain exactly how well their nonfirm-specific skills fit the job requirements. As a result, external successors face a greater downside risk of poor firm performance. Possible consequences include lower pay, if firms tie pay to firm performance, and job loss due either to ouster by the board or to firm bankruptcy. Job loss may impair professional reputation, making it more difficult to obtain another equally well-paying and prestigious job (Amihud and Lev, 1981).

Many economic models of managerial behavior, including most principal–agent models (see Eisenhardt, 1989, for a review), contain the assumption that managers are risk averse. Economic reasoning (see, for example, Nicholson, 1978) implies that a risk-averse individual will accept greater risk only if compensated by a higher return. Therefore, a risk-averse external successor will require greater compensation than a risk-averse internal successor, since the latter does not bear risk due to lack of firm-specific skills. More specifically, an external successor may require a pay premium to induce him or her to switch firms.

The symbolic aspects of pay also may affect compensation for risk to external successors. An employee, including a CEO, may view the level of pay as a symbol of his or her value to an employer (Wallace and Fay, 1988). Because external successors face greater risk, they may desire a stronger symbol of their value to firms that hire them.

As an addendum to the discussion of risk, we

note that some external CEO candidates may require an additional compensation premium *unconnected to the specificity of their skills* in order to bear the risk of switching firms. Such a premium may result if a firm seeking to hire an outsider has had prior poor performance. The incoming CEO faces a higher risk of job loss, or of lower pay tied to firm performance, than in a firm with better performance. Internal successors in poorly performing companies also face such risks. As compensation, *both internal and external CEO successors* in poorly performing firms may prefer a premium up-front. Guaranteed future compensation, in the event the company terminates employment, also may ameliorate the risks of running a financially troubled firm.

In summary, an external successor lacks firm-specific skills, creating risk of future poor performance that an internal successor does not bear. As a result, an external successor may require a pay premium up-front. Poor prior firm performance, however, should not lead to a pay premium for an external successor relative to an internal successor.

Contingent vs. non-contingent compensation and risk and return to skills

The preceding arguments regarding a pay premium to an external successor involve compensation negotiated when the firm hires the CEO, i.e., initial pay. Once an external successor has served as CEO for more than a few years, the CEO acquires some skills and knowledge specific to the firm; therefore, the skill specificity of internal and external successors may differ less. In addition, to the extent that an executive requires an inducement to switch firms, the firm must offer a premium at the time of hiring, or guarantee to pay the premium in the future.

Our arguments also have implications for the form of any initial compensation premium to external successors. For purposes of this analysis, we divide initial CEO compensation into three categories: (1) short-term compensation *not* contingent on firm performance, i.e., salary and non-performance-based bonus; (2) performance-contingent compensation, including any performance-based annual bonus, and the *ex ante* value (i.e., at the time of the award) of deferred compensation tied to firm performance; (3) guaranteed severance pay in the event the firm fires the CEO prior to the end of his or her employment contract. Consistent with most compensation contracts, we assume that executives receive either positive contingent pay if firm performance increases or zero contingent pay if firm performance decreases. The analysis also does not account for possible capital market hedging of contingent pay by executives. We next consider the relationship between skill specificity and each of the three components of initial pay, all else equal.

On the supply side of the market, factors connected to firm-specific skills will tend to produce an initial pay premium to an external successor in the form of non-performance-contingent compensation, primarily because other forms of pay may not adequately compensate an external successor for the foregone return and increased risk. First, compensation contingent on positive firm performance does not directly provide a return to old firm-specific skills that no longer have usefulness. Secondly, compensation tied to firm performance increases the downside risk of future poor performance that an external successor bears due to lack of firm-specific skills. An executive therefore would require either very high contingent pay or guaranteed non-contingent pay to bear such risk. Relatedly, with regard to the symbolic aspects of pay to an external successor, non-contingent compensation provides a stronger symbol than contingent compensation; the latter forces the CEO to bear risk, since factors beyond the control of the CEO may affect firm performance (Harris and Raviv, 1979). Lastly, guaranteed severance pay can compensate external successors for the risk of job loss due to lack of new firm-specific skills. Such pay, however, cannot compensate CEOs for risk of poor performance that does not result in job loss, but affects the value of contingent compensation.

In summary, given that the use of contingent pay as compensation for foregone return and increased risk has disadvantages, we expect non-contingent compensation to external successors to reflect a pay premium. Hypothesis 1 incorporates this logic, as well as earlier arguments regarding risk and return to skills. The hypothesis excludes compensation to outsiders to repay them for lost retirement benefits or other deferred compensation at their old firms.

> *Hypothesis 1: External CEO successors receive greater initial non-contingent compensation than do internal successors.*

Other arguments advanced earlier deal with the value of non-firm-specific skills, and may have implications instead for the contingent compensation portion of initial CEO pay. In particular, firms can compensate new CEOs for scarce non-firm-specific skills using contingent compensation, because these skills have value within the hiring firms. Therefore, if an external successor receives a premium for scarce non-firm-specific skills, which may or may not occur, the premium will not necessarily affect initial non-contingent compensation.

We also cannot state *a priori* whether the sum of initial non-contingent plus contingent pay for external successors will exceed that for internal successors. While Hypothesis 1 suggests that external successors will receive greater non-contingent pay than internal successors, this may not hold for contingent compensation. The amount of contingent compensation to external successors relative to that for internal successors depends on the amount of any contingent premium that external successors may receive for scarce non-firm-specific skills or for risk due to lack of firm-specific skills, relative to the amount that internal successors receive as a return to firm-specific skills.[2] If external successors receive less initial contingent compensation than internal successors, this negative premium could offset the positive non-contingent compensation premium that external successors receive.[3] Given that we can make clearer predictions about the initial non-contingent compensation of external versus internal successors, we test hypotheses regarding such pay only.

Market power and adverse selection

The arguments thus far suggest that external successors may receive a premium in the form of initial non-contingent compensation, due to factors on the supply side of the market for CEOs. The premium compensates external successors for foregone return to their old firm-specific skills, and for risk borne due to lack of new firm-specific skills. Scarce non-firm-specific skills may or may not lead to a pay premium for external successors. In addition, any premium for scarce non-firm-specific skills will not necessarily affect the initial non-contingent compensation of external successors relative to internal successors.

Additionally, for reasons connected to skills, market power in combination with adverse selection in the market for CEOs may affect the amount and form of CEO compensation. The market for CEOs has limited competition. On the supply side, market power in salary negotiations does not necessarily distinguish internal from external successors. A firm negotiates salary only with its first choice for CEO. The candidate, whether internal or external, has some market power as the successor preferred by the firm. Neither type of candidate has unlimited market power, however, since the hiring firm may have other potential candidates. The scarcer the skills of an executive, the less strong is the potential competition; for either an internal or external candidate, not only non-firm-specific skills, but also high-quality firm-specific skills, may be limited in supply. On the demand side of the market, most firms hire CEOs internally, presumably for at least two reasons related to skills: first, firms value the resulting fit between the skills of the CEO and the organization; and second, firms have better information about the skills of internal than external candidates. The former has implications for market power and the latter relates to adverse selection on the demand side of the market.[4]

With regard to fit, a firm that hires internally obtains the firm-specific skills of a CEO. As noted earlier, firm-specific skills generate quasi-rents; the

[2] Managers' risk preferences unrelated to skills also may affect contingent compensation, but such preferences would not necessarily differ systematically between internal and external successors.

[3] As further explanation, we compare the *total* initial compensation of each type of successor related to firm-specific and to non-firm-specific skills. First, external successors should receive a pay premium as compensation for risk due to lack of firm-specific skills. As a countervailing effect, internal successors may receive greater compensation for the return to their firm-specific skills than external successors receive for the foregone value of such skills at their old firms. This could occur if firm-specific skills have greater value when utilized in the CEO position by an internal successor, than when utilized in a lower-level position by an external successor at his old firm. Finally, as discussed earlier, an external successor may or may not receive a premium for scarce non-firm-specific skills. Overall, the size of any initial total pay premium depends on the relative sizes and signs of any premiums connected to firm-specific and non-firm-specific skills.

[4] Adverse selection on the supply side of the market relates to the earlier discussion of risks that external successors bear due to lack of firm-specific knowledge.

CEO and the firm likely will split any positive return to such skills. The amount of competition between firms in the market for CEOs may affect the amount of any quasi-rents that new CEOs receive for firm-specific skills. Because internal hiring predominates, a top candidate from within the firm rarely has an offer to become a CEO at another firm at exactly the same point in time as his current employer offers him the job of CEO. Some internal candidates, however, may have received calls in the past from headhunters or firms searching for external CEO successors. The possibility of such calls in the future may constitute indirect potential competition to the hiring firm. With the exception of such indirect competition, however, the firm functions as a monopolist; the fit of the skills of an executive to the current place of employment tends to lock a CEO candidate into his or her employer, producing market power for the firm and reducing the share of the quasi-rents to firm-specific skills that an executive receives.

In contrast to internal succession, when a firm selects an external candidate as its first choice, potential or actual competition from the current employer of the candidate reduces the market power of the hiring firm. For example, the current employer could offer to increase the share of the quasi-rents that it pays an executive for his or her skills, in order to retain the executive. To match such a response or the potential threat of such competition, a firm that hires externally may be willing to pay a premium above what internal successors usually receive. As a further inducement to a risk-averse executive, the hiring firm may pay some or all of the premium as cash rather than as contingent compensation.

A firm that hires an external successor also faces a greater adverse selection problem than it does for an internal successor, due to information asymmetry. The board of directors may have some prior knowledge about an external candidate, and also acquires information about an external successor in the course of job and pay negotiations. Nevertheless, the board has less information about the true nature and value of the skills of an external successor than about the skills of an internal successor, with whom the board generally has had greater contact in the years prior to succession. The board also may have less information about past effort levels of an external successor, on which to base predictions of future effort. Agency theory predicts that the less information the board has about a CEO, the more the board will prefer an 'outcome-based' contract that ties pay to firm performance, rather than a 'behavior-based' contract that uses non-incentive-based pay such as salary to reward an executive for ability and behavior that the board observes (Eisenhardt, 1989; Murphy, 1986). By implication, for equivalent levels of initial total compensation (contingent plus non-contingent), a firm will seek to pay an external successor less non-contingent compensation than an internal successor. This works against any positive effect on non-contingent compensation of lower market power for a firm that hires externally.

In summary, the factors just discussed connected to market power and adverse selection may have no net effect on the initial non-contingent compensation of external versus internal successors. On the supply side of the market, both internal and external successors have some market power at the time of hiring. On the demand side, firms that hire externally have less market power but a larger adverse selection problem than firms that hire internally. On balance, the two effects may offset one another with regard to initial non-contingent pay. Alternatively, the reduced market power of a firm that hires externally could affect contingent rather than non-contingent compensation; the adverse selection effect of lower initial noncontingent compensation then might dominate. The latter works against Hypothesis 1, and makes it less likely that we will observe the risk and return premium associated with firm-specific skills.

Industry-specific skills

Finally, we extend the supply side arguments made earlier regarding risk and return to skills to predict a pay premium to outside-of-industry successors above that to within-industry successors, as explained below. Factors on the demand side of the market related to market power and adverse selection, however, would not necessarily differ for within-industry and outside-of-industry external successors. A firm that hires externally faces potential competition from the current employer of any external successor, regardless of whether the successor comes from within or outside of the industry. A firm might face a similar adverse selection problem in both cases as well. In particular, hiring firms often have some prior infor-

mation about the abilities of both within-industry and outside-of-industry external successors, but less information than for internal successors. In the case of a within-industry external successor, the hiring firm likely has some knowledge about the executive as a result of business operations by the firm in the industry. For an outside-of-industry successor, a firm sometimes hires a successor about whom the board of directors has prior knowledge, such as an executive previously on the board or working in the same city, perhaps to limit the adverse selection problem. In summary, market power and adverse selection on the demand side of the market may not lead to a pay premium for outside-of-industry successors relative to within-industry external successors.

With regard to the risk and return to human capital, the supply side arguments regarding firm-specific skills apply to industry-specific skills as well. If external successors switch industries, they lose any future return to their old industry-specific skills, as well as to their firm-specific skills. The successors also have even less information with which to judge their likely success in the new jobs, and therefore face greater uncertainty than external successors who possess industry-specific knowledge. Therefore, CEOs from outside the industry may require greater guaranteed pay up-front than would externally recruited CEOs from within the industry, as compensation for the foregone return to old industry-specific skills and for increased risk caused by lack of new industry-specific skills. Additionally, the latter increased risk may cause outside-of-industry successors to desire greater symbolic pay in the form of noncontingent compensation.

Hypothesis 2: External CEO successors who have only generic skills receive greater initial non-contingent compensation than external successors who have industry-specific experience.

Table 1 summarizes the arguments related to Hypotheses 1 and 2. The table indicates that the basic proposition underlying both hypotheses—that successors who have less skill specificity receive greater initial non-contingent pay—derives from supply side factors. That is, the hypotheses predict a pay premium to external successors due to loss of future return to old firm-specific or industry-specific skills, and due to risk caused by lack of new skills. An external successor, however, may or may not receive a premium for scarce transferable skills that have value in the hiring firm. Any such premium also does not necessarily affect initial guaranteed compensation, but instead may affect compensation contingent on firm performance. Lastly, factors related to market power and adverse selection on the demand side of the market may have no net effect on the pay premium, or might even reduce it.

In testing the two hypotheses regarding CEO human capital, we utilize initial salary and bonus to measure CEO compensation, and control for many factors likely to affect initial cash compensation other than the specificity of CEO skills. In particular, we control for factors likely to influence CEO effort (as opposed to ability), such as the linking of annual bonus to firm performance. We also control for risk of career change due to poor prior performance of the hiring firm, independent of risk associated with skill specificity. The next two sections describe the sample of CEOs as well as the empirical methodology and data.

SAMPLE OF CEOs

The sample of CEOs comes from the *Forbes* annual surveys of executive compensation in large U.S. companies for the years 1978 through 1987. Our data set consists of 305 CEO successors in the firms listed in all 10 years of the survey. Appendix 1 describes the construction of the sample in more detail. The sample includes 35 external successors, defined as CEOs who had 2 or fewer years of tenure in the firm upon becoming CEO. Firms that hire external successors sometimes hire them initially in a position below that of CEO, in the expectation of later promoting the person to CEO. Some studies have defined external successors as incoming CEOs having 4, 5, or even 10 years of firm tenure (Vancil, 1987; Chaganti and Sambharya, 1987; Guthrie, Grimm, and Smith, 1991; Guthrie and Datta, 1992; Rose and Shepard, 1994). Since our study characterizes external successors as having minimal firm-specific expertise as compared with internal successors, we defined external successors more narrowly. External successors comprise 11.5 per cent of the sample, consistent with other succession research (Harris, Johnson, and Magee, 1995; Cannella and Lubatkin, 1993; Zajac, 1990). The final sample of internal successors is large enough to provide a reason-

ably representative sample of internal successors in large U.S. companies.

External successors

In order to test Hypothesis 2, we classified each external successor as either a within-industry or an outside-of-industry successor, depending on whether or not the CEO had prior work experience in at least one of the industries in which the hiring firm conducted business. Many firms in the sample operated in two or more industries, as did many of the firms in which the external CEOs had previously worked.

To classify each CEO, we first ascertained the work history of the CEO from proxy statements and from the often long and detailed *Wall Street Journal* article announcing the hiring. Next we identified all 3-digit SIC code industries in which the hiring firm had revenues in the year prior to the CEO's first year on the job, based on information in annual reports, 10-K reports, and *Moody's* manuals. Any CEO designated as a within-industry successor had prior work experience in at least one of the 3-digit SIC code industries for the hiring firm, and within 5 years of moving to the firm (in order to preclude outdated industry experience). A CEO often had work experience in more than one 3-digit industry in which the hiring firm operated. Additionally, a within-industry successor usually had work experience in the industries of the hiring firm when matched at the more disaggregated 4-digit SIC code level. Since the board of directors often chooses a successor who has experience in the business areas on which the firm wishes to focus in the coming years, whether or not the business segments currently have the highest sales revenues, we did not limit the industry matches to the primary businesses of each firm. We also used a matching process based on the businesses of each hiring firm in the year prior to succession, to reduce any influence of the incoming CEO on the composition of the firm's businesses. Although some external successors in the sample initially joined firms in positions below that of CEO, and therefore might have influenced the composition of firm businesses prior to succession, we assume that any final diversification or retrenchment decisions rested with the prior CEOs. This classification method resulted in 19 within-industry and 16 outside-of-industry external successors.

EMPIRICAL METHODOLOGY AND VARIABLES

Tests of the hypotheses utilize regressions. Table 2 defines the variables used in this study. In the regressions, the dependent variable is the natural logarithm of salary and bonus reported in *Forbes*, adjusted for inflation using the Consumer Price Index. Since firms hire CEOs at different points throughout the year, first-year salary and bonus levels lack comparability across CEOs. For an external successor, in the fiscal year during which a CEO begins his or her tenure, salary and bonus tend to vary according to the number of months the CEO has held the job. For an internal successor, reported salary and bonus for the first year include pay in the previous job. As the next best alternative, we use second-year salary and bonus to measure 'initial' cash compensation.

The use of second-year salary and bonus has the advantage that for external successors it usually does not include payment for deferred compensation or retirement benefits that the CEO may forgo at the old firm, which proxy statements indicate that firms tend to pay external successors in the first year of their tenure. In addition, external successors often receive initial contracts that guarantee minimum salary and bonus for 2 or more years. In such cases, second-year salary and bonus in part would reflect compensation negotiated at the time of hire as CEO.

The right-hand side variables in the regressions consist of one or more CEO successor dummy variables, as well as a number of control variables. We do not attempt to estimate a structural econometric model of the supply and demand for CEO skills. Instead, we estimate a reduced form, and then as a check on the results we estimate a two-stage model of external succession and compensation.

External successor variables

To test Hypothesis 1 that external successors receive greater initial non-contingent compensation than internal successors, we utilize a dummy variable indicating the type of successor (1 = external successor, 0 = internal successor). A positive and statistically significant coefficient on the dummy variable would support Hypothesis 1. To test Hypothesis 2 that external successors who lack industry work experience receive greater compen-

Table 2. Variable names

SALBON	Salary plus bonus (real dollars), in thousands of dollars
LGSALBON	Natural logarithm of SALBON
SALES	Firm sales revenues (real dollars), in millions of dollars
LGSALES	Natural logarithm of SALES
AVGROA	Annual return on assets, averaged over the 3-year period prior to the CEO's first year in office
PROFIT	Earnings before extraordinary income (after taxes and interest, in real dollars), in millions of dollars
OUTSIDEDIR	Percentage of the board of directors composed of outside directors
BOARDSIZE	Number of directors on the board
BOARDTEN	Number of years of CEO tenure on the board of directors, up to and including the CEO's second year on the job
CEOAGE	Age of the CEO
CEOAGESQ	CEOAGE squared
EXTERNAL	Dummy variable indicating an external successor (1 = external successor, 0 = internal successor)
EXTINDUSTRY	Dummy variable indicating an external successor from within the industry (1 = external successor within industry, 0 otherwise)
EXTGENERIC	Dummy variable indicating an external successor from outside the industry (1 = external successor outside of industry, 0 otherwise)
EXTNONHEIR	Dummy variable indicating an external CEO successor hired initially into the CEO position and therefore not an heir apparent successor (1 = non-heir apparent external successor, 0 otherwise)
EXTHEIR	Dummy variable indicating an external heir apparent successor (1 = heir apparent external successor, 0 otherwise)

sation than external successors who have such expertise, we utilize three dummy variables coded 1 or 0 for each CEO: internal successor, external successor with industry work experience, and external successor without industry work experience. The regressions that test Hypothesis 2 include the two external successor dummy variables, and exclude the internal successor variable. Thus, the regression coefficients on the external successor variables reflect any premium paid to each type of external successor relative to internal successors. An analysis of the difference in the coefficient estimates for the two external dummy variables provides a test of Hypothesis 2. We also could have used this regression to test Hypothesis 1, but it would not have provided information on the overall premium to all external successors together.

Control variables

The control variables account for possible influences on initial salary and bonus other than the origin and skills of the successor. Because the external successor dummy variables capture differences in skill specificity, we do not include control variables designed to capture aspects of CEO human capital and skills. We do, however, control for incentives that CEOs may have to expend effort regardless of ability, as emphasized in the pay-for-performance literature on executive compensation. For this reason, the regressions include current firm performance as a control variable. Since our hypotheses involve non-contingent rather than contingent compensation, the firm performance variable also serves to control for any effect that contingent compensation might otherwise have on the estimated coefficients. We also control for risk of career change due to prior poor performance of the hiring firm, unconnected to risk associated with skill specificity.

Additionally, we control for two influences frequently mentioned in the succession literature regarding the hiring of internal versus external successors. These influences are firm size and performance. Inclusion of these variables reduces the possibility that the coefficients on the successor

dummy variables reflect characteristics of firms that hire externally, rather than factors influencing compensation once the firm has selected its top candidate for CEO. The remainder of this section describes each control variable in the regressions. We adjust all financial data for inflation using the Consumer Price Index.

Firm size

As just noted, firm size may affect the choice of successor. Some researchers have suggested that smaller firms have a greater propensity to hire external successors, because the firms have a smaller pool of internal candidates than do large firms (Dalton and Kesner, 1985; Fredrickson, Hambrick, and Baumrin, 1988; Furtado and Rozeff, 1987; Reinganum, 1985). In addition, a great deal of evidence suggests that firm size is positively correlated with CEO compensation (Ciscel and Carroll, 1980; Finkelstein and Hambrick, 1989; McGuire, Chiu, and Elbing, 1975; and numerous other studies). Lambert, Larcker, and Weigelt (1991) also find a statistically significant but much smaller correlation between changes in top management compensation and firm size. Researchers have advanced various rationales for this association: larger firms have a greater ability to pay; boards may acquiesce to CEOs who expand firm size in order to justify higher pay based on greater managerial demands; or management of a large corporation requires greater skill, which justifies higher pay. Since substantial evidence suggests that firm size has a major impact on CEO compensation, we include firm size in the regressions, even though it may pick up some of the generic skills reflected in the CEO successor dummy variables. We measure firm size using firm sales revenue data from Compustat.

Firm performance

In order to elicit and reward CEO effort, firms may base the bonus portion of CEO pay partially or completely on firm performance for the year. The level of earnings also may affect the ability of a firm to pay cash compensation. We use operating earnings before extraordinary income (after taxes and interest) to measure firm performance. A dollar amount rather than a rate of return captures the ability to pay aspect. The data come from Compustat.

Past firm performance

In the discussion of risk borne by CEOs, we noted that both external and internal successors could require a premium up-front to compensate them for the risk of job loss in poorly performing firms. A new CEO might look to the profitability of the hiring firm in the recent past as an indicator of such downside risk in the near future, i.e., during his or her first couple of years on the job. Many alternative measures of risk reflect variability of returns, and therefore include upside risk, i.e., potential for high returns, which is of less concern in this study. Executives also can receive compensation for upside risk through pay contingent on firm performance. The inclusion of past firm performance in the regressions also controls for any 'compensating differential' a CEO may require to accept a job which has perhaps a less desirable nature, e.g., a less pleasant task, in a poorly versus a well-performing company (Leonard, 1990). Finally, the past performance variable controls for the possibility that performance in the recent past affects the likelihood that a firm will hire an external successor.

We measure past firm performance as the average return on assets (ROA) for the 3 years prior to the first year in office for the CEO (defined as operated earnings before extraordinary income divided by total assets). Alternatively, we could have used return on sales as an accounting measure of profitability. This approach has the drawback that sales tend to decrease for poorly performing firms; if sales decrease in proportion to the decrease in profits, then return on sales will not reflect the lowered profits. We also do not use return on equity, since firms have different percentages of their total assets as equity. Thus, we use ROA, even though the accounting method of valuing assets for banks and insurance companies differs from that of other companies.[5] The data come from Compustat.

[5] In computing ROA, we do not use an industry-adjusted measure, for three reasons. First, any risk of job loss due to bankruptcy depends on profitability without reference to an industry average. Secondly, the amount of any compensating differential may depend on the nature of the job relative to jobs in well-performing firms both outside of and within the industry. And thirdly, the propensity of a firm to hire externally depends at least in part on the absolute level of firm performance, regardless of performance relative to the indus-

Board of directors: Percentage of outside directors and board size

Research based on agency theory has suggested that outside directors more effectively monitor top management in general, and CEO compensation in particular, than do inside directors such as the top managers of the firm and family members (Brickley and James, 1987). The regressions include two variables: the percentage of outsiders on the board and total number of board members. Agency explanations suggest that a higher percentage of outsiders will lower compensation, holding all other factors equal such as board size. To the extent that CEOs can more easily control larger boards, reducing the effectiveness of board monitoring of the CEO (Lipton and Lorsch, 1992), larger boards may award higher compensation (Holthausen and Larker, 1993). Data for the board of directors variables come from proxy statements, annual reports, and *Moody's* manuals.

CEO tenure on the board

The persuasiveness and personal reputation of the CEO with board members may help to counteract the impact of outside board members on compensation (Finkelstein and Hambrick, 1989). Often a CEO has had a seat on the board prior to becoming CEO, which could confer credibility in the eyes of other board members who have come to know and respect the judgment of the new CEO. The longer the CEO has served on the board, the greater this effect may be, and the more influence the CEO may have on his or her compensation. For external successors, past tenure on the board also could provide some firm-specific expertise. In our sample, however, external successors had an average tenure on the board of only 1 year before becoming CEO. Thus, the external successors had little opportunity to acquire firm-specific skills as compared with internal successors, who on average had 22 years of work experience in the firm prior to succession.

We measure CEO board tenure as the total number of years of CEO board membership, up to and including the second year as CEO. The data come from proxy statements, annual reports, and *Standard & Poor's Register of Corporations, Directors, and Executives*.

CEO age

Prior studies have suggested that CEO preferences for current versus deferred compensation may vary by age. In particular, CEOs close to retirement may prefer compensation in the form of greater current salary and bonus and less deferred compensation (Finkelstein and Hambrick, 1988). The regressions include two variables: the age of the CEO and age squared. The latter incorporates any possible nonlinearity in the relationship between CEO age and salary plus bonus. *Forbes* provides the data on CEO age.

Year dummy variables

Factors that vary by year, such as tax law changes or macroeconomic events, may affect compensation. The regressions account for economy-wide shifts in compensation by using dummy variables for each year 1979 through 1988, the second year of compensation for CEOs who began their tenure between 1978 and 1987. We exclude one of the year dummy variables from the regressions, since each regression includes a constant term.

We cannot directly control for one additional factor that may affect compensation, namely, the industry of the hiring firm. Industry might affect CEO compensation for several reasons. First, firms may succumb to isomorphic pressures to conform to industry 'pay norms' (Finkelstein and Hambrick, 1996). Second, differences in managerial discretion across industries may affect CEO compensation. The board of directors can acknowledge the many decisions required in a high-discretion setting by raising compensation in such industries (Hambrick and Finkelstein, 1987). Third, Joskow, Rose, and Shepard (1993) have suggested that government regulation may affect CEO compensation in regulated industries.

We cannot directly control for industry factors for two reasons. The first has to do with the composition of the data set. When we assign a 3-digit SIC code to each firm based on the industry having the highest proportion of firm sales revenues, the data set consists of 89 3-digit SIC codes—less than four companies per SIC code on

try. In hiring a CEO, the board of directors has a responsibility to stockholders to maximize absolute, not relative, performance. Even if performance declines due to industry-specific factors not under the control of the CEO, the board may still need to search externally for an executive who can manage effectively in the changed environment.

average. Even at the more aggregated 2-digit level, there are 39 SIC codes, over half of which have only one, two, or three companies per SIC code. Due to the small number of companies per SIC code, the inclusion in the regressions of a dummy variable for each industry would pick up much of the variability in the data, whether or not industry membership truly determined compensation.

Second, because many of the companies in the sample have diversified into multiple industries, the assignment of only one SIC code per company can provide a misleading representation of the industries in which each company operates. An accurate test of the proposition that industry norms affect compensation, for example, requires a comparison of CEO compensation in one firm with that of other companies having similar sets of businesses. Our data set, although large, does not provide enough companies to allow for a test of this sort.

Although we do not directly control for industry effects in the regressions, we estimate an additional two-stage model to ascertain whether omitted variables, including industry effects, might lead to bias in our results. We report the two-stage results following the main analysis. The two-stage model suggests that industry effects do not explain the empirical results.

RESULTS

Table 3 reports simple statistics for the variables listed in Table 2. Table 4 contains separate simple statistics for internal and external CEO successors. The tables show that in real terms, from 1979 through 1988, external successors in their second year on the job on average received 13 per cent more salary and bonus than did internal successors. In addition, although not shown in the tables, outside-of-industry external successors received more than did within-industry external successors—a mean of $755,000 versus $694,000, respectively. Companies that hired external successors had substantially lower past profitability on average than did companies that promoted CEOs from within the firm: the mean return on assets prior to the succession event for companies hiring external successors amounted to 38 percent of the mean return for companies hiring internal successors. Companies that hired outsiders also had lower sales and profits than did companies that promoted CEOs from within. Finally, Table 4 shows a disparity in CEO tenure on the board. At the end of their second year as CEO, external successors had an average board tenure of approximately 3 years, as opposed to 8 years for internal successors. The mean values of the remaining variables—the percentage of outsiders on the board, the total number of board members, and CEO age and age squared—do not differ noticeably between external and internal successors.

Hypothesis 1

Table 5 presents a matrix of correlation coefficients for the variables listed in Table 2, and Table 6 reports results of an initial set of ordinary least-squares regressions. The regressions use the natural logarithm of two variables: salary plus bonus, the dependent variable, and firm sales, a control variable. When converted to logarithms, the two variables each have approximately a normal distribution. To test Hypothesis 1 that external CEO successors receive greater initial non-contingent compensation than internal successors, the first regression (#1) in Table 6 includes the single external successor dummy variable on the right-hand side.

In the first regression, the coefficient on the external successor dummy variable is positive and statistically significant at the 0.01 level. The coefficient estimate indicates that after controlling for other factors included in the regression that may affect compensation, the premium to external successors amounts to 30 percent more than the salary plus bonus of internal successors.[6] The regression not only supports Hypothesis 1, but also estimates a substantial premium paid to CEOs hired from outside the firm.

Other than the successor dummy variable, only the firm sales and past return on assets variables are statistically significant, in addition to the year dummy variables, which are statistically significant as a group. The positive sign and significance of the coefficient on firm sales accord with the results of prior studies of executive compensation. Past return on assets controls for any effect on pay of

[6] In a semi-logarithmic regression, the percentage effect of a dummy variable on the dependent variable is: $g = 100\ [\exp(c - \frac{1}{2}v(c)) - (1)]$, where g is the percentage effect, exp is the exponential function, c is the coefficient estimate, and $v(c)$ is the estimate of the variance of c (Kennedy, 1981).

Table 3. Simple statistics: Full sample ($N = 305$)

Variable name	Mean	S.D.	Minimum value	Maximum value
SALBON	649.497	314.878	117.470	2242.440
LGSALBON	6.361	0.493	4.766	7.715
SALES	5878.220	9849.250	266.070	76396.240
LGSALES	8.028	1.087	5.584	11.244
AVGROA	0.534	0.047	–0.114	0.210
PROFIT	325.975	778.242	–2127.660	8381.720
OUTSIDEDIR	71.291	15.186	0.000	94.400
BOARDSIZE	15.089	4.553	5.000	43.000
BOARDTEN	7.728	4.627	2.000	32.000
CEOAGE	54.734	5.829	37.000	70.000
CEOAGESQ	3029.720	633.472	1369.000	4900.000
EXTERNAL	0.115	0.319	0.000	1.000
EXTINDUSTRY	0.062	0.242	0.000	1.000
EXTGENERIC	0.052	0.223	0.000	1.000
EXTNONHEIR	0.066	0.248	0.000	1.000
EXTHEIR	0.049	0.217	0.000	1.000

Table 4. Simple statistics: Subsamples

Variable name	Mean	S.D.	Minimum value	Maximum value
Internal successors ($N = 270$)				
SALBON	640.100	299.303	172.330	1994.220
LGSALBON	6.355	0.473	5.149	7.598
SALES	6223.450	10362.060	266.090	76396.240
LGSALES	8.081	1.085	5.584	11.244
AVGROA	0.058	0.047	–0.114	0.210
PROFIT	352.152	819.609	–2127.660	8381.720
OUTSIDEDIR	70.938	15.334	0.000	94.400
BOARDSIZE	15.189	4.665	5.000	43.000
BOARDTEN	8.322	4.518	2.000	32.000
CEOAGE	54.893	5.733	37.000	70.000
CEOAGESQ	3045.940	623.022	1369.000	4900.000
External successors ($n = 35$)				
SALBON	721.988	414.287	117.470	2242.440
LGSALBON	6.410	0.635	4.766	7.715
SALES	3214.970	3101.260	266.070	13131.280
LGSALES	7.614	1.026	5.483	9.483
AVGROA	0.022	0.031	–0.027	0.108
PROFIT	124.040	230.423	–571.300	827.180
OUTSIDEDIR	74.014	13.896	30.700	91.600
BOARDSIZE	14.314	3.538	6.000	23.000
BOARDTEN	3.143	2.341	2.000	13.000
CEOAGE	53.514	6.487	41.000	66.000
CEOAGESQ	2904.660	706.250	1681.000	4356.000

Table 5. Pearson correlation coefficients (significance levels in parentheses, $N = 305$)

	SALBON	LGSALBON	SALES	LGSALES	AVGROA	PROFIT	OUTSIDEDIR	BOARDSIZE	BOARDTEN	CEOAGE	CEOAGESQ	EXTERNAL	EXINDUSTRY	EXGENERIC	EXTNONHEIR	EXTHEIR
SALBON	1.00† (0.0)															
LGSALBON	0.94† (0.01)	1.00† (0.0)														
SALES	0.43† (0.01)	0.39† (0.01)	1.00† (0.0)													
LGSALES	0.56† (0.01)	0.61† (0.01)	0.75† (0.01)	1.00† (0.0)												
AVGROA	0.064 (0.27)	0.10† (0.07)	0.09† (0.10)	0.15† (0.01)	1.00† (0.0)											
PROFIT	0.34† (0.01)	0.30† (0.01)	0.76† (0.01)	0.51† (0.01)	0.18† (0.01)	1.00† (0.0)										
OUTSIDEDIR	−0.04 (0.49)	−0.05 (0.36)	−0.09 (0.12)	−0.14† (0.01)	−0.33† (0.01)	−0.03 (0.63)	1.00† (0.0)									
BOARDSIZE	−0.02 (0.75)	−0.03 (0.55)	0.12† (0.04)	−0.02 (0.72)	−0.25† (0.01)	0.10† (0.09)	0.15† (0.01)	1.00† (0.0)								
BOARDTEN	−0.03 (0.59)	−0.04 (0.49)	0.01 (0.83)	0.002 (0.97)	0.17† (0.01)	−0.01 (0.85)	−0.14† (0.01)	0.07 (0.20)	1.00† (0.0)							
CEOAGE	0.032 (0.58)	0.04 (0.53)	0.11† (0.06)	0.11† (0.06)	0.06 (0.26)	0.06 (0.31)	−0.08 (0.14)	−0.07 (0.23)	0.28† (0.01)	1.00† (0.0)						
CEOAGESQ	0.03 (0.62)	0.03 (0.57)	0.10† (0.07)	0.10† (0.07)	0.06 (0.26)	0.05 (0.34)	−0.08 (0.15)	0.07 (0.25)	0.29† (0.01)	0.998† (0.01)	1.00† (0.0)					
EXTERNAL	0.08 (0.15)	0.036 (0.53)	−0.10† (0.09)	−0.14† (0.02)	−0.24† (0.01)	−0.09 (0.10)	0.06 (0.26)	−0.06 (0.29)	−0.36† (0.01)	−0.08 (0.19)	−0.07 (0.22)	1.00† (0.0)				
EXTINDUSTRY	0.04 (0.53)	−0.01 (0.81)	−0.08 (0.17)	−0.13† (0.03)	−0.18† (0.01)	−0.09 (0.13)	0.10† (0.07)	−0.05 (0.36)	−0.29† (0.01)	−0.12† (0.03)	−0.12† (0.04)	0.72† (0.01)	1.00† (0.0)			
EXTGENERIC	0.08 (0.17)	0.07 (0.25)	−0.05 (0.34)	−0.06 (0.31)	−0.15† (0.01)	−0.04 (0.48)	−0.02 (0.74)	−0.03 (0.60)	−0.19† (0.01)	0.02 (0.68)	0.03 (0.66)	0.65† (0.01)	−0.06 (0.29)	1.00† (0.0)		
EXTNONHEIR	0.15† (0.01)	0.11† (0.06)	−0.08 (0.18)	−0.10† (0.10)	−0.21† (0.01)	−0.08 (0.17)	0.06 (0.28)	−0.05 (0.42)	−0.29† (0.01)	−0.07 (0.24)	−0.06 (0.26)	0.74† (0.01)	0.53† (0.01)	0.47† (0.01)	1.00† (0.0)	
EXTHEIR	−0.05 (0.42)	−0.07 (0.20)	−0.06 (0.33)	−0.09† (0.10)	−0.11† (0.05)	−0.05 (0.40)	0.02 (0.66)	−0.04 (0.51)	−0.20† (0.01)	−0.03 (0.56)	−0.03 (0.58)	0.63† (0.01)	0.44† (0.01)	0.42† (0.01)	−0.06 (0.29)	1.00† (0.0)

† Indicates significance at the 0.10 level or less (two-tailed test).

Table 6. OLS regressions: Compensation of external vs. internal successors (*t*-statistics in parentheses, $N = 305$)

Dependent variable: LGSALBON			
Regressions	# 1	# 2	# 3
Independent variables[a]			
EXTERNAL	0.2616**		
	(3.384)		
EXTINDUSTRY		0.2158*	
		(2.093)	
EXTGENERIC		0.3138**	
		(3.017)	
EXTNONHEIR			(0.4319)**
			(4.508)
EXTHEIR			0.0507
			(0.484)
LGSALES	0.2806**	0.2804**	0.2796**
	(11.701)	(11.681)	(11.811)
AVGROA	0.9784†	0.9786†	1.0394†
	(1.814)	(1.813)	(1.952)
PROFIT	–0.00002	–0.00002	–0.00002
	(–0.618)	(–0.621)	(–0.584)
OUTSIDEDIR	0.0003	0.0004	0.0002
	(0.190)	(0.236)	(0.123)
BOARDSIZE	0.0042	0.0041	0.0047
	(0.804)	(0.774)	(0.908)
BOARDTEN	0.0047	0.0046	0.0049
	(0.873)	(0.861)	(0.928)
CEOAGE	0.0186	0.0174	0.0238
	(0.327)	(0.305)	(0.424)
CEOAGESQ	–0.0002	–0.0002	–0.0002
	(–0.352)	(–0.335)	(–0.450)
Year dummy variables	Jointly significant	Jointly significant	Jointly significant
R^2	0.4535	0.4546	0.4695
Adj. R^2	0.4191	0.4182	0.4342
F	13.184**	12.501**	13.2**

** Significant at the 0.01 level or less; * significant at the 0.05 level or less; † significant at the 0.10 level or less.
[a] All regressions include a constant term.
All reported significance levels utilize two-tailed tests except the *F*-test.

Table 7. Maximum likelihood regression of compensation using fitted value of external successor dummy variable (asymptotic two-tailed *t*-statistics in parentheses, $N = 305$)

Dependent variable: LGSALBON	
Independent variables[a]	
EXTERNAL	0.3526**
	(3.864)
LGSALES	0.2798**
	(10.962)
AVGROA	0.7906
	(1.346)
PROFIT	–0.00002
	(–0.535)
OUTSIDEDIR	0.0004
	(0.217)
BOARDSIZE	0.0041
	(0.652)
BOARDTEN	0.0024
	(0.413)
CEOAGE	0.0121
	(0.165)
$CEOAGE^2$	–0.0001
	(–0.182)
Year dummy variables	Jointly significant
Rho[b]	–0.4042†
	(–1.650)
Log-likelihood	–180.2339

** Significant at the 0.01 level or less; * significant at the 0.05 level or less; † significant at the 0.10 level or less.
[a] The regression includes a constant term. All reported significance levels utilize two-tailed tests.
[b] Rho is the estimated correlation between the error terms in this regression and the first-stage probit regression.

the risk of job loss, as well as for any compensating differential for unpleasantness of the job, in poorly performing firms. The positive coefficient, however, does not provide support for such effects.

The other variables in the regression—percentage of outsiders on the board, total number of board members, real profits (dollar amount), tenure of the CEO on the board, and CEO age and age squared—lack statistical significance individually and together as a group.[7] Since all the insignificant variables have high standard errors of the coefficient estimates, high variance of the distribution of each of the estimates may contribute to the statistical insignificance. Deletion from the regression of all insignificant variables produces little change in the estimated values and significance of the remaining coefficients. Due to space constraints, results of this regression as well

[7] Although insignificant, the negative coefficient on real profits seems surprising, given that real profits and the logarithm of salary plus bonus have a positive correlation coefficient of 0.30 (significant at the 0.01 level). The statistical insignificance of real profits may stem from its high positive correlation with the logarithm of sales, combined with a high standard error of the parameter estimate.

as other sensitivity tests we conducted are available on request from the authors.

We also assessed the sensitivity of the results to the designation of external successors as those having 2 or fewer years of presuccession firm tenure. As noted earlier, some studies classify CEOs having longer presuccession firm tenure as external successors. We ran one regression which included, in addition to the external successor dummy variable, three new dummy variables indicating whether or not a new CEO had 3, 4, or 5 years of presuccession tenure at the firm. All three new dummy variables lacked significance, and the other results remained almost unchanged. In a second regression, we utilized only one additional dummy variable, which took a value of 1 if a CEO had 3, 4, or 5 years of presuccession tenure at the firm, and a value of 0 otherwise. Again, the new dummy variable lacked significance and the other results changed little.

A last sensitivity test involved the past ROA variable, which had a positive estimated coefficient. We split the sample into two groups: CEOs hired by firms in the bottom quarter of past return on assets, and the remainder of the sample. We estimated the regression for the two subsamples, omitting the past ROA variable, and found that external successors earned less of a premium in poorly performing than in better performing firms.[8] The direction of the results did not change when we included the ROA variable in the regressions. Apparently, poor prior firm performance does not explain the pay premium to external successors.[9]

We also tested the regression for heteroscedasticity. A White test (White, 1980) failed to reject the hypothesis of homoscedasticity at the 1, 5, and 10 per cent levels of significance in all OLS regressions reported in this study. We also investigated whether any serial correlation through time of the residuals might affect our results, and found it does not.[10]

Hypothesis 2

Hypothesis 2 proposes that external successors who lack industry-specific experience earn more than external successors who have such experience. A second regression (#2) in Table 6 is identical to the first regression (#1), with the exception that we replaced the single external successor dummy variable with two dummy variables, namely, external successor with industry work experience and external successor without industry experience. The coefficients on both of the CEO successor variables in the second regression have positive, statistically significant values. The coefficient estimates on the remaining variables have similar signs, magnitudes, and significance levels to those in regression #1.

The direction of the results in the second regression accords with Hypothesis 2: external successors with industry experience received less salary and bonus than did external successors from outside the industry. Successors with industry experience received 23 percent greater salary and bonus than did internal successors; successors without industry experience received 36 percent more than did internal successors. Holding all else constant at the sample means, these percentages correspond to a salary and bonus premium to external successors with industry experience of approximately $150,000, and a premium to external successors without industry experience of

[8] We attempted to refine this test by deleting financial firms from the analysis but had too few external successors in each remaining subsample.

[9] In an additional sensitivity test, we replaced the board size and board tenure variables with their logarithmic values. Of the nonlogarithmic independent variables in the regression that could be converted to logarithms, i.e., nondummy variables with values above zero, the normal probability plots of these two variables suggested some nonnormality which improved with a logarithmic transformation. In a normal probability plot, the distribution of the data for a variable is plotted against a standard normal distribution. If the data are from a normal distribution, a plot of the data should fall along the reference line of the standard normal distribution (SAS Institute, 1982). Again, the results changed little.

[10] Approximately one-third of the sample consists of multiple CEOs per firm. Although none of the within-firm observations occur in consecutive years, if the error term includes stable, idiosyncratic firm-level influences on compensation, then such 'fixed effects' could result in serial correlation through time for the third of the sample with multiple observations per firm. To eliminate any possible effect of such serial correlation, we randomly deleted all but one observation for each firm that had multiple CEOs, to obtain a data set consisting of one CEO per firm, and reestimated the regression. The sign, magnitude, and significance of the coefficient estimate for the external successor dummy variable were similar to the original results; the other coefficient estimates were similar as well. We conclude that any autocorrelation that might exist does not affect our results. Additionally, while idiosyncratic firm-level fixed effects still might potentially inflate the significance levels if correlated with the right-hand side variables, only 11 per cent of the external successors include multiple CEOs per firm. This low incidence of repeated external succession within firms suggests that firm-level fixed effects are not highly correlated with the successor dummy variable.

approximately $235,000. Thus on average, the difference in pay to the two sorts of external successors equals $85,000—an amount large both in absolute value and relative to the average premium received by external successors with industry-specific skills.

Surprisingly, given the large difference in the premiums, the coefficient estimates for the two external successor dummy variables do not differ significantly from one another.[11] The lack of statistical significance may stem from the relatively small number of observations in the two categories of external CEOs: 19 within-industry successors and 16 outside-of-industry successors. Unfortunately, external succession occurs infrequently, limiting the number of external successors in the sample. With a small number of obervations in each group of external successors, the statistical test may have little power. As a result, we cannot draw strong conclusions regarding Hypothesis 2 from this study. Nevertheless, we find it difficult to ignore the large estimated premium difference in the direction predicted by Hypothesis 2.

The results regarding the relative pay of the two types of external successors depend on the designation of whether or not an external successor had work experience in at least one industry in which the hiring firm operated. For two CEOs, the proper designations were not clear cut. These two individuals each had previously worked in industries very similar to but not the same as the industries in which the hiring firm operated.[12] We originally designated these CEOs as having industry-specific skills. To test the sensitivity of the results, we recoded the two external successors as lacking industry experience and reran the second regression. The results changed little.

Heir apparent successors

The sample of external successors includes both newly hired executives as well as successors with 2 or fewer years of firm tenure. The latter comprise 'heir apparent' successors, often explicitly designated to succeed the current CEO and initially appointed to a post such as president. Our conceptual arguments, however, may apply most strongly to external successors whom the firm brings in directly as CEO rather than to heir apparent successors. Arguably, at a job level below that of CEO, an executive both forgoes any future return to old firm-specific or industry-specific skills, and also faces uncertainty about future performance due to lack of such skills. Therefore, firms that hire external heir apparent successors may agree to a pay premium at the time that the successor switches firms. The firm might pay the premium at the time of initial hiring, or might guarantee payment in the future, such as when the executive becomes CEO.

The foregoing logic suggests that much of the pay premium to an external heir apparent successor may accrue at the time the executive switches firms, prior to becoming CEO. To investigate the possibility that our arguments regarding CEO pay apply most strongly to non-heir apparent external successors, we utilized two new dummy variables coded 1 or 0 for each CEO: non-heir apparent external successor and heir apparent external successor. The sample includes 20 nonheir apparent external successors and 15 heir apparent external successors. Table 2 reports simple statistics for these variables. Table 7 reports a regression that includes the two new external successor dummy variables and the same control variables as in regression #1. Consistent with our supposition, Table 6 shows that non-heir apparent external successors received substantially greater premiums than did external heir apparent successors. The high standard error of the coefficient estimate for the external heir apparent successor variable likely contributes to its lack of statistical significance, despite a small positive estimated premium. We did not attempt to divide external heir apparents and non-heir apparents between within-industry and outside-of-industry hires, in order to refine our test of Hypothesis 2. The

[11] We also performed an alternative test of the hypothesis by including the EXTERNAL and EXINDUSTRY dummy variables in the equation, removing EXTGENERIC, and performing a *t*-test of the hypothesis that EXINDUSTRY differs statistically significantly from zero. EXINDUSTRY was not statistically significant.

[12] One CEO hired by a savings and loan association had prior employment in a commercial bank and in the financial services subsidiary of an insurance company, which made second mortgage and consumer loans. Although the primary lending business of a savings and loan association involves mortgages, which matches the executive's prior financial services experience, the executive did not come from the savings and loan industry. A second CEO moved from TRW to General Dynamics, both defense contractors. TRW, however, produced aircraft parts, while General Dynamics manufactured airplanes rather than parts. Even though the same 3-digit SIC code encompasses both airplanes and aircraft parts, management of these two businesses potentially could require different skills.

sample has too few CEOs in each category to provide any statistical power to a test.

Industry effects and dummy endogenous variables

Finally, we noted earlier that omitted industry-specific factors could affect the salary and bonus of a new CEO. Due to data limitations discussed previously, we could not incorporate industry effects into the regressions using industry dummy variables. As long as any industry effects are uncorrelated with the external successor variables, however, the regressions will produce unbiased and consistent coefficient estimates of the dummy variables (Johnston, 1984). The results reported here will still hold. If, alternatively, certain industries have a predisposition to hire external successors, then idiosyncratic factors associated with compensation in these industries could account for the coefficient estimates on the external successor dummy variables.

The possibility that industry effects might explain our results is a special case of a more general issue: potential endogeneity of the external successor dummy variables. That is, some underlying factors may influence both CEO compensation and the type of successor hired. The regressions control for two such possible influences: firm sales and past profitability. Other variables included in the regressions also could be correlated with both hiring and compensation. Inclusion of such variables in a compensation regression eliminates any bias due to these factors in the estimated pay premium to external successors.[13] Omitted variables such as industry effects, however, might affect both the hiring of an external successor and his or her compensation.[14]

To eliminate any such bias due to unobservable variables, we used Heckman's (1978) two-stage estimation procedure. We first estimated a probit regression of the likelihood of external succession. Then, in the second stage, we used the fitted value of the external successor dummy variable from the first-stage as an instrument for the external successor dummy variable in the compensation regression. Maximum likelihood estimation produces efficient coefficient estimates in the second-stage regression. Appendix 2 describes the procedure in more detail, and presents the results of the first-stage regression using the single external successor dummy dependent variable. Unfortunately, the probit estimation did not perform well when we analyzed external within-industry and external outside-of-industry successors separately, as discussed in Appendix 2. Therefore, we report results using only the single external successor dummy variable.

Table 7 reports the second-stage estimates of a regression analogous to regression #1. The estimated pay premium to external successors is 42 per cent, a good deal larger than the original estimate of 30 per cent. The results suggest that correction for any bias increases the estimated premium to external successors, and that our original estimate may be conservative. This analysis, which controls for omitted industry effects, indicates that any such effects do not account for the coefficients on the external successor dummy variables. This result does *not* suggest that industry effects have no bearing on compensation—only that they do not affect the direction of the pay premium to external successors.

DISCUSSION AND CONCLUSION

This study analyzes the relationship between the specificity or fit of CEO human capital to the organization and initial cash compensation. Our focus on managerial skills differs from most agency theoretic research on executive compensation, which generally deals with the potential lack of managerial effort, or tends not to distinguish between effort and ability (with notable exceptions such as Murphy, 1986). At the opposite end of the spectrum, stewardship theory suggests that top managers have intrinsic motivation to put forth maximum effort, and that organizations must empower CEOs to take action (Donaldson and Davis, 1991). From either perspective, our research asks the following question: do differences between CEOs in the specificity of their skills result in differential pay, holding level of

[13] Note that some of the variables in the regressions are those for the second year of compensation. In practice, these have a high positive correlation with the values of the variables at the time of hiring. In the two-stage procedure, we use variables as of the time of hiring to predict external succession.
[14] Other factors that might affect both external succession and compensation include: geographic location of the hiring firm; variables other than those in the regression related to the relative power of the CEO and the board; R&D intensity, often an industry-related effect. The two-stage estimation helps to control for these possible effects.

effort constant? We then examine pay differences between CEO successors who differ in the specificity of their skills, namely, internal and external successors.

The comparison of internal and external successors, at the start of their tenures as CEO, has the advantage that differences in skill specificity are clear cut. The analysis also produces different predictions regarding the relationship of skill specificity and compensation than would hold for internal successors only. Economic reasoning suggests that all other things equal, including the efficacy of any particular skill, internal successors who possess greater quantities of firm-specific, industry-specific, and generic skills would receive greater total pay (contingent plus non-contingent) than would internal successors who possess less of each skill. As our analysis shows, the logic differs when comparing the pay of internal and external successors—successors who have less skill specificity receive greater initial non-contingent compensation.

During the 10-year period examined here, the raw data show that on average external CEO successors received 13 percent more in initial salary and bonus than did internal successors. After controlling for factors associated with firm size, current and past profitability, board composition and size, CEO influence, and CEO age, the regression analysis shows a premium to external successors of 30 per cent. Evaluated at the sample mean and holding all else constant, the 30 percent premium amounts to almost $200,000. The regressions estimate an even larger premium for non-heir apparent successors, to whom our arguments apply most strongly. Additionally, the estimated premium to external successors with industry-specific skills is 23 percent—an average of approximately $150,000; the estimated premium to external successors who lacked industry-specific skills is a substantially larger 36 percent, or an average of almost $235,000. These premiums are strikingly large, both in aboslute and percentage terms. Although the difference between the pay of external successors with and without industry skills is not statistically significant, the lack of statistical significance occurs due to low power of the test. The large average difference in pay to the two types of external successors, in the direction predicted by Hypothesis 2, seems too large to ignore.

Overall, the results provide strong support for Hypothesis 1 that external successors receive greater initial non-contingent compensation than internal successors. The results also provide some support for Hypothesis 2 that external successors from outside the industry receive a greater premium than external successors from within the industry. Although the regressions do not include direct measures of CEO human capital, the estimated pay differences at least in part should reflect differences in the human capital specificity of CEOs, for several reasons. First, the analysis deals only with initial salary and bonus, on which skill differentials should have an impact. Secondly, we control for many factors other than skill specificity that prior studies have suggested influence executive compensation, including factors that might influence CEO effort.

The analysis also suggests that some obvious counter hypotheses do not explain the results. For example, one might suppose that external successors receive greater initial salary and bonus as compensation for general risk of career change. The regressions, however, control for risk of career change unconnected to skill specificity. The prior firm performance variable controls for risk of job loss or of lower contingent compensation in poorly performing firms, for both internal and external successors. An additional risk of career change for external successors stems from lack of firm-specific skills in the new job—an effect that the external successor dummy variables are designed to pick up. Perhaps one might argue that external successors bear greater skill-specific risk when they move to poorly rather than better-performing firms. Again, the results do not support this proposition. Subsample analyses show that external successors in poorly performing firms did not receive a greater premium than did external successors in other firms. The two-stage estimation accords with this result. Although Appendix 2 shows greater likelihood of external succession when firms performed poorly, the second-stage results show that poor prior firm performance is associated with lower compensation for all successors.

A related counter argument might suggest that external successors receive greater compensation because they bring especially astute and fresh perspectives at times of crises. Both our conceptual arguments and empirical tests, however, suggest this counter hypothesis does not explain the results. First, as noted earlier, a firm can use contingent pay to compensate a new CEO for a

'fresh perspective', and for scarce non-firm-specific skills more generally, since such skills have value in the new firm. Our arguments pertain only to initial non-contingent compensation, since we cannot make predictions regarding the direction of any premium for other forms of pay. Additionally, as just discussed, the results show that external successors did not receive a greater non-contingent compensation premium at times of crisis, i.e., in poorly performing firms.

Yet another counter argument might suggest that market power on the demand side of the market alone could explain the results. Market power, however, might affect contingent compensation rather than the initial non-contingent compensation examined here. The market power arguments also do not predict a difference in pay between outside-of-industry and within-industry external successors. Our findings suggest instead that outside-of-industry successors received a larger pay premium than did within-industry external successors.

Additionally, the results show that the estimated premiums do not reflect factors such as past profitability that might influence the likelihood of external succession. In particular, in our sample as well as in many others, external succession is negatively correlated with past profitability and firm size. The regressions directly control for both factors. Additionally, the two-stage estimation that controls even more completely for possible endogeneity suggests that the initial estimated pay premiums may be conservative. The two-stage analysis further suggests that industry effects do not explain our results.

Finally, we have thus far focused exclusively on the relationship between CEO skills and financial reward. Nonfinancial rewards may motivate executives as well. Next we consider three sorts of nonfinancial motivations and how they affect interpretation of our results.

First, the intrinsic satisfaction of challenging work (White, 1959), the need to achieve (McClelland, 1961), and the need to gain esteem and recognition (Maslow, 1970) may motivate CEOs. These motivations might cause *all* CEOs, internal or external, to accept less pay than otherwise (Hambrick and Finkelstein, 1995), and therefore would not lead to a premium for external successors. Alternatively, executives who switch firms to become CEO might place a higher value on the prestige of the job than do internal successors. External successors therefore might accept less pay than internal successors. Any such effect works against our results, and would not explain the pay premiums.

A second, related nonfinancial motivator, however, might lead to a pay premium for external successors. In particular, Donaldson and Davis point out that long tenure with a corporation 'promotes a merging of individual ego and the corporation, thus melding individual self-esteem with corporate prestige' (1991: 51). As a result, internal successors, particularly those with long corporate tenure, might accept less pay (both contingent and non-contingent) than external successors, who lack such firm-specific nonfinancial motivation. Unlike differential skill specificity, however, such firm-specific motivation would not affect the pay of within-industry versus outside-of-industry external successors. Greater nonfinancial motivation of internal successors, therefore, may explain a portion of the estimated premiums to external successors, and skill specificity may explain a good deal of the rest.

A third sort of nonfinancial motivator has to do with equity theory (Adams, 1963). Deckop (1988) suggested that firms can pay external successors more than internal successors, because the need for internal firm equity across job categories in the organizational hierarchy places limits on the amount that internal CEO successors earn. If true, then internal successors might receive less pay (contingent and/or non-contingent) than external successors, but we would not expect to see pay differentials between within-industry and outside-of-industry external successors. Again, internal equity may explain part but not all of the premiums we observe.

In summary, this initial investigation of the relationship between the specificity of human capital and CEO compensation analyzes the underlying supply and demand side influences on pay differentials to internal and external successors due to differences in skill specificity. Such differences in CEO human capital may produce a premium in initial non-contingent compensation to external successors relative to internal successors. We discuss the implications of differential skill specificity for initial contingent and initial total compensation, but cannot make clear predictions regarding pay premiums to external successors. The empirical analysis controls for a wide range of factors other than skill specificity, and includes many sensitivity

tests. The results support the proposition that differential skill specificity is associated with pay premiums to external successors, and are robust to some obvious counter hypotheses. More generally, we hope that our conceptual discussion and our results will encourage further research on CEO human capital.

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APPENDIX 1: SAMPLE CONSTRUCTION

The initial sample of CEO successors included some successors with unusual hiring circumstances or compensation. To preclude bias in the empirical analysis due to idiosyncratic compensation of such CEOs, we included only successors who met the following criteria:

1. the succession did not coincide with involvement by the hiring firm in a merger, acquisition, or buy-out;
2. the CEO did not have highly atypical compensation or hiring circumstances;
3. the CEO was not an interim appointee (tenure of less than 1 year);
4. the CEO was not a family member (or founder) or major stockholder in the firm;
5. the succession was the CEO's first appointment as CEO of the company.

The involvement of a firm in large mergers, acquisitions, or buyouts creates the problem that these events could have affected the amount and mix of compensation. The initial sample also included one highly atypical hiring circumstance—namely, the appointment of a new CEO in connection with a federal bailout of a major bank—which could have affected CEO compensation. Three CEOs had atypical compensation packages: Iaccoca received $1 in salary at Chrysler and two CEOs received only board of director fees. Interim CEOs also may have had atypical compensation packages; such CEOs have a short time horizon and therefore might prefer less deferred compensation and greater salary and bonus. A new CEO who is an exceptionally large stockholder or who is a family member may accept less compensation overall because individual or family stock ownership provides alternative compensation in dividends and stock price appreciation. Alternatively, by virtue of their stock ownership or family membership, such CEOs may have *de facto* control over their compensation and may therefore award themselves greater compensation. Finally, the compensation of a CEO appointed for a second time at the same firm, after having previously resigned the CEO position, may reflect his or her past tenure in the CEO job. Therefore, the CEO may receive greater compensation than do other new CEOs.

Of the initial sample of successors, we excluded six internal and nine external successors from the sample for the reasons just discussed. Given the relatively small number of external successors in the initial sample, deletion of any of these observations could cause concern. The excluded external successors, however, had highly atypical compensation and hiring circumstances that could introduce bias into the analysis. In particular, the compensation of these external successors would tend to be influenced in idiosyncratic ways by factors unconnected to the CEO skills issues of interest in this study.

In addition to the idiosyncratic factors just discussed, other factors besides internal and external succession could affect CEO compensation. The empirical analysis therefore includes several control variables. We had missing data for one or more of the control variables for one external successor and 29 internal successors, which we dropped from the sample. The final sample consisted of 305 CEO successors, comprised of 270 internal successors and 35 external successors.

We used original proxy statements to spot-check all the *Forbes* data used in this study, and verified the year that each executive became CEO using proxy statements and the *Wall Street Journal*. For any executive listed in *Forbes* as having 4 or fewer years of firm tenure upon becoming CEO, we obtained the exact dates that each executive began his or her tenure at the firm and as CEO. This information allowed us to be more precise than the *Forbes* data permit in identifying external successors as those with 2 or fewer years of tenure in the hiring firms.

APPENDIX 2: DUMMY ENDOGENOUS VARIABLES ESTIMATION

Heckman (1978) and Maddala (1983) provide detailed information regarding the two-stage procedure used to correct for possible endogeneity of the external successor dummy variables. We use Limdep Version 6.0 (Greene, 1992) to perform the estimation. In what follows, we first discuss the procedure for the single dummy variable used to test Hypothesis 1 and then discuss Hypothesis 2.

Table A1. Probit regression of external succession (asymptotic two-tail *t*-statistics in parentheses, $N = 305$)

Dependent variable: EXTERNAL			
Independent variables[a]			
Log of sales in year	–0.3036* (–1.994)		
AVGROA	–10.913** (–3.097)		
Real profits in year prior to succession	–0.00007 (–0.171)		
CEO board tenure upon succession	–0.3557** (–5.741)		
CEO age upon succession	–0.1589 (–0.541)		
CEO age upon succession squared	–0.0016 (0.573)		
Year dummy variables	Jointly significant		
Number of internal successors predicted	282	Number of internal successors correctly predicted	265
Number of external successors predicted	23	Number of external successors correctly predicted	18
Chi-square statistic	102.684**	Percentage of total successors correctly predicted	92.8%

** Significant at the 0.01 level or less; * significant at the 0.05 level or less; † significant at the 0.10 level or less.
[a] The regression includes a constant term.
All reported significance levels utilize two-tailed tests except the chi-square statistic.

The first stage consists of a regression that utilizes the external successor dummy variable as the dependent variable. On the right-hand side, we use all variables in our compensation regression for which we have data relevant to the time when the executive became CEO. The right-hand side variables are: log of sales for the hiring firm in the year prior to succession; past return on assets of the hiring firm (same variable as in the compensation regression); tenure on the board of the CEO upon succession (where a value of 1 indicates that tenure began with succession); the age and age squared of the CEO upon succession; year dummy variables. We use probit maximum likelihood estimation for the first-stage external succession equation.

Table A1 reports the results of the first-stage probit regression. Consistent with other research on CEO succession, the estimated coefficients on past return on assets and on firm sales are negative and significant, as is the coefficient on CEO board tenure. Overall the regression correctly predicts the outcome of internal or external succession for 93 percent of the observations, a high degree of accuracy. The regression predicts the correct outcome for just over 50 percent of the external successors, which suggests some unexplained variance in the type of successor hired. We also estimated the equation without the CEO-level right-hand side variables, but obtained a much poorer fit for the external successor variable. The specification reported here has much greater predictive power, thus increasing the validity of the instrument.

In the second stage of this procedure, we estimate the compensation regression using the predicted value of the external successor dummy variable from the first stage as an instrument for the actual successor dummy variable. Table 7 in the body of the paper reports the results. We also attempted to use this procedure to test Hypothesis 2, but obtained very poor results in the first stage. We estimated separate probit regressions for the external within-industry and outside-of-industry successors. In each case, the regression predicted the correct outcome for only a few of the external successors. A second-stage compensation regression using these estimates would have produced questionable results.