On the Essentiality of Succession Plans

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Abstract

We characterize an optimal succession plan and analyze its implications for investors, a CEO, and a CEO successor. The presence of a successor alters the incentives of the current CEO and enables investors to keep a larger share of the surplus. Firms with succession plans exhibit a negative relationship between pre-turnover performance and CEO turnover. We show that the early enrollment of a successor is essential to reduce moral hazard and to mitigate the risk of talent poaching by other firms. The model makes clear predictions for which firms should adopt succession plans which are borne out by the available evidence.

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1 Introduction

CEO succession plans are one of the most important responsibilities of the board of directors and a crucial part of good governance. They provide stability in firm management and prepare a company for a leadership turnover. For these reasons, large institutional investors require that succession plans are in place prior to investing in a firm. Succession plans also affect the opinions of credit rating agencies and financial analysts. For its part, the Securities and Exchange Commission has issued several recommendations to listed firms to plan for succession in top management before a talent gap occurs.[1]

This should be no surprise given the numerous and highly publicized incidents of CEO turnover. For example, in just two years (2014-16), the online apparel company Land's End experimented with three different CEOs while its stock price fell 68 percent.[2] Mattel fired its CEO after poor earnings and had to scramble to find a replacement. Sales and morale declined during the lengthy process of choosing a successor.[3] Staples' CEO was forced out after a failed merger with Office Depot, leaving the company without a clear direction. Beyond pure anecdotal evidence, empirical research indicates that companies with succession plans tend to perform better.[4]

Despite their importance, corporate succession plans have received comparatively little attention from executives and academics. A 2010 survey on CEO succession planning revealed that over half of US corporations could not name a successor if their CEOs left immediately. According to the same survey, boards spent a mere two hours a year discussing CEO succession planning.[5] Five years later, a majority of the same companies still did not know who was

[1] "Succession planning is key to smooth transitions: Boards increasingly are recognizing the risk of not having a long term strategic outlook for replacing a CEO", Wall Street Journal, June 8, 2012.

[2] "Land's End picks retail veteran and luggage executive as new CEO", Wall Street Journal, December 19, 2016.

[3] "So much for Mattel ex-CEO resigning. He was fired", Fortune, April 9, 2015.

[4] See, for instance, Behn et al. (2006).

[5] See "2010 Survey on CEO succession planning", Heidrick & Struggles, Rock Center for Corporate Gover-

next in line to fill senior executive positions, and did not have processes to select senior executives.[6] In the Finance literature, we could only find one study on corporate succession planning, namely Naveen (2016). The author argues that more complex firms tend to choose internal candidates, presumably because of the cost of grooming outsiders to acquire firm specific expertise. Other studies, such as Denis and Denis (1995), Huson et al. (2001), Huson et al. (2004), Clayton et al. (2005), and Lehn and Zhao (2006) relate stock returns to CEO turnover, but do not address succession planning issues.

In this paper, we build the first theoretical model that attempts to characterize important features of CEO succession plans. We analyze the optimal arrangement between a principal – the investors –, a CEO, and a CEO successor. Both managers are accountable to investors. The CEO has control over and possesses private information about the firm's output. The CEO successor is on standby and gets the reins of the firm if the original CEO fails to deliver. Having a successor in place helps the firm mitigate costly disruptions associated with leadership turnover. Absent a succession plan, terminating the CEO causes the value of the firm to drop abruptly.[7] Our model predicts that firms without succession plans, or with poorly designed succession plans, experience a stronger negative stock price reaction when their CEOs suddenly depart.[8]

The model goes much farther than implying that having a plan B is useful. First, we show

nance, Stanford University.

[6]See "2014 Report on senior executive succession planning and talent development", the Institute of Executive Development, Rock Center for Corporate Governance, Stanford University.

[7]Lehn and Zhao (2006) report that a significant number of firms that fire their CEO end up being acquired. Somewhat surprisingly, some studies have found a positive price reaction to CEO turnover. But these studies do not distinguish between voluntary and forced terminations. See Denis and Denis (1995), Huson et al. (2001) and Huson et al. (2004). Clayton et al. (2005) find a higher stock return volatility around CEO turnover events. They do not separate forced from voluntary turnovers and do not contrast firms with and without succession plans. We predict that firms with succession plans see lower returns volatility around CEO turnovers, especially in cases of abrupt CEO departures.

[8]While this is a testable implication, an endogeneity issue needs to be addressed since riskier corporations tend to have more elaborate and complex capital structures, as documented by Rauh and Sufi (2010). To control for this effect, empirical studies need to control for the quality of the firm's assets.

how the presence of a successor improves the incentives of the current CEO, and enables investors to keep a larger share of the surplus. Second, succession plans create value even in firms with a zero probability of experiencing a CEO turnover. In fact, succession plans are especially valuable when other means to discipline managers are too expensive. To make this point clear: it is precisely firms that never find it profitable to terminate their CEOs that benefit most from succession plans. When the CEO knows that the threat of being terminated is not credible, investors must give up a higher share of the surplus; the heir apparent makes the termination threat believable, whether it is used or not. Firms in that situation must weigh the carrying costs of hiring a heir apparent against the benefit they have in mitigating moral hazard frictions. This argument is quite different from the common discussion surrounding early versus late hiring. Third, our model shows that, all else equal, firms with succession plans should exhibit a strong negative relation between CEO pre-turnover performance and CEO turnover, because CEOs who do not perform are let go earlier in companies with succession plans. In an extension of the model, we also show that the early enrollment of the CEO successor is key to reduce moral hazard within the firm and to mitigate the risk of talent poaching. Aspiring CEOs know that they get their highest prize only when they get the top job, and, therefore, are tempted to promise their services to several firms.

Our model connects with previous work in different contexts. Goyal and Park (2002) relate CEO turnover to the split between the jobs of Chairman and CEO in the presence of moral hazard. However, separation of the two roles does not guarantee stability in firm management when the CEO departs. Huson et al. (2001) highlight the role of monitoring by institutional investors in CEO turnover. Holmstrom and Tirole (1997) have a model where firms with low net worth include financiers that help monitor the firm. Whereas Holmstrom and Tirole focus on monitoring skills, we consider skills to manage the firm when the incumbent manager might be replaced. Repullo and Suarez (2004) consider a project that requires the simultaneous

effort of an entrepreneur and the advice of a venture capitalist. With unobservable effort and advice, double moral hazard shapes the design of the venture capital contract.

Our model also relates to the work of Bolton and Scharfstein (1990), DeMarzo and Sannikov (2006), DeMarzo and Fishman (2007), and Biais et al. (2007). Bolton and Scharfstein (1990) show that committing to replace a manager reduces moral hazard. In DeMarzo and Fishman (2007) and DeMarzo and Sannikov (2006) the optimal contract between the principal and the manager can be implemented with straight debt, equity, and a line of credit used for temporary shortages. Biais et al. (2007) show that cash reserves can play the same role as the line of credit in the previous papers. A common feature in all these models is that with limited commitment on the part of the manager, the principal may decide to liquidate the firm after the reporting of bad earnings. This happens even when all parties agree that the manager's report are genuine and liquidation is ex-post inefficient. DeMarzo and Fishman (2007) point out that the ability to fire the incumbent manager and replace him with an identical manager makes the threat of termination renegotiation proof. This observation also holds in our model, but we say more. First, multi-party arrangements can be improved upon *whether or not* they feature a positive probability of termination. Even if termination never occurs, a better termination option improves the principal's surplus and consequently facilitates the funding of the project. Having a backup manager in place raises the principal's net present value by making it cheaper to provide incentives to the original manager. Second, the solution proposed in DeMarzo and Fishman (2007) of waiting to hire a new manager only after poor performance is observed is generally inferior.

The rest of the paper is organized as follows: Section 2 lays out the succession planning problem. Section 3 discusses the firm with no succession plan while section 4 characterizes optimal arrangements when the firm has a succession plan. Section 5 provides conditions under which it is optimal for backup CEOs to commit to the firm early. Section 6 discusses

several empirical predictions. Section 7 concludes the paper. Proofs are relegated to the Appendix.

2 The environment

Consider a risky firm in a world with three dates $t = 0, 1, 2$ hence two periods. There are two types of agents: managers who have skills to run the firm, and investors with no management skills but a unit endowment of the unique good at date 0. Investors can store their endowment and earn a risk-free gross return $R \geq 0$ at date 2, or invest in the firm. The firm requires an investment of one unit of the good at date 0 and must be operated by a manager to generate output with positive probability.

At no additional capital investment, the firm can continue uneventfully at date 1. However, if the manager leaves at date 1, the firm faces a leadership crisis and its value drops to S. This value represents a leaderless firm without direction and losing ground. More broadly, S is the value of the best alternative to the vulnerable firm following the abrupt departure of the manager. Our goal is to provide a solution that mitigates disruption and allows the smooth continuation of the firm. Concretely, we propose that the firm adopts a succession plan which, in its simplest form, brings on board a second manager on stand-by. The current manager is experienced and in control at date 1. We think of this manager as the current CEO, or manager 1. Under manager 1, the firm yields maximal output $y_H > 0$ with probability π and $y_L < y_H$ otherwise. Without loss of generality, we normalize y_L to zero. The same process governs the firm's output at date 2 provided it does not face a leadership crisis and manager 1 stays in control. Payoffs are i.i.d across periods.

When the firm is operated by manager 2, the positive payoff is θy_H rather than y_H where

$\theta \in [0,1]$. This potential productivity fall can be motivated for instance by the argument in Naveen (2016) that manager 2 must go through a period of learning on the job. When $\theta \in [0,1)$, management turnover is costly under the succession plan. In section 5, we incorporate grooming of manager 2 in a succession plan, so that θ becomes gradually higher. For now, we treat it as fixed and exogenous. Both managers have an outside labor market option that generates utility $V_O \geq 0$ in any period when they are not managing the firm. All agents have linear preferences and do not discount the future.

Putting in place a succession plan involves a per period cost $f \geq 0$. As a result, introducing a succession plan is profitable only if doing so raises investors' gross surplus by f or more.

Contracting between investors and managers is limited by fundamental frictions. First, only the operating manager observes the firm's output. In addition, this manager can divert part of the firm's output unbeknownst to anyone, at a proportional cost $\phi \in [0,1]$. When he chooses to consume the firm's output, he enjoys a payoff $(1-\phi)y$. The cost proxies for the time and resources the manager spends in diverting funds. Finally, managers cannot commit ex-ante to manage the firm at date 2 and, therefore, must expect at least $V_O \geq 0$ in payoff in order for the firm to keep going without a crisis. Investors, for their part, can commit to any arrangements.

Because investors cannot observe output directly and do not have the competence to replicate the manager's skill, they have to rely on reports from managers. A standard appeal to the revelation principle implies that, without any loss of generality, we can concentrate our attention on direct revelation contracts. Formally, a contract between investors and managers contains the following list of objects:

1. An amount $k_I \leq 1$ of capital contributed by investors;

2. A manager name $\{\kappa(h) \in \{1,2\}\}$ for all possible histories h of messages at dates 0 and 1, with the convention that $h = \emptyset$ at date 0 and the understanding that if a manager

is not called upon to manage the firm in a particular period, the manager enjoys its outside option utility;

3. A payment schedule $\{w^j(h) \geq 0 : j = 1, 2\}$ for all possible histories h of cash flows and for each manager;

4. Premature CEO termination probabilities $s(0)$, $s(y_H)$, depending on the two possible output announcements in period 1.

Our goal is to characterize one optimal arrangement between investors and managers, and argue that it captures important characteristics of succession plans used in practice by US firms.

3 The firm with no succession plan

To better understand the value of a succession plan, we begin with a firm without such a plan. In other words, we first impose the restriction that $w^2(h) = 0$ at all histories h, so that manager 2 does not participate. The resulting contracts are summarized by $C = \{k_I, \{w^1(h) \geq 0\}, s\}$.

All payments to the manager are non-negative. This is without loss of generality, since the parties are equally patient, and investors have the ability to commit to any payment scheme, including an exchange of actuarially fair intertemporal transfer. If $k_I < 1$ then the firm is not viable, and payments to the manager are zero. Given a contract C such that $k_I = 1$, then:

$$V_2(y) = (1 - s(y)) [\pi w(y, y_H) + (1 - \pi) w(y, 0)] + s(y) V_O$$

is the utility promised to the manager at date 2 when the output message at date 1 is $y \in \{0, y_H\}$. The payment to the manager may depend on the output messages received by date 2. This expression for V_2 assumes that when the manager is not running the firm, he only

enjoys the outside option. This is without loss of generality. Any payments to the manager if he leaves, including a claim to a golden-parachute, can be folded into $w(0)$. For the manager to participate, it is necessary that:

$$2V_O \leq \pi \left[w(y_H) + V_2(y_H) \right] + (1 - \pi) \left[w(0) + V_2(0) \right], \tag{3.1}$$

where $w(y)$ is the compensation to the manager at date 1, which depends on the first message $y \in \{0, y_H\}$. For direct revelation to be incentive compatible, investors must reward the manager for telling the truth:

$$w(y_H) + V_2(y_H) \geq w(0) + V_2(0) + (1 - \phi) y_H. \tag{3.2}$$

When the firm continues with the manager at the helm, with positive probability in period 2, i.e. for all $y \in \{0, y_H\}$ such that $s(y) < 1$, the expected payoffs must again meet the participation constraint:

$$V_O \leq V_2^c(y), \tag{3.3}$$

where the superscript "c" highlights that the payoff is conditional on continuation. For $y \in \{0, y_H\}$,

$$V_2^c(y) = \pi w(y, y_H) + (1 - \pi) w(y, 0),$$

while incentive compatibility requires

$$w(y, y_H) \geq w(y, 0) + (1 - \phi) y_H. \tag{3.4}$$

Finally, investors' net payoffs written in long form are:

$$\begin{aligned} W^{NSP}(C) = \pi\left[(y_H + s(y_H)S - w(y_H)\right] &+ (1-\pi)\left[0 + s(0)S - w(0)\right] \\ +(1-\pi)^2(1-s(0))[0 - w(0,0)] &+ \pi(1-\pi)(1-s(y_H))[0 - w(y_H,0)] \\ +\pi^2(1-s(y_H))\left[y_H - w(y_H,y_H)\right] &+ (1-\pi)\pi(1-s(0))\left[y_H - w(0,y_H)\right] \\ &- R, \end{aligned}$$

where the superscript NSP stands for no-succession-plan. The terms of the above expression correspond to each of the possible outcomes at which the contract calls for a message from the manager to the investors, weighted by the corresponding probabilities. For concreteness, we will focus on a specific part of the Pareto set, namely feasible contracts that maximize the investors' payoff *ex-ante,* where we call a contract feasible if it satisfies conditions $(3.1 - 3.4)$.

Maximizing investors' objective is easiest done recursively. Assume that the manager enters the final period with promised utility $V_2^c \geq V_O$. Write the highest payoff investors get at date 2 if they commit to the on-going concern as $W_2^c(V_2^c)$. This maximum conditional payoff solves:

$$W_2^c(V_2^c) = \max_{w_2^L, w_2^H} \pi(y_H - w_2^H) + (1-\pi)(-w_2^L)$$

subject to:

$$\pi w_2^H + (1-\pi)w_2^L = V_2^c \text{ (promise keeping)},$$

$$w_2^H \geq w_2^L + (1-\phi)y_H \text{ (truth telling)},$$

and

$$w_2^H, w_2^L \geq 0 \text{ (limited liability)},$$

where w_2^H and w_2^L denote performance dependent payments to the manager.

Note that the promise-keeping condition is a strict equality. Investors could always choose to pay the manager at date 2 more than a particular V_2^c. In fact, doing that may increase investors' payoff ex-post, as we will show later. But writing the promise as a strict equality recognizes that investors have the ability to commit to inefficient promises and actions at date 2. As it will become clear when we look at the ex-ante version of the problem, doing so can make it cheaper to provide the right incentives to the manager over the life of the arrangement.

The solution to the second period problem is easy to describe. In terms of expected payoff, the manager is willing to exchange a decrease in w_2^L of, say, $\delta > 0$ for an increase of $\frac{\pi}{1-\pi}\delta$ in w_2^H. The investors' payoff is, likewise, unchanged. However, such transfers weaken the truth-telling constraint. Thus, it follows that, optimally, $w_2^L = 0$. This implies that $w_2^H = \frac{V_2^c}{\pi}$ is optimal if it is enough to satisfy the truth-telling constraint,

$$w_2^H = \frac{V_2^c}{\pi} \geq (1-\phi)y_H.$$

This suggests that if investors want to keep the manager, they cannot commit to deliver less than $\pi(1-\phi)y_H$ in terminal utility following period 1's announcement. But, in fact, they have a broader set of available options. Recall that investors have the option to terminate the manager after a bad performance, in which case, the firm is valued at S at the end of period 1.[9] Let V_2^s be the payoff that the manager expects upon being fired. The associated value function is $W_2^S(V_2^s) = S + V_O - V_2^s$ since investors get S but must pay $V_2^s - V_O$ to the manager,

[9]The result that it is sometimes necessary to commit to terminate the relationship to induce the manager to pay investors is now standard in contract theory. For example, in Bolton and Scharfstein (1990), investors commit to terminate funding if a firm's performance, managed by a penniless manager, is deemed poor. In Bolton and Scharfstein (1996) creditors commit to liquidate the firm's assets at a low price if the manager strategically defaults on the debt payments. The same arrangement is present in many other papers, including DeMarzo and Sannikov (2006) and DeMarzo and Fishman (2007).

as he was promised V_2^s but only gets V_O from his outside option. If $S + V_O \geq \pi\phi y_H$, firing the manager is always optimal from the point of view of investors at date 2. Henceforth, we will assume that $S + V_O < \pi\phi y_H$.[10] In that case, termination only makes sense if investors have committed to deliver less than $\pi(1-\phi)y_H$ to the manager.

Denote by V_2 the payoff the manager expects in period 2 in the absence of termination. For $V_2 \in (V_O, \pi(1-\phi)y_H)$ it is optimal for investors to randomize between terminating the manager and not. More precisely, in the closure of that interval, the optimal termination probability is:

$$s(V_2) = \frac{\pi(1-\phi)y_H - V_2}{\pi(1-\phi)y_H - V_O},$$

and zero everywhere else. The manager gets a payoff of V_O if he is terminated, and $\pi(1-\phi)y_H$ otherwise. As a result, the overall payoff to investors, following the first output message is:

$$W_2(V_2) = s(V_2)S + (1 - s(V_2))W_2^c\left(\max\left\{V_2, \pi(1-\phi)y_H\right\}\right).$$

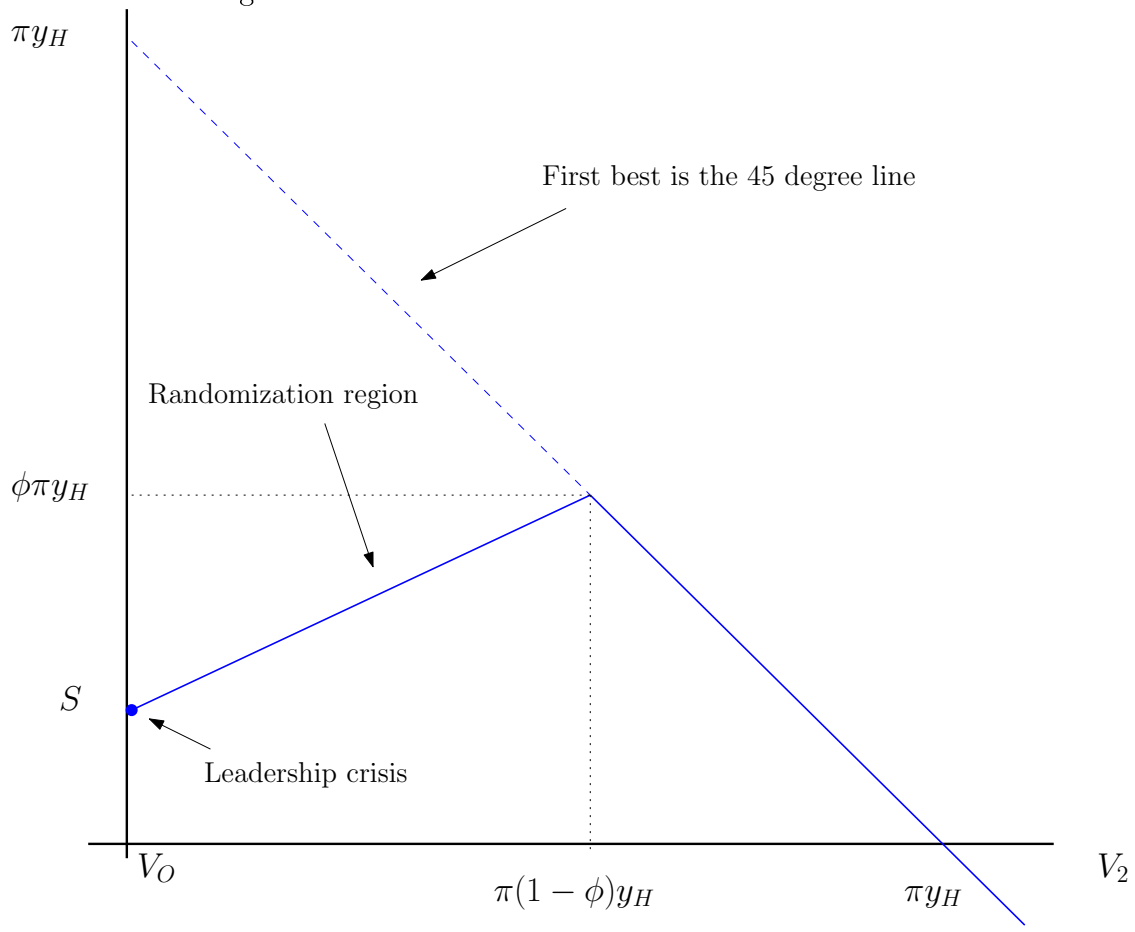
This value function is concave, strictly increasing in the range $[V_O, \pi(1-\phi)y_H]$, and thereafter strictly decreasing with a slope of -1, as depicted in figure 1.

The analysis also implies that in the absence of moral hazard, i.e., if $\phi = 0$, it is not possible for investors to profitably operate the firm in the second period. In fact, and as pointed out in a different context by Bulow and Rogoff (1989), this would still be true in the two-period case, and the firm would not be viable if $\phi = 0$. Some direct punishment is necessary to support contracts when investors and the manager are equally patient.

Consider now the recursive formulation of the manager's problem as of date 1, given a

[10] Note that a severance package of the form υS, with $\upsilon < 1$, would have two bad consequences for investors. Investors would have to share more of the upside to induce the manager to tell the truth, and it would make it harder to replace the manager when he does not perform.

Figure 1: Period 2 value function for the investor



promised utility $V_1 \geq 2V_O$. The investors' maximal payoff solves:

$$W_1(V_1) = \max_{w_1^L, w_1^H, V_2^L, V_2^H} \pi \left[y_H - w_1^H + W_2(V_2^H) \right] + (1-\pi) \left[-w_1^L + W_2(V_2^L) \right] - R$$

subject to:

$$\pi \left[w_1^H + V_2^H \right] + (1-\pi) \left[w_1^L + V_2^L \right] \geq V_1 \text{ (promise keeping)},$$

$$w_1^H + V_2^H \geq w_1^L + V_2^L + (1-\phi) y_H \text{ (truth telling)},$$

$$w_1^L, w_1^H \geq 0 \text{ (limited liability)},$$

and

$$V_2^L, V_2^H \geq V_O \text{ (lower bound on agent payoff at date 2)},$$

where (w_1^L, w_1^H) are date 1 payments to the manager, while (V_2^L, V_2^H) are the payoffs investors commit to deliver at date 2, as a function of the output message in the first period.

To preview the nature of the optimal solution and illustrate why inefficient terminations can be part of the optimal contract, assume that the firm continues without terminating the manager with probability one, regardless of the output message, so that, in particular, $V_2^L \geq \pi(1-\phi) y_H$. Truth telling implies that

$$w_1^H + V_2^H > \pi(1-\phi) y_H + (1-\phi) y_H,$$

in turn, the manager's expected payoff must satisfy:

$$\pi \left[w_1^H + V_2^H \right] + (1-\pi) \left[w_1^L + V_2^L \right] \geq \pi(1-\phi) y_H + \pi(1-\phi) y_H.$$

Assume further that

$$0 = V_O < \pi(1-\phi)y_H + \pi(1-\phi)y_H$$

so that the manager is willing to participate as long as $V_1 \geq 0$. Then, given the inequality above, investors' surplus under the policy of continuing no matter the manager's output message is:

$$W_1^c(V_1 = 0|k_I = 1) = \pi y_H + \pi y_H - [\pi(1-\phi)y_H + \pi(1-\phi)y_H] - R. \tag{3.5}$$

One alternative is to terminate the manager after bad earnings are announced at date 1. In that case, investors' highest surplus is:

$$W_1^S(V_1 = 0|k_I = 1) = \pi y_H + \pi^2 y_H + (1-\pi)S - \pi(1-\phi)y_H - R. \tag{3.6}$$

To understand this expression note that if investors commit to terminate following a bad announcement, they can set $w_1^L = 0$, $V_2^L = V_O = 0$ and $s(0) = 1$, which means that truth telling only requires making $w_1^H + V_2^H = (1-\phi)y_H$. On the other hand, the expected output is lower since termination occurs following a bad message. When π is sufficiently close to 1, so that committing to terminate following a bad message is not very costly, the second policy dominates the first. Investors would commit to terminate in period 2 even though that destroys value ex-post.

The following result provides a complete characterization of the contract that maximizes investors' surplus when there is no succession plan:

Proposition 3.1. *The set of solutions to the investors' problem satisfies:*

1. *Investors fund the firm when and only when $W_1(V_1) \geq 0$ for some $V_1 \geq 2V_O$;*

2. *When investors do fund the firm, the manager is let go with positive probability at date*

1 *if and only if*

(a) $2V_O < \pi(1-\phi)y_H + \pi(1-\phi)y_H$, *and,*

(b) $\pi - (1-\pi)\frac{\phi\pi y_H - S}{\pi(1-\phi)y_H - V_O} > 0$.

Proof. This proof as well as the proof of all upcoming results are in the appendix. □

When condition (a) holds, some termination is always optimal when π is close to one. The threat to terminate when a bad result is reported to investors is cheap to include in the contract, because bad messages are unlikely. When (a) holds, but (b) does not, no termination ever occurs along the optimal path. Condition (b) requires that the slope of investors' value function in the termination region is sufficiently mild. If it is too steep, which occurs when S is very low, firing the manager becomes too costly.

Having characterized the optimal contract fully, we can now write the highest value to investors associated with operating the firm with no succession plan (NSP, for short) as:

$$W^{NSP}(V_O, \phi, y_H, \pi, S) = \max_{V_1 \geq 2V_0} W_1(V_1).$$

Critically for our purposes, the participation constraint can have slack. This is the case for instance when $V_0 = 0$ but $[\pi\phi y_H + \pi\phi y_H] - R > 0$, since in that case investors generate a profit by repeating the optimal static contract twice. One of the benefits of succession plans, as we will show next, is that they are effective in reducing the participation slack by making the termination threat cheaper to invoke. This is true even in the case of firms with no termination risk in the optimal NSP contract.

4 The firm with a succession plan

Many surveys indicate that firms often pay dearly when they wait to replace a CEO who left abruptly. To quote respondents in one such survey,[11] "[t]he board agonized for two years over whether to fire the CEO, but we didn't have a successor in place. It's a very tough decision because it takes three months to put a new person in place, at least." In our model, terminating the CEO (manager 1) without a successor on standby (manager 2) is ex-post inefficient. In this section we formalize the various ways in which succession plans create value for investors.

To that end, we first measure the gross effects of these plans on investors' payoffs. We will then incorporate the cost f of putting a succession plan in place and study net investors' benefits. Provided manager 2 is sufficiently skilled, succession plans create strictly positive value in gross terms except when truth-telling constraints have always slack under the optimal arrangement without a succession plan. In particular, succession plans create value even for firms that face zero risk of a crisis.

To establish these results, recall that manager 1 is the current CEO. If θ is such that $\phi\pi\theta y_H \leq S$, then the presence of manager 2 does not expand the set of options for investors. The firm might as well face the uncertainty of going outside to find a replacement manager. However, as long as the incentive compatibility constraint binds with positive probability in the case of a firm with no succession plan, and θ is sufficiently high, a succession plan strictly adds value. Formally,

Proposition 4.1. *The maximal gross payoff investors generate with a backup manager under contract strictly exceeds all payoffs they generate with no backup manager, if and only if:*

1. $2V_O < \pi(1-\phi)y_H + \pi(1-\phi)y_H$, *and*

[11] See "2014 Report on senior executive succession planning and talent development," Institute of Executive Development, Rock Center for Corporate Governance, Stanford University, page 3.

2. θ is sufficiently close to 1.

When the optimal arrangement without a succession plan (NSP) involves termination with positive probability, this result should come as no surprise. Putting manager 2 in charge raises the investor's payoff as long as $S < \pi\phi y_H$. But the proposition is much more general: Having manager 2 raises investors' payoff, even when the manager 1's contract never features ex-post inefficient termination. Specifically, when

$$2V_O < \pi(1-\phi)y_H + \pi(1-\phi)y_H$$

but

$$\pi - (1-\pi)\frac{\phi\pi y_H - S}{\pi(1-\phi)y_H - V_O} < 0$$

investors have to give manager 1 an excessive share of the surplus. The threat of replacement by manager 2 enables investors to reduce the slack in manager 1's participation constraint. Put another way, even when optimal contracts involve no inefficient termination, having a successor on hand can turn negative investors' payoffs to positive ones. This is consistent with the evidence that institutional investors require firms to have succession plans when deciding to invest. Of course, the threat must be credible, which means that when firms select a CEO heir apparent, they must be confident that the backup CEO has high managerial skills or the succession plan is capable of grooming the successor.

To summarize proposition 4.1, denote by $W^{SP}(V_O, \phi, y_H, \pi, S, \theta)$ the maximum gross surplus investors can get with a succession plan in place. The proposition says that as long as $2V_O < \pi(1-\phi)y_H + \pi(1-\phi)y_H$ and θ is sufficiently close to 1.

$$W^{SP}(V_O, \phi, y_H, \pi, S, \theta) > W^{NSP}(V_O, \phi, y_H, \pi, S)$$

where SP and NSP stand for succession plan and no-succession-plan, respectively. To complete the characterization of the optimal arrangement, simply observe that investors will choose to have a succession plan if the gross gains from having the succession plan exceed its costs:

$$W^{SP}(V_O, \phi, y_H, \pi, S, \theta) - W^{NSP}(V_O, \phi, y_H, \pi, S) > f.$$

In particular, the net value of corporate succession plans depends on firms' fundamentals and characteristics, the costs of implementing the plan, and the skills of the top managers involved. Indeed, the firm's fundamentals are fully described by $\{\pi, \phi, \theta, y_H, S, f\} \in [0,1]^3 \times \mathbb{R}^2$. To proceed, let $\Omega_1 \subset [0,1]^3 \times \mathbb{R}^2$ be the subset of parameters such that a bad output realization in period 1 leads to termination of the CEO in firms without a succession plan while Ω_2 is the same object for firms with a succession plan, we have:

Corollary 4.2. $\Omega_1 \subset \Omega_2$. *That is, firms with a succession plan in place feature a higher dependence of CEO pre-turnover performance and CEO turnover than other firms, all else equal.*

While proposition 4.1 reveals a clear relation between cash-flow fundamentals and the value of succession plans, the relation is somewhat subtle. For instance, the impact of risk (proxied by $1 - \pi$) on the value of succession plans depends on the relative strength of two opposing effects. On the one hand, condition 1 in the proposition is more likely to hold for high π. High π firms are high surplus firms and more likely to overcompensate current CEOs if a succession plan does not exist. High π firms also destroy a lot of value when they fall into a leadership crisis. The threat to terminate the CEO is costly and, therefore, investors are willing to give up more of the surplus unless the CEO successor is ready. On the other hand, condition 2 in the proposition is less likely to hold when π is high, because if the backup CEO takes over, the loss $(1 - \theta)\pi y_H$ in expected output is proportional to the amount of surplus.

While the relationship between cash-flow risk and the value of succession plans is subtle, the practical consequence of the endogeneity of succession plans is clear. A formal test of corollary 4.2 in a cross-section of firms requires either an exogenous source of variation in the incidence of succession plans, or a careful way to control for the riskiness of the cash flows and other firm's fundamentals.

5 The necessity of the early enrollment of a successor

A question proposition 4.1 leaves unanswered is the timing of manager 2's involvement. Can investors afford to wait until a new CEO is needed to hire a replacement, or is it better that manager 2 commits to the firm before a bad shock happens? This section provides reasons why backup CEOs should join the firm before a crisis hits.

5.1 Grooming the successor

One obvious reason why on-boarding a successor before it is known whether her services are needed is that this enables the successor to learn the specific skills necessary to run the firm effectively. Making this point without altering the analysis only requires assuming that θ rises from θ_0 to θ_1 if and only if the successor has gone through a grooming program at the firm. This program creates a direct pressure on the incumbent to perform, and limits his incentives to divert resources.[12]

Recall that f is the cost of grooming the heir apparent. Whether the gains from doing so outweigh the value of waiting for a leadership crisis and then recruit a replacement boils down to the following inequality:

[12] One of the most obvious examples of the value created in this fashion is the fact that U.S. football teams typically hire promising quarterbacks much before current quarterbacks have become less productive. Designated successors serve as backups, but they also learn by observing until their turn comes.

$$W^{SP}(V_O, \phi, y_H, \pi, S, \theta_1) - W^{SP}(V_O, \phi, y_H, \pi, S, \theta_0) > f.$$

The difference between the two value functions on the left-hand side of the inequality stems directly from the effect that grooming has on output if the firm ends up being run by the successor. However, there is another important effect, which relates the impact of preparing the successor to the incentives of the current CEO. By spending f the firm increases θ which helps investors retain a greater share of the surplus. Assume for instance that $S > \pi\phi\theta_0 y_H$ but that S is such that no termination occurs in an optimal contract that has no succession plan. Assume further that θ_1 is close to near 1. Then the current CEO receives the highest possible payoff if there is no grooming of the successor, but if an heir-apparent is available, he only gets his outside option after a bad output realization occurs.

5.2 Early enrollment mitigates moral hazard

Even when grooming does not succeed, hiring a CEO successor in period 0 rather than waiting until a crisis strikes enables investors to allocate promised payments to the successor when she is most needed. To see this, assume that when the heir-apparent joins the firm at date 0, her payoff V_O is alienable. It now becomes possible to require a commitment$\epsilon_{M2} \leq V_O$ by the successor to the firm at date 1. This commitment can be thought of as compensating the successor below the value of her marginal product in the first period or, equivalently, as a direct investment of funds by the back-up CEO in the firm. The following proposition says that an early commitment by the back-up CEO is optimal as long as moral hazard frictions are present.

Proposition 5.1. *If* $V_O > 0$ *but*

$$V_O R < \pi(1-\phi)y_H,$$

then a positive commitment ϵ_{M2} *must take place* ***before*** *date* 1 *uncertainty is resolved.*

The intuition behind this result is that backup CEOs trade ϵ_{M2} at date 0 for a high payoff if and when they are called upon to run the company. When $V_O R < \pi(1-\phi)y_H$ the back-up manager's participation constraint holds with slack when no early commitment is made. This means that investors are giving up more surplus than what is needed for manager 2 to participate. Therefore, investors can ask for a commitment from back-up CEOs in the first period without commensurate future promises. This strictly raise investors' payoffs.

In practical terms, investors hire successors before their services are needed and pay them below the value of their marginal product until they are called upon to run the firm. But why would successors in waiting accept that? Because they get a big payoff when they become CEOs. In expectation this is better than their outside option. This is also a good for investors because it reduces the slack in the successor's participation constraint.[13]

5.3 Early enrollment as a poaching deterrent

We have shown that a backup CEO that provides expertise can change negative NPV outcomes into positive ones for investors in the firm. This comes from limiting the incentives of the firm's CEO to reduce investors' surplus. In this subsection we show that the early commitment by the CEO successor also acts as a de-facto signing clause that makes poaching of skilled managers by employers harder.

[13] In fact, under the stark assumption of linear preferences we use, the compensation spread is extreme and the successor only receives a payoff when the firm underperforms. Such extreme nature of the payoff will change once risk-aversion or a lower bound on consumption are introduced.

The parametric restriction $V_O R < \pi(1-\phi)y_H$ in proposition 5.1 guarantees that the incentive compatibility constraint is binding once the successor takes over the CEO position, so that satisfying it implies that her participation constraint has slack. In this subsection we show that when there is the risk that the successor might be lured away by other firms, a date 0 enrollment becomes necessary in all optimal contracts, regardless of whether $V_O R < \pi(1-\phi)y_H$. The commitment ϵ_{M2} becomes a guarantee that the successor will be available to manage the firm if needed. As mentioned before, one can think of ϵ_{M2} as below-market compensation for services rendered to the firm that are verifiable. If and when manager 2 is nominated to be the next CEO, the payoff then received more than compensates the foregone earnings.

Why is such a commitment necessary? When there is an opportunity to collaborate with several firms, the successor has the incentive to offer her services in a guarded and strictly confidential way to multiple firms. With multiple contracts at play simultaneously, the successor increases the odds of landing a CEO job, boosting her future expected payoff. If different CEOs fail in different states of the world, investors are not negatively affected by the multiple commitments. In fact, to the extent that allowing the successor to enter into more than one contract weakens her participation threshold, investors encourage such diversification. It would simply be cheaper for investors to do so.

However, a conflict arises when different firms' outcomes are not perfectly negatively correlated. To make this clear, assume that a second firm has selected a manager identical to manager 1 – call him manager 1' – with the ability to operate an identical firm so that, in particular, outcomes of the two firms at date 1 are perfectly correlated. Assume further that the second company can make an offer to manager 2 (the successor) after the first company has offered a contract to managers 1 and 2. We will show that under these circumstances, the first company will always require an explicit commitment from manager 2 when the contract

is signed.

Formally, we model this possibility as a sequential game involving two competing investors, manager 1, manager 2 and manager 1'. Manager 1 and manager 1' enter into contracts that give them at least the value of their outside option, so their presence amounts to additional constraints on the two firms. For simplicity, we do not consider the possibility that the second firm could attempt to poach manager 1 with the purpose of having him serve in the role of successor to manager 1'. One way to think about this is that manager 1 and manager 1' are tied to their respective firms, whereas manager 2 has some discretion and can go to either firm. It is possible to show that the same results emerge in a game where both managers 1 and 2 can be poached.

The poaching game we have in mind consists of four stages:

1. Investor 1 moves first and has the option to offer a contract with characteristics

$$(\epsilon_{M2}, V_{M1}, V_{M2})$$

   to managers 1 and 2 where ϵ_{M2} is the commitment required from manager 2 by investor 1, V_{M1} is the expected payoff of manager 1 under investor 1's proposal, while V_{M2} is the expected payoff of manager 2 if called upon following a failure;[14]

2. Manager 2 decides whether to accept or reject the offer;

3. Investor 2 either offers a contract with characteristics$\left(\epsilon_{M2}^{'}, V_{21'}, V_{M2}^{'}\right)$ to managers 1' and 2, or makes no offer; Here $\epsilon_{M2}^{'}$ denotes the commitment required from manager 2 by investor 2, while $V_{M2}^{'}$ is the value of the proposed contract to manager 2.

[14] To economize on notation we do not list all the stipulations of the contracts but only its key characteristics from the point of view of the upcoming argument.

4. Manager 2 accepts or reject investor 2's offer. Once again, accepting means making a commitment to the firm;

Manager 2 does not have the ability to commit to showing up if called upon by company 1, making room for poaching by company 2. The only parametric restriction we impose in this subsection, and solely for concreteness, is that no profitable NSP contract exists, but a profitable SP contract exists. The case where firms are viable even with one manager in place is not difficult to deal with, but it would require considering the possibility that investors in firm 2 sign a contract with manager 1 that excludes manager 1'. Ruling this out parametrically makes the exposition quicker.

Under the assumption that no NSP contract has positive NPV, firms can attract investors only if they can secure the services of manager 2. This also means that firm 1 offers a contract at stage 1 in all subgame perfect equilibrium of the game. The key point we wish to make is that such contract requires a commitment on the part of manager 2.

Proposition 5.2. *Assume that $V_O > 0$. All subgame perfect equilibrium of the poaching game described in steps 1-4 above are such that the contract proposed by the first company requires a strictly positive commitment by manager 2.*

A strictly positive commitment is necessary and sufficient for company 1 to make sure that company 2 will not preempt its offer. That is, when investors are competing for the services of talented successors, an early commitment by manager 2 is necessary, regardless of whether $V_O + \epsilon_{M2} < \pi(1-\phi)y_H$, i.e regardless of whether their incentive compatibility constraint is expected to bind.

The proof of this result makes it clear that the expected payoff of successors increases when poaching is possible. A commitment is an effective binding clause that makes poaching of skilled managers by firms harder. This is particularly important in countries with weak

control rights and less formal governance systems, but also in high powered industries such as investment banking, entertainment, high-tech, pharmaceutical and bio-technologies where employees' loyalties have little meaning.

6 Testable predictions

Our model allows us to make several predictions about which firms are more likely to implement succession plans. Only firms whose characteristics are such that the gross value added by succession plans is sufficiently large to cover the cost of installing the plan should feature CEO successors. More concretely:

Prediction 1: Large firms are more likely to have succession plans than small firms.

Consider firms that are scaled up or down versions of one another, in the sense that the output process is a scalar multiple of the process we have used throughout in this paper. The gains from succession plans are then linear in the size of the firm. If the cost of formalizing a succession plan is at least partially fixed, then small firms are less likely to have succession plans.[15]

Prediction 2: Only firms for which finding and grooming competent successors is cost effective are likely to have succession plans.

If the productivity θ_1 of the successor is low, then the threat of replacement of the current CEO is not credible. Firms are better off relying on sudden CEO terminations. Not surprisingly, what is optimal depends on the successor's learning curve, $\theta_1 - \theta_0$. If firms lack ways to groom successors and appraise their progress, succession plans are not beneficial.

Prediction 3: Firms that potentially face more severe moral hazard frictions (a lower ϕ) are more likely to have succession plans.

[15] In corporate surveys, companies often state that having succession plans is too expensive and take too much effort. See Schlechter (2015).

The arguments we used to establish Proposition 4.1 imply that the gross gains from succession plans are monotonic in $\pi(1-\phi)y_H$ and the prediction follows directly from this observation. But it is also quite intuitive since the purpose of succession plans is to mitigate the consequences of poor results that bring on the wrath of investors. Less intuitively,

Prediction 4: High powered and safer firms (firms with a high π) are more likely to have succession plans.

It is only when the output is high that the incentives to be truthful make sense. The more successful and safer is the firm, the higher the incentive the manager has to divert output. Predictions 3 and 4 have exact counterparts in terms of the contribution of succession plans (direct or via foregone compensation) to the firm. Firms that suffer from more severe moral hazard frictions or are safer should require a higher commitment from back-up managers. Furthermore, the higher π, the bigger the investors' losses if the successor is not well prepared to replace the current CEO.

Corporate surveys do suggest that companies tend to establish succession plans more by way of reducing risk than to find the ideal successor.[16] This indicates that corporate boards are not only worried about moral hazard and complacency in firms with high upside, but also care about the possible value destruction associated with a leadership crisis.

Prediction 5: Firms with succession plans in place feature a higher dependence of CEO pre-turnover performance and CEO turnover than other firms, all else equal.

The prediction directly results from corollary 4.2, but since the decision to have a succession plan is endogenous, there must be an exogenous source of firm cross-section variation in the likelihood of a succession plan. Finally,

Prediction 6: Companies that are more likely to be sold are less likely to have a succession plan.

[16] See "2014 Report on senior executive succession planning and talent development," Institute of Executive Development, Rock Center for Corporate Governance, Stanford University.

If investors view that a company will eventually be sold, having a formal process for CEO succession becomes less important. In our model, S is the value of the best alternative available for the firm, which could include the sale of assets or of the company itself to a third party. Yahoo's recent difficulties may provide a good example. Once Yahoos' board of directors understood that its best option was to sell the company, it focused on the sale of the company and decided to put no further effort in finding a successor to Marisa Meyer.[17]

7 Conclusion

This paper provides insights into the role of corporate succession plans. Leadership succession plans provide stability in firm management. In addition, they discipline and incentivize current CEOs by creating a strongly negative relation between CEO pre-turnover performance and CEO turnover. As a result, successors create value even when their services are unlikely to be called upon. We also show that optimal succession plans require an early commitment by successors to optimally reduce moral hazard and to deter poaching of executive talent. These considerations enable us to make sharp, testable predictions about the firms that are more likely to have succession plans.

8 Proofs

8.1 Proof of proposition 3.1

The first item of the proposition is straightforward. The second item says that termination is never optimal if the manager expects a utility level in excess of what is needed to run the firm without the incentive compatibility constraint ever binding. When, on the other hand,

[17] See "Lessons on succession planning from Yahoo's revolving door of CEOs," Smart CEO blog, 2015.

the participation threshold is low, in the sense made precise in condition (4a), threatening to terminate with positive probability is efficient when the slope of the randomization region is sufficiently shallow and the probability of a bad output realization in date 1 is sufficiently remote. To see why it is so, note first that we can set $w_1^H = w_1^L = 0$ in period 1, without loss of generality, since the manager and investors discount the future at the same rate. Then recall that continuing no matter what requires $V_2^L \geq \pi(1-\phi)y_H$ and, in turn,

$$\pi\left[w_1^H + V_2^H\right] + (1-\pi)\left[w_1^L + V_2^L\right] \geq \pi(1-\phi)y_H + \pi(1-\phi)y_H.$$

This means that, given condition (4a), the participation constraint has slack. Hence, at most, $V_2^L = \pi(1-\phi)y_H$, since investors have no reason to go above that. But is there an incentive to lower V_2^L further? Doing so enables investors to lower both V_2^H and V_2^L without violating the incentive compatibility constraint. Furthermore, this raises $\pi W_2(V_2^H) + (1-\pi)W_2(V_2^L)$ strictly, as long as condition (4b) is met Indeed, the left-hand derivative of W_2 is $\frac{\phi\pi y_H - S}{\pi(1-\phi)y_H - V_O}$ at $\pi(1-\phi)y_H$, while it is -1 at any $V_2 > \pi(1-\phi)y_H$. This completes the proof.

8.2 Proof of proposition 4.1

When $2V_O \geq \pi(1-\phi)y_H + \pi(1-\phi)y_H$, investors can commit to let the firm run for two periods, and incentive compatibility constraints have slack. In that case,

$$W_1^c(V_1) = \pi y_H + \pi y_H - 2V_O - R$$

and that cannot be improved upon since whoever the manager is has to get at least the value of the outside option. Therefore, in that case, a successor is not essential.

Consider now the case where

$$2V_O < \pi(1-\phi)y_H + \pi(1-\phi)y_H. \tag{8.1}$$

We will show that the result holds for $\theta = 1$, an assumption we will maintain for the rest of the proof. That it remains true for θ sufficiently close to 1 follows directly from the continuity of investors' payoffs in θ.

The above inequality implies $V_O < \pi(1-\phi)y_H$. If the optimal contract features termination with positive probability, then investors can replace termination with hiring manager 2 with an expected payoff of $\pi(1-\phi)y_H$ which gives investors a net surplus of $\pi\phi y_H > S$, without changing any other aspect of the investors' payoffs. Having a successor in place thus raises the investors' payoffs strictly. This only leaves the case where at the optimal, with no succession plan, investors commit to the CEO in period 2, regardless of the message received at date 1.

When the firm is managed by manager 1 throughout, regardless of early performance and given (8.1), investors' payoffs are

$$\pi y_H + \pi y_H - [\pi(1-\phi)y_H + \pi(1-\phi)y_H] - R. \tag{8.2}$$

Condition (8.1)implies that$V_O < \pi(1-\phi)y_H$. If investors commit to replacing manager 1 with manager 2 if a bad message is issued at date 1, they can make $V^L = V_O$ following a bad message in period 1 and, as a result, satisfying the truth-telling constraint only requires that $w^H = 0$ and

$$V^H = (1-\phi)y_H + V_O.$$

Since

$$\pi V^H + (1-\pi)V^L = \pi(1-\phi)y_H + V_O > 2V_O,$$

the participation constraint of manager 1 is met When manager 2 is called upon to be the CEO, which occurs with probability π, she can be promised $\pi(1-\phi)y_H$. From the point of view of investors, the net payoff is

$$\pi y_H + \pi y_H - [\pi(1-\phi)y_H + \pi V_O + (1-\pi)\pi(1-\phi)y_H] - R$$

which exceeds (8.2) since $V_O < \pi(1-\phi)y_H$. This completes the proof.

8.3 Proof of proposition 5.1

A successor is part of the optimal contract if and only if $2V_O R < \pi(1-\phi)y_H + \pi(1-\phi)y_H$. But this implies $V_O R < \pi(1-\phi)y_H$. Should $\epsilon_{M2} = 0$ then manager 2's participation constraint has slack when she is called to become the CEO, so that investors can request a strictly positive commitment from manager 2 at date 0. In that case, investors are strictly better off requesting at least part of V_O before the uncertainty is resolved.

8.4 Proof of proposition 5.2

To begin the backward induction search for equilibrium, start with manager 2's last move, following the proposal at stage 3, if any, by investor 2. Manager 2's optimal strategy at that node is to take the contract with the strictly highest payoff, if a contract happens to be available. From the point of view of manager 2, the contracts offered by either investors are two-dimensional objects: a request for a commitment $\epsilon_{M2} \leq V_O$ and a payoff if called to be the successor. Without loss of generality, for the purpose of the proof, we can assume that any offer by investor 2 requires all he can give up at this stage, since that is at least weakly optimal. In the case where two contracts are on the table – one from each investor – and there are two possibilities. When the two payoffs are the same, manager 2 can assign any weight

to either choice. When, on the other hand, one contract is strictly better ex-ante, manager 2 selects the better contract. Selecting a contract at this stage means both making the required commitment, but also choosing which firm to commit if a CEO fails at date 1.

At stage 3, investor 2's contract choice set is constrained by the contract already on the table. Specifically, investor 2 can only ask for a commitment of $V_O - \epsilon_{M2}$ from manager 2 when she has already accepted to forego commit ϵ_{M2} to investor 1's contract. In addition, investor 2 must offer at least the promise V_{M2} made by investor 1 to manager 2 in the event of failure at date 1. Given this, if the contract offered by the first investor is such that no positive NPV can be generated by investor 2, investor 2 is better off offering no contract. In the event that a contract with exactly zero value is available, investor 2 can randomize between offering that contract and not. If a contract with strictly positive NPV exists, then investor 2 offers the best possible contract.

At stage 2, manager 2 must decide whether to accept the offer made by investor 1, and, in particular, and commit ϵ_{M2} requested by the first investor. If he turns down the offer, then the second investor will simply offer the contract described in the previous section which, since the investor is making a take-it-or-leave it offer at that time, cannot be better, and is typically worse than the contract offered by investor 1. So we will simplify the analysis by immediately assuming that, at this second stage, manager 2 accepts any offer that satisfies their basic participation constraint.

This brings us to the node of interest: the initial contract offer by investor 1 at stage 1. One option on the table at this stage is to request the full manager 2's commitment. If so, investor 1 forces investor 2 to work with no commitment from manager 2. Under this circumstance, let V_{M2}^{max} be the maximum promise to manager 2 by investor 2 compatible with non-negative NPV to investor 2. If investor 1 offers $V_{M2} < V_{M2}^{max}$, the offer will be trumped by investor 2, since he can generate strictly positive NPV when stage 3 comes around. On the

other hand, setting any $V_{M2} > V_{M2}^{max}$ secures manager 2's services by investor 1. Moreover, for contracts with V_{M2} sufficiently close to V_{M2}^{max}, investor 1's contract, if accepted, generates a strictly positive NPV for investors. Indeed, if a promise of V_{M2}^{max} to manager 2 leads to zero NPV with no commitment on the part of manager 2, the same promise is associate

d with a strictly positive NPV.

From these considerations it follows immediately that any subgame perfect equilibrium must feature an offer by investor 1 that is accepted with probability 1 by manager 2, and provides a way to construct one such equilibrium, establishing existence as a by-product.[18] There only remains to argue that none of the subgame perfect equilibria can be such that $\epsilon_{M2} = 0$. If such an offer was on the table and generated strictly positive NPV (again, we just argued that generating strictly positive NPV is possible for investor 1) then the same contract exists for investor 2, since at least the same capital commitment is feasible and, therefore, they would preempt investor 1's offer, which contradicts the fact that all equilibria must feature contract offers by investor 1 that are accepted. This completes the proof.

[18] As is standard in sequential games where some action sets are continuous (the investors') while some (manager 2's) are discrete, it is also easy to argue that no equilibrium features mixing by manager 2 between contract offers that leave him indifferent. Mixing would cause a discontinuity in investor 1's payoff function and his best-response set would be empty. In all sequential equilibrium of this poaching game, manager 2 accepts investor 1's offer with probability 1.

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