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THE INTERNAL GOVERNANCE OF FIRMS

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ABSTRACT

We develop a model of internal governance where the self-serving actions of top management are limited by the potential reaction of subordinates. Internal governance can mitigate agency problems and ensure that firms have substantial value, even with little or no external governance by investors. Internal governance works best when both top management and subordinates are important in generating cash flow. External governance, even if crude and uninformed, can complement internal governance and improve efficiency. This leads to a theory of investment and dividend policy, where dividends are paid by self-interested CEOs to maintain a balance between internal and external control. Our paper can explain why firms with limited external oversight, and firms in countries with poor external governance, can have substantial value.

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The Internal Governance of Firms

The people you pay are more important over time than the people who pay you.[2]

A public corporation is commonly viewed as an organization run by CEOs and monitored by a board of directors on behalf of public shareholders. This view separates decision management (by the CEO and other managers) from decision control (by the board) and from investment and risk-bearing (by public shareholders). This governance structure is viewed as reasonable and efficient (Fama and Jensen (1983a, b) and Jensen (2000)), provided that decisions are made to maximize the value of shareholders' residual claim. Many public corporations thrive in this governance structure.

Yet the clear evidence that public corporations "work" has to be set against the equally clear evidence that most shareholders have little control over boards (Monks (2007)) and that many boards treat CEOs generously (Bebchuk and Fried (2004)). CEOs are self interested, not automatically faithful servants of the shareholders (see, for example, Jensen (1986, 1993), Morck, Shleifer and Vishny (1990) and Shleifer and Vishny (1989, 1997)). The market for corporate control can provide some discipline, but it is hard to see it as effective in controlling operational decisions. How then do we reconcile the survival and apparent efficiency of the public corporation with the weak channels through which it is supposedly governed?

We argue that there are important stakeholders in the firm, particularly its junior managers, who care about its future even if the CEO acts in his or her short-term self interest and shareholders are dispersed and powerless. These stakeholders, because of their power to withdraw their contributions to the firm, can force the CEO to act in a more public-spirited and far-sighted way. We call this process *internal governance*.

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[2] J. W. Lorsch and T. J. Tierney (2002), *Aligning the Stars: How to Succeed when Professionals Drive Results*. Boston, MA: Harvard Business School Press, p. 64.

The main departure of this paper from most of the existing literature is to see the firm as a composition of diverse agents with different horizons, different interests and different opportunities for misappropriation and growth. To fix ideas, think of a partnership run by an old CEO who is about to retire. The CEO has a young manager working under him who will be the future CEO. (We could just as well think of two young managers, each with a 50% chance of promotion, or four with a 25% chance, etc.) Three ingredients go into producing the firm's cash flow: the firm's capital stock; the CEO's ability to manage the firm, based on his skill and firm-specific knowledge, and the young manager's effort, which allows her to learn and prepare for promotion.

We assume the CEO can commit to an investment plan, which means the CEO will leave behind a pre-determined amount of capital stock. The CEO can appropriate everything else: he can tunnel cash out of the firm, consume perks, or convert cash to leisure by shirking. The CEO cannot directly commit future CEOs to any course of action.

Because the CEO has a short horizon, he could simply decide to take all of the cash flow, investing nothing for the future. But he needs the young manager's effort in order to generate the cash flow. If the manager sees that the CEO will leave nothing behind, she has scant incentive to exert effort, and cash flow falls significantly. To forestall this, the CEO commits to investing some fraction of current cash flow, building or enhancing the firm's capital stock in order to create a future for his young employee, thereby motivating her.[3] This allows the firm to build substantial value, despite being led by a sequence of myopic and rapacious CEOs.[4]

[3] It is hard to write contracts that specify future investment, since both the quantity and quality of investment should depend on the arrival of opportunities, on forecasted business conditions and on the CEO's business judgment, which are nearly impossible to measure or verify. Managerial learning effort is equally hard to contract on, though it can be rewarded ex post through promotion (Prendergast (1993)). However, we do not require explicit contracting here. All we need is some mechanism to make investment visible and credible to the junior manager.

[4] While our CEO is myopic and self-interested, in reduced form he acts as if he cares about his subordinates and the survival of the firm. Donaldson and Lorsch (1983) conclude from interviews that continuity of the firm is CEOs' primary objective. Donaldson (1985) describes top management's objective as maximizing corporate wealth, not shareholder value. Of course, most CEOs are not the caricatures that economic

We show that internal governance is most effective when both the CEO and the manager contribute to the firm's cash flows. If the CEO's contributions dominate, he has no desire to limit his capture of cash flow in order to provide incentives for the manager. If the manager's contributions dominate, she has little incentive to learn, because she cannot capture value today, and learning will be of little use when she does become the CEO. Also, both current and future profit opportunities matter for incentives, so internal governance works best when the business environment is stable.

We extend the basic model by allowing the CEO to commit to sell the firm to the manager when he retires. We show that this extends the horizon of the CEO so much that the first best level of capital investment is reached, given managerial effort. We call this the rolling partnership and it essentially reduces the agency problem at the firm down to the problem of incentivizing managerial effort. Of course, in a variety of situations, the manager is likely to be wealth constrained so that she cannot buy the firm from the CEO, and therefore the rolling partnership will not be feasible. We turn next to how outside equity can help replicate some of the effects of selling the firm on CEO incentives. We show that a combination of internal governance and a rudimentary form of outside governance by shareholders can improve the efficiency of the firm dramatically.

Suppose the firm is a public corporation. Following Fluck (1998) and Myers (2000), we assume that shareholders have only the crude but basic property right to take over the firm and its capital stock, firing the CEO if necessary. We assume that the capital stock would retain its best alternative value in the hands of the investors. In equilibrium, shareholders do not intervene, because the CEO delivers just enough value to the shareholders to keep them at bay. Value is delivered by paying out cash dividends or by investing cash to increase the capital stock, with a larger capital stock increasing the value of investors' claim.

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models like ours make them out to be, yet it is reassuring that even though we imbue them with no redeeming qualities, our model still has them investing for the future.

Outside equity thus has no direct control over investment or effort decisions – it has no operational influence. Even so, it can greatly enhance investment by the CEO and the value of the firm. Intuitively, the ability to issue outside equity allows the CEO to pledge the cash flow generated by future generations of CEOs to outside capital. This gives him the incentive to invest more, essentially by forcing future generations of CEOs to pay for the investment he makes. It can be shown that the steady state level of capital stock can be greater or less than the first best level, given managerial effort. But it certainly is greater than in our base case where the CEO cannot sell the firm to his manager.

We also obtain a theory of dividend policy. Shareholders do not care whether they are paid in cash or by increases in the firm's capital stock, which allow them to extract more payment in the future. For the CEO, the dollar paid out as dividends and the dollar left behind as investment costs the same, but initially the CEO prefers to pay by investing, which has the additional effect of motivating greater effort by the manager. With decreasing returns to investment, the rate of return falls, and eventually the CEO makes the manager worse off by investing more. Intuitively, additional investment increases cash flows in the next period, when the manager will be CEO. But the increased capital stock also increases shareholders' claim on the firm. When cash returns generated by investment are low, the latter effect may dominate the former effect. The current CEO will switch to paying dividends, not because shareholders prefer dividends to capital gains, but because more investment will reduce the rents going to the manager below her participation constraint. This then gives us a dividend policy that follows the life cycle of a firm. No dividends are paid when the firm is young and investment profitable, but dividends commence when the firm is mature.

More generally, the firm starts paying out when additional investment would impose too heavy a future burden on employees to meet the expectations of claimholders. We find that this combination of internal and external governance can encourage greater investment and longer

CEO horizons than if there was only external governance while eliminating the rents that would be extracted by top management if there was purely internal governance.

We offer these models to make a general point: The traditional description of the firm falls short on three counts. First, control need not be exerted just top down, or from outside; it can also be asserted bottom-up. The CEO has to give his subordinates a reason to follow, and that, implicitly, is how they control him. Second, the view that there is one residual claimant in the firm, the shareholder, is too narrow. Anyone who shares in the quasi-rents generated by the firm has some residual claims, and thus there is no easy equivalence between maximizing shareholder value and maximizing efficiency. Third, the fact that CEOs and managers get rents at different horizons means that each one has to pay attention to others' residual claims in order to elicit co-operation. The checks that parties inside the firm impose on each other ensure the firm functions well, even if outside governance is weak.

The rest of the paper is as follows. In section I, we present a simple model of internal governance. We solve it and analyze different outcomes. Section II extends the benchmark model to rolling partnerships. Section III explores external governance by public shareholders. Section IV discusses how our results relate to prior literature. Section V concludes.

I. The model

Consider a firm with a two-level managerial hierarchy. Each agent can work, at most, for two periods. At the top of the hierarchy is a CEO who is old. In the second layer is a young manager who will become CEO next period. We start with no outside investors, so it's best for now to think of the firm as employee-owned, a rolling partnership of managers and CEOS.

At the beginning of each period t, the current CEO commits to invest part of the period's cash flow. This determines the end-of-period capital stock k_t.[5] The CEO backs up his

[5] So at the beginning of period *t+1*, the capital stock k_t is verifiable by the junior manager. But a new CEO can appropriate both capital stock and cash flows -- in other words, he can "tunnel" out both assets

commitment with internal audit and accounting procedures sufficient to convince the manager that past investments will not be tunneled out of the firm and that the new investment will in fact be made. More comprehensive procedures allow more of cash flows and past investment to be "ring-fenced," ensuring the CEO cannot appropriate them.[6] The manager then decides how much she will engage in firm-specific learning effort s_t at a cost of s_t . Her effort contributes to the current period's cash flow C_t. At the end of the period, the CEO walks off with all of the cash or capital that was not ring-fenced for investment. The timeline of the model is given by Figure 1.

Figure 1: Model timeline

Period t Period t+1…

(1) CEO hires manager.	(2) CEO commits to end-of-period capital stock k_t	(3) Manager engages in learning effort s_t	(4) Cash generated. Investment made. CEO gets residual.	(5) CEO retires. Manager becomes CEO.

1.1. Learning by doing

Firm-specific learning is important for a manager to be effective. Learning by doing helps generate business and cash inflows when the manager is young. It is thus a form of effort, and we will use the terms "learning" and "effort" interchangeably. Learning also helps her make better decisions when she becomes CEO – for even though such knowledge may be critical for the CEO to function effectively, it may be much harder to acquire at the CEO level where vendors and customers will be far more circumspect, and the CEO's time more limited.[7] More specifically, at the end of any period t, the firm generates cash flows

$$C_t(k_{t-1}, s^{CEO}, s_t) = \theta_t \left(k_{t-1}\right)^{\gamma} [\, f(s^{CEO}) + g(s_t)] \qquad (1.1)$$

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and cash flows. This is not critical; with some added notation, we can handle situations where the CEO can take only cash flows, not capital.

[6] Internal auditing and accounting procedures may not be necessary, because the manager is an insider who can observe investment first-hand. But there has to be some way for the CEO to commit investment before the manager commits effort.

[7] Recent literature has called such learning "organizational capital." See Atkeson and Kehoe (2005) and Lustig, Syverson and Nieuwerburgh (2008), for example.

where θ_t is a measure of how favorable the business environment is at time t and γ is a constant less than one. The function f indicates the CEO's contribution to cash flows, and its argument, s^{CEO}, is the firm-specific learning acquired by the CEO at t – 1 when he was a young manager. The function g captures the manager's contribution to cash flows, where s_t is the learning effort the manager exerts at time t. Both f and g are increasing and concave and obey INADA conditions. All agents maximize the present discounted value of their remaining lifetime income. The discount rate applied to next period's cash flows is *r*.

1.2. What the CEO takes

We assume for now that the manager's wages are normalized to zero. The CEO captures everything but the capital stock that he commits to leave behind, that is, he appropriates $C_t + k_{t-1} - k_t = C_t - (k_t - k_{t-1}) = cash\ flow - investment$. It will be convenient to say the CEO determines investment, though technically he determines end-of-period capital stock. At the end of every period, the current CEO retires, so he has no direct incentive to preserve firm value for the future. The manager becomes the new CEO, because he is the only one with the relevant human capital to succeed – we will relax this assumption later.

We assume that cash flow always covers investment, so there is no need for outside financing. We consider outside financing in Section III. We now solve the model and see what it implies for CEO investment and managerial effort.

1.3. First best and second best

Inspection suggests that the first-best capital stock is

$$k_t^{FB} = \left[\frac{\theta_{t+1}}{1+r} \left(f(s_t^{FB}) + g(s_{t+1}^{FB}) \right) \right]^{\frac{1}{1-\gamma}} \tag{1.2}$$

where s_t^{FB}, s_{t+1}^{FB} are first best levels of learning effort.[8] s_t^{FB} solves

$$\frac{\theta_{t+1}}{1+r}\left(k_t^{FB}\right)^{\gamma} f'(s_t^{FB}) + \theta_t (k_{t-1}^{FB})^{\gamma} g'(s_t^{FB}) = 1 \qquad (1.3)$$

Thus the first-best level of capital stock increases with the prospective quality of the business environment, θ_{t+1}, but does not directly depend on the current business environment θ_t. In contrast, the first-best level of managerial learning depends both on the current as well as the future business environment since it affects current as well as future cash flows.

In the second-best case, there is no direct rationale for the current CEO to commit to leave behind any capital stock, because that generates cash returns only after he has retired. However, there is a kind of contemporaneous settling up, because the CEO's investment affects the future income of the manager, and therefore the manager's incentive to engage in learning effort, and in turn the firm's cash flows today. Start first with the CEO's income. It is

$$C_t(k_{t-1}, s^{CEO}, s_t^{SB}) - (k_t - k_{t-1}) = \theta_t \left(k_{t-1}\right)^{\gamma} [\, f(s^{CEO}) + g(s_t^{SB})] - (k_t - k_{t-1}) \qquad (1.4)$$

where s_t^{SB} is the manager's second-best equilibrium learning. Differentiating w.r.t. k_t, we see that the CEO's marginal net return from investing is

$$\theta_t \left(k_{t-1}\right)^{\gamma} g' \frac{ds_t^{SB}}{dk_t} - 1 \qquad (1.5).$$

This net return depends on current business conditions θ_t and capital stock k_{t-1} because these determine the cash flow impact of any increase in the manager's learning effort induced by CEO investment. It also depends critically on how the manager's optimal learning effort varies with investment, that is, on $\frac{ds_t^{SB}}{dk_t}$. This *sensitivity of effort to investment* is the channel through

[8] Formally, the first-best solves for investment and managerial learning pairs (k_t, s_t) for all t, so as to maximize the discounted sum of cash flows net of investment and managerial effort, where the net cash flow in period t is given by $C_t(k_{t-1}, s_{t-1}, s_t)$, as in Eq. (1.1), minus $[(k_t - k_{t-1}) + s_t]$.

which the CEO's investment feeds back into contemporaneous cash flows; it will be a central focus in what follows.

To see how this sensitivity is determined, first note that the manager chooses s_t^{SB} to maximize her future rents as the CEO. She maximizes

$$\frac{1}{1+r}\left[\theta_{t+1}\left(k_t\right)^{\gamma}\left[f(s_t)+g(s_{t+1})\right]-(k_{t+1}-k_t)\right]-s_t. \tag{1.6}$$

Differentiating and setting the result equal to zero, we get

$$\frac{\theta_{t+1}}{1+r}\left(k_t\right)^{\gamma} f'(s_t^{SB})=1 \tag{1.7}$$

So $s_t^{SB}=f'^{-1}\left(\frac{1+r}{\theta_{t+1}\left(k_t\right)^{\gamma}}\right)$. Since f' is decreasing, learning is greater if the future is discounted less (lower *r*), if the expected future environment θ_{t+1} is better, and if the CEO leaves behind more capital stock k_t.

Now totally differentiating the manager's first order condition (1.7) and rearranging, we obtain

$$\frac{ds_t^{SB}}{dk_t}=\frac{-\gamma f'}{k_t f''} \tag{1.8}$$

which is positive, implying that even a myopic CEO has incentives to invest for the future in order to motivate his manager today. Further specialization of functions gives illustrative closed-form solutions and numerical examples.

1.4. Specializing functions.

Assume that for the same amount of learning, the contribution of the CEO to cash flows is α times that of the manager, that is, $\alpha g = f$. Let $f(s_t)=\frac{1}{b-1}(a+bs_t)^{\frac{b-1}{b}}$ with $a \geq 0$ and $b > 1$. Substituting in Eqs. (1.8), then (1.5), we get

$$k_t = \theta_t (k_{t-1})^{\gamma} \frac{\gamma}{\alpha} \left(a + b s_t^{SB}\right)^{\frac{b-1}{b}} \tag{1.9}$$

Substituting f in (1.7) and rearranging, we get

$$\left(a + b s_t^{SB}\right)^{\frac{1}{b}} = \frac{\theta_{t+1}}{1+r} \left(k_t\right)^{\gamma} \tag{1.10}$$

$$s_t^{SB} = \frac{-a}{b} + \frac{1}{b} \left(\frac{\theta_{t+1}}{1+r} \left(k_t\right)^{\gamma} \right)^{b} \tag{1.11}$$

Given the capital stock k_t, the manager's effort s_t^{SB} depends only on the future business environment and the end-of-period capital stock, even though it affects current cash flows. This is because the manager does not share in current period rents. The current environment will affect her effort, but only through k_t. Substituting Eq. (1.10) in (1.9) and simplifying, we get

$$k_t = \left[\frac{\gamma}{\alpha} \theta_t \left(\frac{\theta_{t+1}}{1+r} \right)^{b-1} \right]^{\frac{1}{1+\gamma-\gamma b}} \left(k_{t-1}\right)^{\frac{\gamma}{1+\gamma-\gamma b}} \tag{1.12}$$

The current business environment today θ_t and the beginning-of-period capital stock k_{t-1} influence the end-of-period capital stock k_t, even though they have no effect on the returns produced by that capital stock, which are driven by θ_{t+1}. The intuition is simple: end-of-period capital adds to the CEO's income only by enhancing his subordinate's learning effort today. That matters more for current cash flows if today's business environment is good or if the current capital stock is high. Put another way, appropriating an additional dollar is more attractive for the CEO if today's environment is bad, or if the firm's capital stock is small, because the associated decline in effort by his employee does less absolute damage. Finally, the greater the relative contribution of the manager to cash flows, the greater the desire of the CEO to motivate learning effort by increasing investment.

1.5. The Steady State

In the steady state, $\theta_{t+1} = \theta_t = \theta^{SS}$ and $k_t = k_{t-1} = k^{SB}$. Substituting in Eq. (1.12) and simplifying, we get

$$k^{SB} = \left[\frac{\gamma}{\alpha} \frac{\left(\theta^{SS}\right)^b}{(1+r)^{b-1}} \right]^{\frac{1}{1-\gamma b}} \tag{1.13}$$

From Eqs. (1.12) and (1.13) we have

$$\frac{k_t}{k^{SB}} = \left(\frac{k_{t-1}}{k^{SB}} \right)^{\frac{\gamma}{1+\gamma-\gamma b}} = \left(\frac{k_0}{k^{SB}} \right)^{\left(\frac{\gamma}{1+\gamma-\gamma b}\right)^t} \tag{1.14}$$

Thus any initial capital stock converges to the steady state if $b < \frac{1}{\gamma}$. Steady-state managerial learning and cash flows net of investment and learning effort can also be calculated using Eqs. (1.11) and (1.1).

In Figures 2a, 2b and 2c, we plot the convergence to the steady state of investment, the manager's learning effort and net cash flows for two initial conditions, one with initial investment above the steady state and one below. This numerical example (and the ones to follow) employ benchmark parameter values $(1+r)^{-1} = 0.95$, $\gamma = 0.2$, $(b-1)/b = 0.3$, $\alpha = 0.5$, $a = 0$, and $\theta^{SS} = 1$. As the plots reveal, convergence is almost fully achieved within five CEOs' tenures. The convergence rate is faster when the firm starts farther from the steady state.

We can also determine the first-best steady state. We substitute the specific forms of f and g in Eqs. (1.2) and (1.3), simplify and solve to get

$$k^{FB} = \left[\frac{\gamma}{\alpha} \left(\frac{\theta}{1+r} \right)^b \left(\frac{1+\alpha}{b-1} \right) \left(\frac{1+r+\alpha}{\alpha} \right)^{b-1} \right]^{\frac{1}{1-\gamma b}} \tag{1.15}$$

Comparing the ratio of the second best steady state in Eq. (1.13) with the first-best steady state capital stock in Eq. (1.15),

$$\frac{k^{SB}}{k^{FB}} = \left[\frac{(1+r)}{\left(\frac{1+\alpha}{b-1}\right)\left(\frac{1+r+\alpha}{\alpha}\right)^{b-1}} \right]^{\frac{1}{1-\gamma b}} \tag{1.16}$$

It can be shown that the ratio in Eq. (1.16) is smaller than one. Note that (somewhat surprisingly) the ratio is independent of the steady-state business conditions. Finally, as can be verified analytically and as also shown in Figure 3a, the ratio in square brackets tends to zero as $\alpha \to 0$ or $\alpha \to \infty$. In other words, second-best capital stock goes to zero when the CEO contributes nothing to current cash flow ($\alpha = 0$) or the manager contributes nothing ($\alpha = \infty$).

The intuition is interesting. α represents the relative importance of the CEO in generating cash flows. If α is very high, the CEO does not really need the manager's effort, and hence sees little need to invest. If α is very low, today's manager, who reaps the benefit of her effort only when she is the CEO, sees little merit in effort, because that effort will do little to enhance her future rents. Thus the ratio in Eq. (1.16) is maximized at a positive, finite level of α.

Turn next to the ratio of second-best to first-best cash flows, which is:

$$\frac{CF^{SB}}{CF^{FB}} = \frac{\left(k^{SB}\right)^{\gamma}(1+\frac{1}{\alpha})f(s^{SB})}{\left(k^{FB}\right)^{\gamma}(1+\frac{1}{\alpha})f(s^{FB})}$$

Substituting values, we get

$$\frac{CF^{SB}}{CF^{FB}} = \left[\frac{(1+r)}{\left(\frac{1+\alpha}{b-1}\right)\left(\frac{1+r+\alpha}{\alpha}\right)^{\frac{b-1}{\gamma b}}} \right]^{\frac{\gamma b}{1-\gamma b}} \tag{1.17}$$

As with investment, the ratio is smaller than one and independent of steady-state business conditions.[9]

We summarize the steady-state results as follows.

(i) Under stable business conditions, second-best investment, managerial learning and cash flows are all smaller than their first-best counterparts.

(ii) Second-best cash flow is maximized when the CEO's contribution to cash flows is neither too large nor too small relative to the manager's contribution.

1.6. Some implications

Correlation of cash flow with investment

Internally-governed firms may naturally display a positive correlation between current cash flow and investment, even though there is no financing constraint thus far. The rationale is as follows. Managerial effort anticipates future business conditions *and* also responds to the CEO's current investments. Since the CEO's current investment is driven by the need to motivate effort so as to enhance current (not future) cash flows, it will be driven by current business conditions. Since current business conditions drive both cash flows and investment, there is a correlation between the two even after controlling for future business conditions. See Figure 3b, where we report coefficients from regressing investment normalized by past capital stock $\left(i_t / k_{t-1}\right)$ on cash flows $\left(Cashflow_t / k_{t-1}\right)$ and business conditions $\left(\theta_{t+1}\right)$.[10]

This investment-cash flow sensitivity emerges not because firms are financially constrained (unlike Fazzari, Hubbard, and Peterson (1988)), but because of a common factor driving investment and cash flow. Kaplan and Zingales (1997) suggest that many firms that have high investment-cash flow correlations do not actually face financial constraints.

[9] From an efficiency standpoint, it is more appropriate to focus on cash flows net of investment and managerial effort. It turns out that in this case too, the ratio of second-best outcome to the first-best is small when α tends to zero or infinity (for the same reasons) and is maximized at an interior level of α (see Figure 3a).

[10] The regression is based on draws of 500 periods around our benchmark example, where each period, the business condition is drawn to be a random variable that is uniformly distributed between 0.5 and 1.5.

Temporary shocks to business conditions

Better current business conditions increase the CEO's incentives to invest, even though they have no direct influence on the future cash flows produced by the investment, because of the indirect effect on managerial incentives. The current capital stock also alters investment incentives because it alters the value of managerial effort. If business conditions fluctuate, especially in the downward direction, these linkages can lead to significant inefficiency.

As an illustration, consider Figure 3c, where we "shock" the business condition at date t = 1 to $\theta_1 = 1.5$ or 0.5, compared to the steady-state value $\theta^{SS} = 1$. Even though an unexpected temporary shock to business conditions should not affect investment for the future, investment in period t = 1 moves substantially (depending on the shock), taking about four periods to revert to the steady-state (once business conditions revert to the steady-state starting at t = 2). An adverse shock to business conditions reduces current investment (or, equivalently, increases the CEO's incentive to take out cash), which then reduces the capital stock next period, and reduces incentives to invest next period (and also managerial effort) even though business conditions have returned to normal. Thus shocks have persistence; our model suggests that recessions are likely to be more prolonged in economies where internal governance predominates.

If business conditions are stable, however, the different horizons of the CEO and the manager could combine to disconnect cash flows and capital stock from business conditions. This is what we see in both Eqs. (1.16) and (1.17), where the ratio of second-best to first-best capital stock and cash flows do not depend on business conditions in the steady state.

1.7. Essential aspects of the mechanism of internal governance

We have assumed a CEO who is selfish, myopic and unconstrained by external governance. The future welfare of the firm or its employees has no weight in his objective function. All this can be relaxed. We can also replace terms like "capture" or "appropriation" with less loaded terms like "investment distortions" or "shirking." None of what the CEO does

need be illegal. In a similar vein, the "CEO" can be a stand-in for top management, while the "manager" could stand for critical employees.

But our goal is to see precisely what conditions are necessary for internal governance to work and to see where it could be an important support to corporate performance. Consider the necessary ingredients: the CEO should believe that undertaking future-oriented actions will increase current cash flows, and thus his welfare. This requires key stakeholders like customers and employees (see Hirschman (1970), Titman (1984)) to be interested in the future, even if the CEO is not. Customers are, however, typically at a distance, and leaving aside the purchase of high-value durable goods, are unlikely to be appropriately informed or concerned about a seller's future health.

This then leaves employees, particularly early- or mid-career managers, as the stakeholders most concerned, informed and able to act against short-sighted CEOs. They can be a reliable part of a mechanism of internal governance only if they have a stake in the future of the firm. This requires some firm-specific rents, which can come from some firm-specific ability or costs of leaving the firm (such as the costs of moving house and kids). The absence of such rents, either because external governance severely limits what employees can appropriate, or because employees are interchangeable across firms, would render internal governance ineffective.

Do we need the actions (investment and effort) to be staggered? If there are contemporaneous complementarities between CEO actions and managerial actions, the former could spur the latter. However, for this to be effective in improving manager incentives, the CEO should also commit to paying the manager an appropriate share of current rents.[11] This may be difficult, since learning effort is hard to contract on. Our model (also see Prendergast (1993))

[11] We have assumed that the manager's effort also pays off directly in the future, since it determines her capability as CEO. This link is not strictly necessary. If the manager's effort is critical in generating the cash flow necessary to make the investment, then the manager's effort could be linked to the future via investment. We have not explored this link. We thank Mark Rubinstein for suggesting it.

suggests that the rewards to learning may be prospective control rents from promotion in the firm, which suggests a model where CEO actions, such as investment, have long term effects.

In summary, the existence of future firm-specific rents can make employees far more effective in exerting internal governance. However, they do not do this by asserting "voice" in Hirschman's terminology (probably an easy way to get fired), but by reducing effort or by being reluctant to accept a job offer. None of this needs any coordination on the part of employees, or any appeal to the board of directors or to external governance.

II. Partnerships and efficiency

We have fixed the manager's reservation wage, for convenience at zero. This assumption is more important than it may seem at first glance, because it gives the manager rents when she starts work. The CEO would like to extract the rents by bargaining down the wage. The CEO could do so if there were competition among aspiring managers with independent wealth or the ability to borrow, and the negative wage he imposes would essentially be the price at which he sells the partnership to the manager. In practice, managers are unlikely to have independent wealth of the requisite magnitude, while moral hazard should impede borrowing on her personal account against future income. Nevertheless, this is an important possibility to explore.

Consider again the benchmark model of the private firm. Suppose we allow the CEO to fix the managerial wage *after* investment has been committed but *before* the managerial effort is incurred. Suppose also that there is no friction in the market for personal borrowing by managers, so that their entire stream of future rents can be pledged. Then, it is clear that under competitive labor market for managers, for any committed capital stock, the CEO can charge the manager an amount that sets her exactly at the reservation wage of zero. Formally, this amount is

$$w_t(k_t) = \frac{1}{1+r}\left[\theta_{t+1}(k_t)^{\gamma}\,[f(s_t)+g(s_{t+1})] - (k_{t+1}-k_t) + w_{t+1}(k_{t+1})\right] - s_t$$

The key question is how does this set of assumptions affect the CEO investment? The CEO's objective is now to choose investment k_t to maximize

$$\theta_t \left(k_{t-1}\right)^{\gamma} \left[f(s^{CEO}) + g(s_t^{SB}) \right] - (k_t - k_{t-1}) + w_t(k_t)$$

Substituting for $w_t(k_t)$, we can see that the CEO's objective takes the form of the entire present discounted sum of value created by the firm, which means he chooses the firm-value maximizing k_t given managerial response $s_t(k_t)$.

In other words, when managerial wage can be set by the CEO after investment has been committed and managers can borrow in an unconstrained manner against future income, the CEO internalizes *all* effects of investment choice on firm cash flows. We do not quite achieve first best yet because when she chooses effort, the manager still does not internalize the cash flow appropriated by the current CEO. Nevertheless, the agency problems of the firm are reduced to the moral hazard problem of managerial effort because the CEO "sells" the firm to the manager (see also Kreps (1990)).[12] The manager in turn anticipates that she will sell the firm when she is the CEO to the next manager at the price that internalizes all effects of that period's investment choice, and so on. The firm now resembles a rolling partnership where senior partners sell the firm to junior partners. We summarize this discussion as follows:

Proposition 1:

When there are no constraints on managerial ability to borrow against future rents to their human capital, a "partnership" model of the firm – a private firm where the CEO sells the firm to the manager – attains the efficient level of investments (given the moral hazard problem of managerial effort).

[12] Kreps (1990) focuses on the role played by reputation in lengthening decision-making horizons of myopic agents. In particular, he considers a model where an overlapping set of managers co-operate, by mutually trusting each other, since a manager next period "buys" the reputational capital of the current manager and this sale incentivizes the current manager for the long run, preventing defections motivated by his short-termism. See also Morrison and Wilhelm (2004).

In practice, the inability to pledge intangible human capital and the difficulty of borrowing against tangible assets are fundamental frictions that limit the ability of managers to raise money against future rents. One could think of the retiring CEO (retiring senior partners) accepting a promissory note from the manager (junior partners) in return for turning the firm over, but that would imply the CEO retains some ability to enforce claims on cash flows. But once we allow outsiders have some power of enforcement over cash flows, we enter the realm of outside financing, which we now turn to.

III. External Governance

Thus far we have modeled a firm with no need for external finance, for example an employee-owned cooperative or partnership, like a law or consulting firm. This may be the only feasible organizational form when assets are principally human capital or intangibles like client relationships. Now we assume that the firm seeks outside financing, which is feasible only if investors have some meaningful property rights. That in turn requires us to assume that the firm invests in assets that would retain a "second best" value (that is, the value without the use of the CEO's human capital) in the hands of outside investors. We give the investors only the most primitive property right to intervene and take the assets, however. This property right cannot play much of a role in "disciplining" the CEO. Instead it moves the firm to a better equilibrium. The extended framework also allows us to develop a theory of dividend policy.

2.1. Outside Equity

Following Fluck (1998) and Myers (2000), we give outside shareholders (or more generally, capital holders) only the most basic property right.[13] They cannot control the CEO's

[13] Equity could also be raised from private investors. We consider public corporations in order to show how internal governance works when outside investors have property rights but no ability to control operating or investment decisions or the capture of cash flow by the CEO. Private investors could intervene to shape operating decisions or discourage capture, which could create hold-up problems for

decisions, but at the beginning of each period *t* they can take over the assets of the firm, realizing β ($0 \le \beta < 1$) per dollar of capital stock. It turns out that β will represent the ease of raising outside capital, so we will term it the governance parameter. Clearly, $\beta = 0$ corresponds to the private firm case we analyzed thus far. If the CEO can make a commitment (see below) that satisfies the shareholders, they go away and return one period later, when they can threaten the assets available at that time once again. Shareholders have no control over any decisions the CEO makes in between.

As before, the CEO can make a commitment at the beginning of the period to make a portion of the cash flows and the end-of-period capital stock verifiable. Now, though, the CEO makes two other choices. First, the CEO can use the verifiable cash flows not only to commit to end-of-period capital stock but also to pay a dividend d_t. Second, the CEO can issue additional equity with proceeds of x_t.We assume the CEO sets each amount separately and optimally, though with mild assumptions, all that matters is the total amount the CEO leaves behind for investment and to pay the net dividend $d_t - x_t$.

We first analyze the dividend, seasoned equity offering (SEO) and investment decisions of a public going concern (that is, subsequent to an initial public offering (IPO)). Then we analyze the CEO's decisions and the value of the firm at IPO. Finally we consider whether outside equity can bring the firm closer to first-best investment and effort decisions.

The time line for a public going concern is given in Figure 4.

Figure 4: Model timeline with outside equity

Period t Period t+1…

(1) CEO hires manager.	(2) CEO commits to end-of-period capital stock	(3) Manager engages in learning effort	(4) Cash generated. Dividend paid; SEO raised;	(5) CEO retires. Manager becomes

junior managers. The relative efficiency of public vs. private equity is an intriguing topic for further research. So is the choice between debt and equity.

	k_t, SEO x_t and payout d_t.	s_t.	and, investment made. CEO gets residual.	CEO.

2.2. Investment, SEO and Payout

We require, without loss of generality, $d_t \geq 0$ and $x_t \geq 0$. The net dividend $d_t - x_t$ could however be negative. Given the net dividend, the CEO's effective investment in the project is $(k_t - k_{t-1}) + (d_t - x_t)$, which is smaller than the new investment $(k_t - k_{t-1})$ whenever the net dividend is negative. The ability to issue equity thus allows the CEO to invest with "other people's money", reducing the private costs incurred in making investments.

Further, when the CEO invests capital, he not only gives the manager a stronger incentive for effort; he also gives outside shareholders a larger claim on next period's cash flows. A part of this larger claim will be reduced by the amount that has to be promised to new shareholders to bring them on board. Therefore, the additional future claim on assets available to existing shareholders is $\beta(k_t - k_{t-1}) - x_t$ and they also receive a cash dividend of d_t. This total payoff to existing shareholders must exceed their required reservation payoff of $r\beta k_{t-1}$.

Also, the overall capital claim that is created, βk_t, reduces the manager's payoff next period when she becomes CEO as a higher reservation payoff needs to be offered to shareholders. We will therefore need to check whether the manager's participation constraint is met. From all this we will derive a theory of dividend policy.

The CEO's maximization problem is thus given by

$$\max_{k_t, x_t \geq 0, d_t \geq 0} \theta_t (k_{t-1})^{\gamma} [f(s^{CEO}) + g(s_t)] - (k_t - k_{t-1}) - (d_t - x_t), \tag{1.18}$$

$$s.t. \qquad \beta(k_t - k_{t-1}) + (d_t - x_t) \geq r\beta k_{t-1} \tag{1.19}$$

$$s_t \in \arg\max_{\hat{s}_t} \frac{1}{(1+r)}\left[\theta_{t+1}(k_t)^{\gamma}\,[f(\hat{s}_t)+g(s_{t+1})]-(k_{t+1}-k_t)-(d_{t+1}-x_{t+1})\right]-\hat{s}_t \quad (1.20)$$

$$and\ U(k_t)=\frac{1}{(1+r)}\left[\theta_{t+1}(k_t)^{\gamma}\,[f(s_t)+g(s_{t+1})]-(k_{t+1}-k_t)+x_{t+1}-d_{t+1}\right]-s_t \geq 0 \quad (1.21)$$

As can be seen readily, what matters in the CEO's problem is only the net dividend $d_t - x_t$. Let λ_1 and λ_2 be the Lagrangian multipliers for the net dividend constraint Eq. (1.19) and for the manager's participation constraint Eq. (1.21). The CEO's first order condition w.r.t. the net dividend is $-1+\lambda_1$ and w.r.t. k_t is:

$$\theta_t k_{t-1}^{\gamma} g' \frac{ds_t}{dk_t} - 1 + \beta\lambda_1 + \lambda_2 U'(k_t) \quad (1.22)$$

Complementary slackness requires that

$$\lambda_1[\beta(k_t - k_{t-1}) + (d_t - x_t) - r\beta k_{t-1}] = 0 \quad (1.23)$$

$$\lambda_2 U(k_t) = 0 \quad (1.24)$$

Now we describe what this means for the net dividend policy and investment. To start with, let the manager's participation constraint, Eq. (1.21), be satisfied with slack so that $\lambda_2 = 0$ from Eq. (1.24). Note that it is optimal for the CEO to set $[\beta(k_t - k_{t-1}) - x_t + d_t - r\beta k_{t-1}] = 0$ in Eq. (1.23), whereby $\lambda_1 = 1$. The capital investment raises shareholders' ability to extract and could potentially give shareholders more than their minimum required rate of return, so the CEO can offset this by reducing his effective investment through a negative net dividend. In other words, the net dividend is given by

$$d_t - x_t = r\beta k_{t-1} - \beta(k_t - k_{t-1}). \quad (1.25)$$

In general, there is indeterminacy between the size of cash dividend and the size of SEO. A plausible way to break the indeterminacy is to assume some small transactions costs of

issuance. This would imply that when the net dividend is negative, the CEO issues equity equal to the magnitude of the net dividend and makes no dividend payment, but when it is positive, he only makes dividend payments equal to the amount of new dividends. The CEO's cost of investing is his *co-investment* (the share of the investment he pays out of cash flows because capital cannot be fully pledged out and $\beta < 1$) plus the "rental" payment for employing capital, that is, $(k_t - k_{t-1}) + (d_t - x_t) = (1-\beta)(k_t - k_{t-1}) + r\beta k_{t-1}$.

This means that the return for the CEO from satisfying the dividend constraint by increasing capital stock is $\theta_t k_{t-1}^{\gamma} g' \frac{ds_t}{dk_t} - 1 + \beta$, which beats the return for the CEO from the case without outside equity ($\beta = 0$). So the CEO invests more in the presence of outside equity than he would in its absence, even though he still has no direct stake in the future. It can be verified that the equations determining investment and managerial effort are given as follows, with the only the first-order condition for CEO's choice of investment differing from the earlier case of the firm with no external claims :

$$\theta_t k_{t-1}^{\gamma} g'(s_t) \frac{ds_t}{dk_t} = 1 - \beta \tag{1.26}$$

and, as before $\frac{\theta_{t+1}}{1+r} k_t^{\gamma} f'(s_t) = 1$ and $\frac{ds_t}{dk_t} = \frac{-\gamma f'(s_t)}{k_t f''(s_t)} > 0$.

For simplicity, we continue to denote the solutions for investment and managerial effort as k_t^{SB} and s_t^{SB}, respectively, and suppress the dependence on external governance parameter β. Note that in the limiting case when $\beta = 1$, CEO does not need to sacrifice any current cash flows to make the investment (it can be fully financed from outside) and the first-order condition implies that he chooses an unboundedly high level of investment. This, however, would violate the manager's participation constraint. Let us turn to that now.

Manager's Participation Constraint

Thus far, we have assumed the manager's participation constraint is met. Substituting for the net dividend condition $[d_{t+1} - x_{t+1} = r\beta k_t - \beta(k_{t+1} - k_t)]$ in Eq. (1.21) and differentiating w.r.t. k_t, we get

$$U'(k_t) = \frac{1}{1+r}\left[\theta_{t+1}\gamma k_t^{\gamma-1}\left(f(s_t) + g(s_{t+1})\right) + (1-\beta) - \beta r\right] \qquad (1.27)$$

where the derivatives with respect to k_{t+1} and s_{t+1} drop out due to the Envelope Theorem. The term in the square brackets in (1.27), which is the cash return on investment next period plus the reduction in manager's co-investment next period. This can be negative when $\beta > \frac{1}{(1+r)}$ because the required future co-investment can increase with investment this period. For example, when β=1, next period's CEO has to pay r out of cash flows for every additional dollar invested today. Put differently, a higher capital stock means that today's manager puts in more effort, but she also has to pay shareholders more next period when she becomes CEO. If the cash return on investment is sufficiently low, the manager's utility can be reduced by increased investment. This should be contrasted with the last section, where we had no outside equity (and hence no negative term in the square brackets).

Note that for $\beta < \frac{1}{(1+r)}$, the term in the square brackets in (1.27) is always positive and the participation constraint is never hit. Intuitively, with weak governance, the manager's co-investment as CEO next period falls with an increase in capital stock at the end of this period, unlike in the above case with strong governance. For example, when β approaches zero, the CEO next period has to pay shareholders virtually nothing, and any additional investment today only reduces what she needs to invest out of cash flows to meet a target capital stock at the end of that period. Thus the rents to next period's CEO always increase with today's investment.

Let us focus on the case where business conditions are stable: $\theta_t = \theta \; \forall \; t$. For $\beta > \frac{1}{(1+r)}$ and well behaved functional form for U (as we elaborate below), the manager's expected rents $U(k)$ first increase in k and then decrease as diminishing marginal returns set in. This implies that $U'(k) < 0$ when $U(k) \leq 0$. In particular, as $\beta \to 1$, we have that $k \to \infty$ in this very period, $U'(k) < 0$ and therefore the constraint that $U(k) \geq 0$ must be violated for a sufficiently high k. Consider, therefore, β sufficiently high such that $U(k_{\hat{t}}^{SB}) < 0$. Let the first period where this happens be $\hat{t}$. Let k^* be such that in steady state (with capital stock remaining unchanging in the future) we have $U(k^*) = 0$. The CEO cannot set capital any higher than k^* for fear of violating the manager's participation constraint, and will have to meet equity's rate of return constraint by setting the net dividend to be $d_{\hat{t}} - x_{\hat{t}} = r\beta k_{\hat{t}-1} - \beta(k^* - k_{\hat{t}-1})$. Otherwise, the CEO could make the manager worse off by investing more capital (even though he still increases her marginal incentive to exert effort), because he increases the capacity of outside equity to extract value by more than he increases the capacity of the manager to generate cash as CEO next period.

This means from date $\hat{t}$ onwards, the need to ensure the manager's participation constraint will mean capital is steady at k^* and the net dividend will be positive and equal to $d_t - x_t = r\beta k^* - \beta(k^* - k^*) = r\beta k^*$.

We state all this as a formal result below. Assume that the manager has a well-behaved expected utility function ($\lim_{k \to 0} U(k) > 0$, $\lim_{k \to \infty} U(k) < 0$, $U''(k) < 0$, and $U'(k) < 0$ for some k). When the business environment is constant, we have

Proposition 2: *A public firm with an initial capital k_0, outside equity financing, and external governance parameter β is characterized as follows:*

The capital stock, k_t^{SB}, and managerial effort, s_t^{SB}, before the firm reaches the steady state are obtained from the first-order conditions: $\theta k_{t-1}^{\gamma} g'(s_t)\frac{ds_t}{dk_t} = 1-\beta$ and $\frac{\theta}{1+r}k_t^{\gamma} f'(s_t) = 1.$

(i) The capital stock, k_t^{SB}, and managerial effort, s_t^{SB}, are both increasing in the external governance parameter β.

(ii) There exists a critical value $\beta^* \in \left(\frac{1}{(1+r)}, 1\right)$ such that if and only if $\beta > \beta^*$, does the firm reach the steady state in which the equilibrium utility for all future CEOs is zero (they are at their participation constraint and earn no rents net of effort). In particular, the steady state is hit in the first period $\hat{t}$ when $k_{\hat{t}}^{SB} > k^*$ and k^* is such that $U(k^*) = 0$.

a. The steady state capital stock is k^* in period $\hat{t}$ and after, and the steady state dividend is $d^* = r\beta k^*$ in period $\hat{t}+1$ and after.

b. In period $\hat{t}$, the net dividend (dividend net of SEOs) is $[r\beta k_{\hat{t}-1}^{SB} - \beta(k^* - k_{\hat{t}-1}^{SB})]$ which is a cash dividend if positive and an equity issuance if negative.

c. The rate of convergence to steady state is increasing in external governance, that is, $\hat{t}$ is (weakly) decreasing in β.

(iii) The net dividend before steady state is reached is $[r\beta k_{t-1}^{SB} - \beta(k_t^{SB} - k_{t-1}^{SB})]$ which is a cash dividend if positive and an equity issuance if negative.

Proof: As explained in the text and omitted. Details available on request.

The proposition then suggests the life cycle pattern of net dividend payments and investment that is empirically observed. In the early stages of a firm's life cycle, when k_t is low,

capital investment will grow at a rate greater than *(1+r)*. In these cases, the firm's net dividend payment is negative, that is, it raises further financing from the external markets rather than paying out a cash dividend. As the firm becomes more mature and rates of return fall, the net dividend becomes less negative -- the size of the SEO falls and eventually ceases as the firm starts paying positive dividends. Finally, when capital stock is so high (and return on capital is so low) that investing more would de-motivate the manager as it violates her participation constraint, the CEO will stop investing further, the capital stock will stabilize, future CEOs will also all be at their participation constraint, and the firm will make a steady cash dividend payout to investors. Now we need to determine the size of the first capital issuance, that is, the IPO stage.

3.2 Initial Public Offering

Let us see what happens earlier, when the CEO takes the firm public through an initial public offering (IPO) in period τ . In keeping with the spirit of our analysis, the CEO appropriates the proceeds from the offering entirely. The CEO chooses investment k_τ to maximize

$$\theta\left(k_{\tau-1}\right)^{\gamma}\left[f(s^{CEO})+g(s_\tau)\right]-(k_\tau-k_{\tau-1})+\beta k_\tau \tag{1.28}$$

since external governance allows outside shareholders to get value equal to share β of the capital stock next period. Now, the first-order condition for the CEO's investment is given by

$$\theta\left(k_{\tau-1}\right)^{\gamma} g'(s_\tau)\frac{ds_\tau}{dk_\tau}-1+\beta. \tag{1.29}$$

Hence, as in the case of the ongoing concern, the CEO at the time of IPO also has a greater incentive to invest (for any initial level of capital stock) compared to the second-best in absence of equity. This is because a higher end-of-period capital stock also increases the proceeds he gets from the IPO. In a sense then, the ability to "sell" the firm lengthens the CEO's horizon and gives him the incentive to invest more.

We summarize this discussion in the following proposition:

Proposition 3: *Once a firm with external governance parameter β (such that $\beta > 0$) goes public, its capital stock before reaching steady state is always higher than that of the firm without outside equity.*

Proof: Omitted.

IPO, Ongoing Concern and Investment Growth: An example

Let us go back to our example where $f(s_t) = \alpha g(s_t) = \frac{1}{b-1}(a+bs_t)^{\frac{b-1}{b}}$ with $a \geq 0$ and $b > 1$ and $\gamma < \frac{1}{b}$. Then, we obtain that $(a+bs_t) = \frac{\theta_{t+1}^b k_t^{\gamma b}}{(1+r)^b}$; $k_t = \left[\frac{\theta_t \gamma k_{t-1}^{\gamma} \theta_{t+1}^{(b-1)}}{\alpha(1-\beta)(1+r)^{(b-1)}}\right]^{\frac{1}{1-\gamma(1-b)}}$.

Also $\frac{dU}{dk_t} = \frac{1}{1+r}\left[\frac{\theta_{t+1}\gamma k_t^{\gamma-1}}{(b-1)}\left((a+bs_t)^{\frac{(b-1)}{b}} + \frac{1}{\alpha}(a+bs_{t+1})^{\frac{(b-1)}{b}}\right) + 1 - \beta(1+r)\right]$. Then, with stable business conditions $U'(k_t)$ is ∞ as $k_t \to 0$, and $\frac{1}{1+r} - \beta$ as $k_t \to \infty$. Furthermore, $U''(k_t) < 0$. Finally, in steady state,

$U(k_t) = \frac{1}{(1+r)}\left[\theta(k_t)^{\gamma}(1+\frac{1}{\alpha})\ f(s_t) - r\beta k_t\right] - s_t = \frac{a}{b} + \frac{\theta^b k_t^{\gamma b}(\alpha+b)}{(1+r)^b \alpha b(b-1)} - \frac{r\beta k_t}{(1+r)}$, which is $\frac{a}{b}$ as $k_t \to 0$, and $-\infty$ as $k_t \to \infty$. Since $U'(k_t)$ is first positive, then negative if $\frac{1}{1+r} < \beta$, it follows that $U(k_t)$ first increases from a positive number, then falls below zero, crossing zero at a single point. We can then map out dividend policy and investment for any set of parameters.

Let the CEO decides to take the private firm public at τ =10, after it has reached (its private firm) steady state. In its private steady state, $k_{\tau-1}$ = 0.0108. We consider two values of the governance parameter: $\beta = 0.5$ and $\beta = 0.9999$ (to approximate the limiting case with full ability of the firm to pledge assets to outside financiers). Figure 5a shows that when $\beta = 0.5$, in

the period of the IPO, investment grows almost four-fold to k_{10}^{IPO} = 0.041. And then within six more periods, it converges to a steady-state value of 0.057. Clearly, the IPO has boosted investment substantially (and also managerial effort). The CEO would have little incentive to set this level of capital stock, were it not for the added incentive coming from the extra equity value he can raise through the IPO if he raises investment. Figure 5b shows that this effect is especially powerful as external governance improves. When $\beta = 0.9999$, the investment in the IPO phase itself grows multifold to 106.31, reaching its steady-state value in just one period of 337.62.

It is interesting to also examine the dividend policy of the firm post IPO. Figures 5c and 5d illustrate that when the firm is in the "growth phase", net dividend is negative as the firm is investing capital at a fast pace. Eventually, once the firm reaches the steady state, net dividend becomes positive. No further capital issuance is needed and the firm starts paying out a cash dividend. This dividend policy mirrors well the life-cycle of equity issuance and dividends observed for young firms that do an IPO and eventually reach their mature phase.

Finally, what is the current manager's utility over these growth phases and as a function of the external governance? Figure 5e plots this utility net of the effort incurred in learning as a manager. At the IPO stage and in the initial growth phase, this net utility ($U(k)$) rises steadily. Consistent with Proposition 2, when the external governance is relatively weak, the net utility converges to a positive steady-state value. In other words, managers are able to extract rents in equilibrium since capital stock never grows that large. While this is beneficial for managers, it leads to lower investments. In contrast, when the external governance is relatively strong, the manager's net utility rises sharply in the IPO period but then declines rapidly once capital grows to a level where diminishing returns to scale kick in. Once the utility reaches the reservation level of zero, each current CEO cannot grow capital any further (Figure 5b) without violating his manager's participation constraint (Figure 5e) and thus is forced to pay outside equity in the form

of cash dividends (Figure 5d). The firm thus switches from its extraordinary growth phase to steady-state capital with stable cash dividends.

3.3. Discussion

How do Internal Governance and External Governance Interact

We have earlier considered the case of only internal governance. Relative to that, the IPO expands investment and managerial effort for two reasons. First, the IPO changes the CEO's investment incentives in the period of the IPO. (We do not model when the CEO decides to undertake the IPO, though this is an interesting extension). But the boost to capital stock given by the IPO would not be enough for sustained growth, for in the absence of outside equity, both capital stock and effort would subsequently decline to the steady state. Outside equity prevents such a decline: Subsequent CEOs are required to compensate outside equity, but allowed to defer payment by building additional capital stock. This immediately alters the investment incentives of future CEOs, ensuring also that managerial effort remains high. As a result, the IPO potentially moves the firm to a better equilibrium.

What if we only had external governance? Clearly, the CEO would have no reason to invest for the future. He would be willing to commit to leaving behind only so much cash as to pay shareholders their opportunity cost, that is, $(1+r)\beta k_{t-1}$. The CEO is better off liquidating and paying out β dollars in cash rather than leaving a dollar of capital stock behind. A dollar of capital stock is worth only β dollars to outside shareholders but costs the CEO a dollar to retain. So the CEO would always want to liquidate.

Without internal governance, the outside shareholders would have to worry a lot more about their property rights to the firm's assets, because they can't piggyback on monitoring by the manager. The worry increases as the CEO starts to liquidate, because it's easier to tunnel cash than hard assets. Thus the CEO is motivated to turn assets into cash, regardless of whether the

cash is paid out or tunneled out. So our model indicates that internal governance is needed for the firm to last beyond the current period, when CEOs are myopic and rapacious.

No Secondary Issues

An interesting special case is one where the CEO can take the firm public but there are no subsequent secondary issues. If the pace of initial growth in capital stock is high, the effective return on book equity can be higher than r -- because the CEO cannot "dilute" the greater power he bequeaths to equity with the higher capital stock by making secondary equity issuances. Moreover, even when the rate of growth of capital stock would naturally fall below r, the CEO will choose to set it at r because he would always prefer to pay the external financiers "in kind" by committing to leave behind more capital than in cash. As earlier, cash dividends would be paid out only once the capital stock becomes so large that the managerial participation constraint becomes binding.

Interestingly though, in absence of SEOs, the value of equity can reflect the future growth in the capital stock (which would otherwise be diluted through future secondary share issuances). In turn, at the time of IPO, potentially greater equity can be raised and the CEO may invest more. This is because his co-investment is reduced by the greater equity proceeds. It is an interesting question whether a public firm that protects initial equity providers by ruling out SEOs (through CEO's incentive compensation and governance) does better in the long run compared to a public firm that allows such dilution. We leave this for future research.

Outside Equity Owned Firms and Rents

Interestingly, in the steady state for the public firm, the CEO gets no rent in that his participation constraint is just met – he appropriates just enough, after paying the required dividend, to compensate for his effort as manager in the previous period. But because he can appropriate all the cash flows at the margin, he has the maximum possible incentive to exercise effort. The firm cannot give him a better incentive scheme based on cash compensation.

The reason why rents are reduced to zero, despite a succession of rapacious CEOs, is interesting. Each CEO cares only about his take, and about the manager only to the extent that it impacts managerial effort. By raising capital stock, the CEO raises managerial effort but also the capacity of shareholders to extract their return. Eventually, the rents of the future CEO will fall with more investment, even as the manager's effort keeps increasing, but the current CEO is not concerned – he is doing to his successor only what his predecessor did to him. The self interest of each CEO works on behalf of outside shareholders and ensures that future managerial rents are driven to zero. All this happens in a setting where outside shareholders have no way of affecting operating or investment decisions, and no direct way to limit the capture of cash flow by the CEO.

Public Firms and Private Partnerships

In a public firm, the CEO's ability to pledge the cash flow generated by future generations of managers to outside capital gives him the incentive to invest more. Essentially, through an equity issue, the CEO forces future generations of managers to pay for the investment he makes. It can be shown that the steady state level of capital stock can be greater or less than the first best level, given managerial effort. But it certainly is greater than the level in a private firm where the CEO cannot sell the firm to his manager.

In a private firm with a manager who is not wealth constrained, the CEO sells the firm to the manager directly, As we have seen, the CEO invests at the first best level (given effort) because the CEO internalizes the entire stream of future cash flows generated by the firm, not just the portion that can be pledged outside.

So given managerial effort, a private firm, where the manager buys the firm from the CEO and sells it in turn to her manager when she retires would be better than a public firm under the same circumstances. Of course, when the manager in a private firm is wealth constrained, the public firm can produce far greater value than the private firm despite the additional distortions it introduces.

This then suggests that in human capital intensive industries where managers account for a substantial portion of value added and thus get a high wage, they are likely to have the wealth to buy the firm from the CEO. The typical firm will be structured as a rolling partnership. In capital intensive industries where much of the value added comes from capital, the manager's relatively lower wage will make it harder for her to buy the firm. Public firms will be the norm. This suggests an additional rationale for the association of public firms with capital intensive sectors – it is not just that capital intensive firms give outsiders a greater set of control rights, it is also that they are harder to sell to internal owners.

Founders, Stock Markets, and Incentives to Innovate

Finally, when public markets exist with good governance (high β), the founding CEO can appropriate a substantial portion of the cash flows generated over time by generations of future CEOs by undertaking an initial public offering. This then gives him strong incentives to bring together the source of the firm's rents – patents, processes, or people. Thus, the difference in wealth between innovative entrepreneurs and professional managers is substantial. By contrast, when public markets have poor governance, future CEOs appropriate a significant portion of future cash flows, investment ramps up slowly, and the founding CEO has lower incentives to innovate. The difference in wealth between innovative entrepreneurs and professional managers is now smaller.

IV. Relationship to literature

Our model resembles Fama (1980) where concerns about the adverse reputational consequences of misappropriation on his post-retirement career keep the CEO on the straight and narrow. In contrast to the ex-post settling up in that model, the settling up in our model is contemporaneous and by parties whose interests are intimately involved – employees endogenously penalize excessive misappropriation. The difference is important, for instance, in explaining the effects of external finance (Section 3).

We are, of course, not the first to analyze the phenomenon of internal governance. Fama and Jensen (1983 a, b) as well as Hansmann (1996) refer to mutual or internal monitoring, though they do not undertake a detailed analysis. Landier, Sraer, and Thesmar (2006) appeal to the independence of top executives (as measured by their having preceded the CEO into the firm). Instead, we rely on their self interest - the fact that they typically have career concerns inside the firm. The mechanism through which they have impact is not through coordinated action or through appeal to a Board, but through their propensity to get de-motivated. This is neither exit nor voice, in the felicitous terminology of Hirschman (1970), nor active whistle-blowing as in Dyck, Morse and Zingales (2007), but an uncoordinated, even implicit, strike.

Allen and Gale (2000, Chapter 12) also consider a model with overlapping generations of short-term CEO and managers vying for the CEO role next period. Allen and Gale assume complementarities between the CEO and managers in cash flow production, which gives the CEO the need to elicit co-operation and lengthens the effective horizon of decision-making. They explain based on the model the relative merits of the "stakeholder"-focus of governance of Japanese firms at one extreme and the "shareholder"-focus of Anglo-Saxon firms at the other extreme, with French and German firms somewhere in between.[14]

Similar to Allen and Gale (2000), Landier, Sraer, and Thesmar (2008) focus on situations where CEO and manager actions are complementary, and examine the role of optimal dissent in an organization. Intuitively, it is easier for a CEO to persuade the manager to follow him down the wrong path when they have similar private preferences over projects. Managers with different preferences would place greater constraints on the CEO, but at the cost of them being less enthusiastic when the CEO's project choice correctly accords with his own preferences.

[14] Allen, Carletti and Marquez (2007) explore a related theme and study the effect of stakeholder capitalism in a setting where firms' concerns about employees and suppliers soften competition in product markets and enhance shareholder value.

Finally, implicit in our framework is a theory of the firm and its boundaries. In our view, the firm is an agglomeration of assets and specialized human capital which give it unique capabilities (see, for example, Penrose (1959), Grossman and Hart (1986), Hart and Moore (1990), and Rajan and Zingales (1998, 2001)). The literature suggests the ability to control access to the rents the firm generates is top management's source of control. In this paper, we focus on the "bottom-up" influence over firm actions, exercised by those who have access but do not yet have explicit control, because of their ability to affect the firm's rents.

V. Discussion and Conclusion

Our model is simple, perhaps even overly so. Top management is both myopic and self interested. Yet, considerable value is preserved in the organization because of the need for top management to motivate younger managers.

Our model suggests why it may be so hard for firms to shrink gracefully, and why it may make sense for a firm (like Philip Morris) in a mature, declining, industry like tobacco to diversify into a growing industry like food (by acquiring Kraft). If the firm were to stay in the declining industry, it would either have to overinvest or see a collapse of incentives, and worse, a collapse of the discipline imposed by internal governance. Rather than see the value destruction associated with such a decline, the second best option might be to "morph" into a new business. What might be thought of as empire building by top management may just be a reaction to pressure from below. Indeed, Gort, Grabowski and McGukin (1985) find that unfavorable expectations of marginal returns to investment in existing businesses are an important spur to diversification, a finding consistent with the implications of our model (but also with others).

The breakdown of internal governance may also explain the increasing evidence of agency problems in financial firms in the ongoing crisis. When capital is relatively scarce and allocated based on detailed information available only within a firm, employees of financial firms are relatively immobile. Each one cares about the longer term future of their own firm, and has an

incentive to monitor the actions of both colleagues and superiors. As capital becomes more widely available, though, employees become more mobile, and care less about the long term future of their firm. The internal pressure to worry about the long term becomes weaker.

Finally, our paper suggests a rich interaction between the internal structure of firms, the strength of internal governance, and the need for any external governance. Internal governance may be quite effective in growing firms with young staff, where human capital is firm specific. By contrast, external governance may be much more important in mature firms in declining industries with aging staff where the required management skills are fairly generic. Countries like Japan that have had a rapid demographic transition may also have suffered as their old system of internal governance becomes less effective in a newer environment.

More generally, there is a rich vein of research to be mined in seeing the linkages between the internal organization of firms, internal governance, and external financing and governance. We have just touched the surface in this paper. More research clearly needs to be done.

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Figure 2a: Convergence of investment in second-best to the steady state

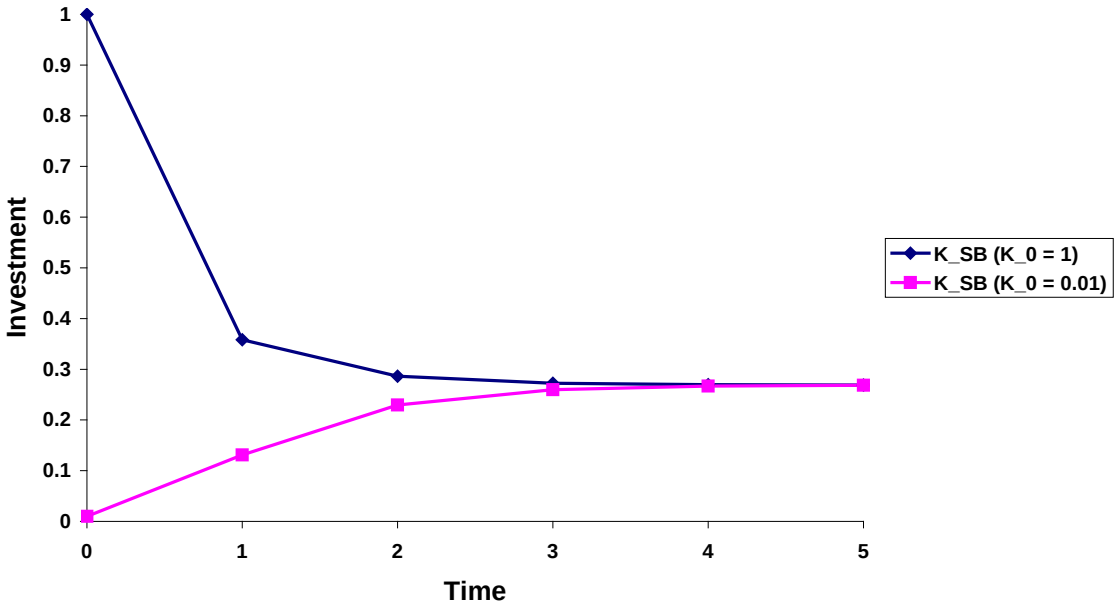

Figure 2b: Convergence of managerial learning in second-best to the steady state

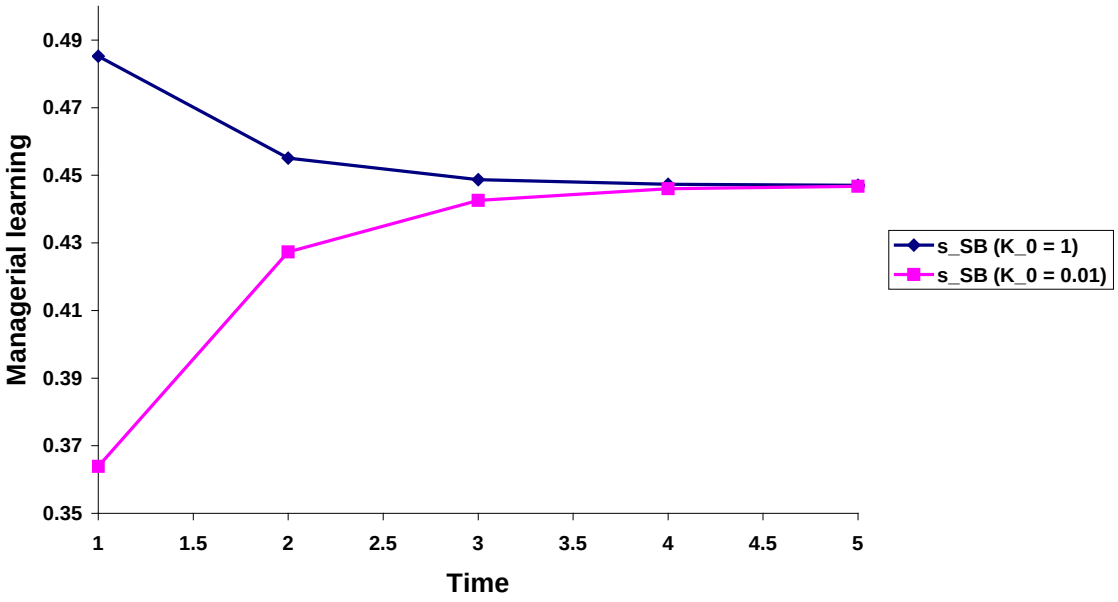

Figure 2c: Convergence of net cash flow in second-best to the steady state

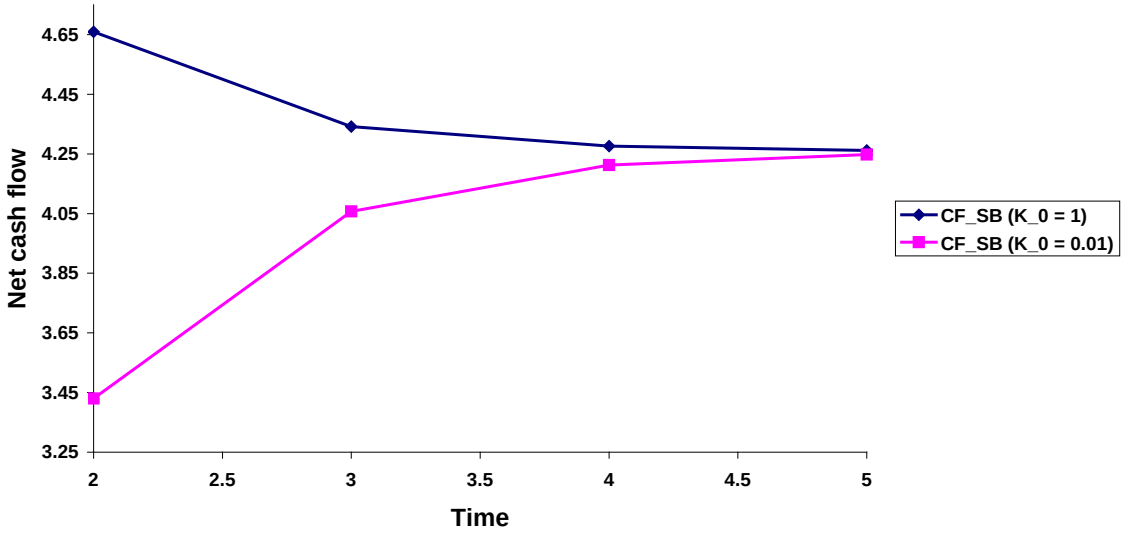

Figure 3a: Ratio of steady-state outcomes between SB and FB

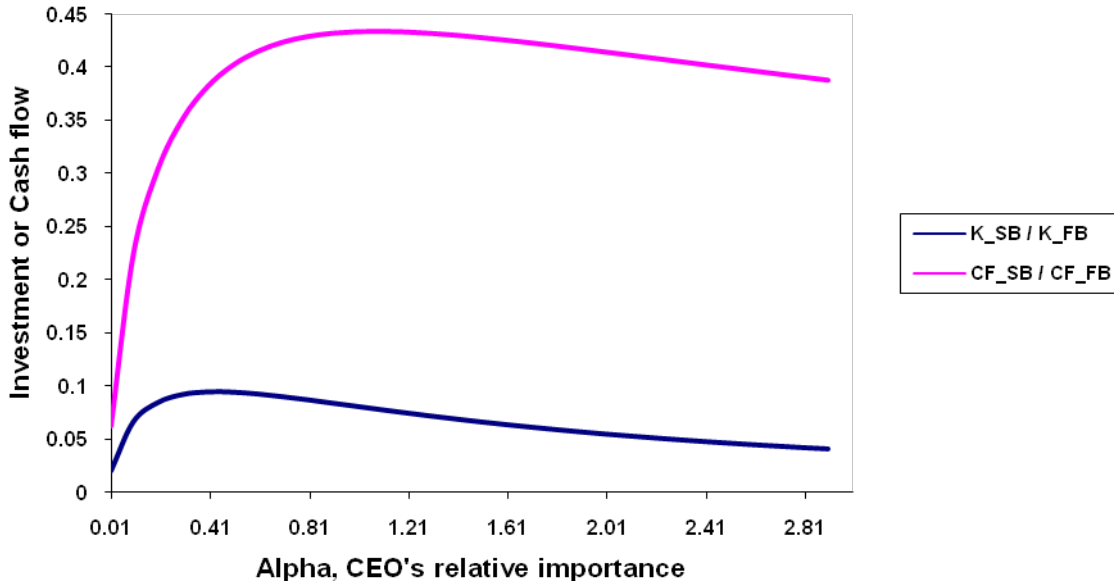

Figure 3b: Sensitivity of investment to cash flow in a regression on cash flow and future conditions

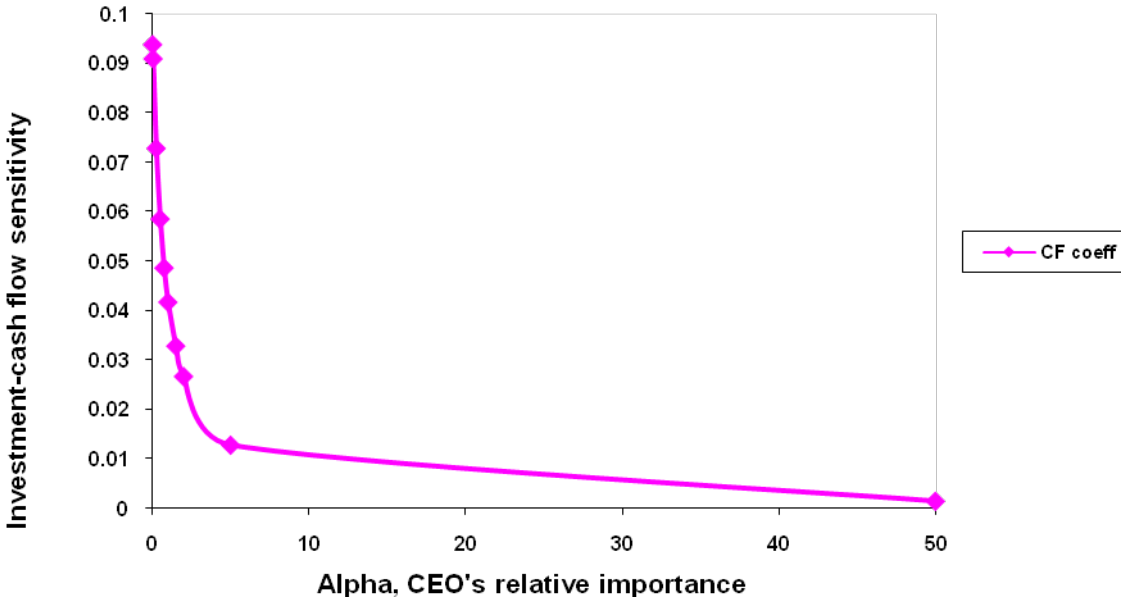

Figure 3c: Sensitivity of investment to future conditions in a regression on cash flow and future conditions

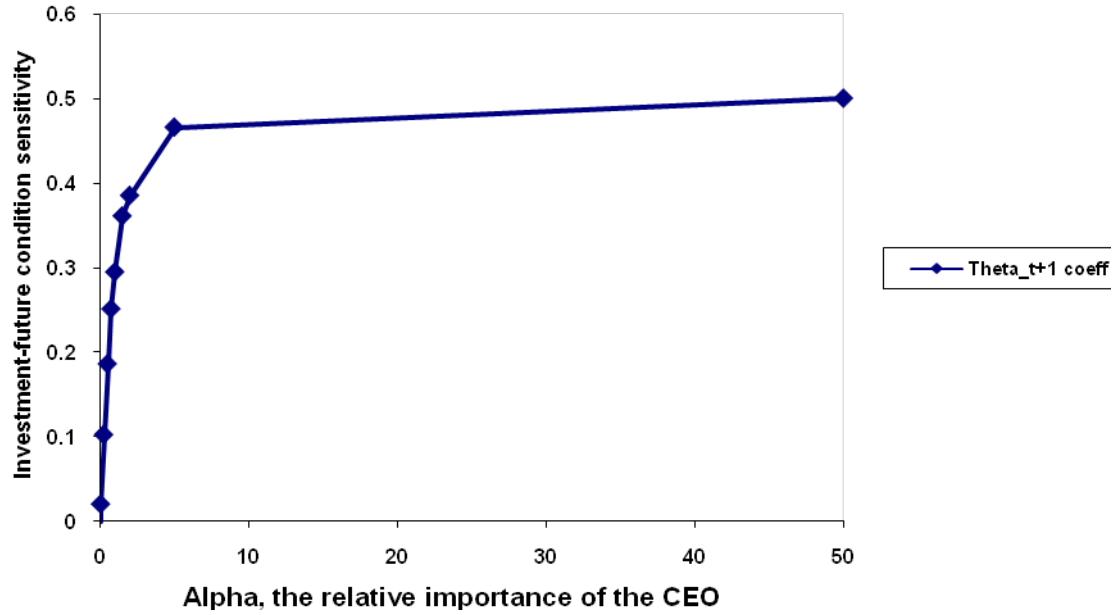

Figure 3d: Convergence of investment after temporary shock at t = 1

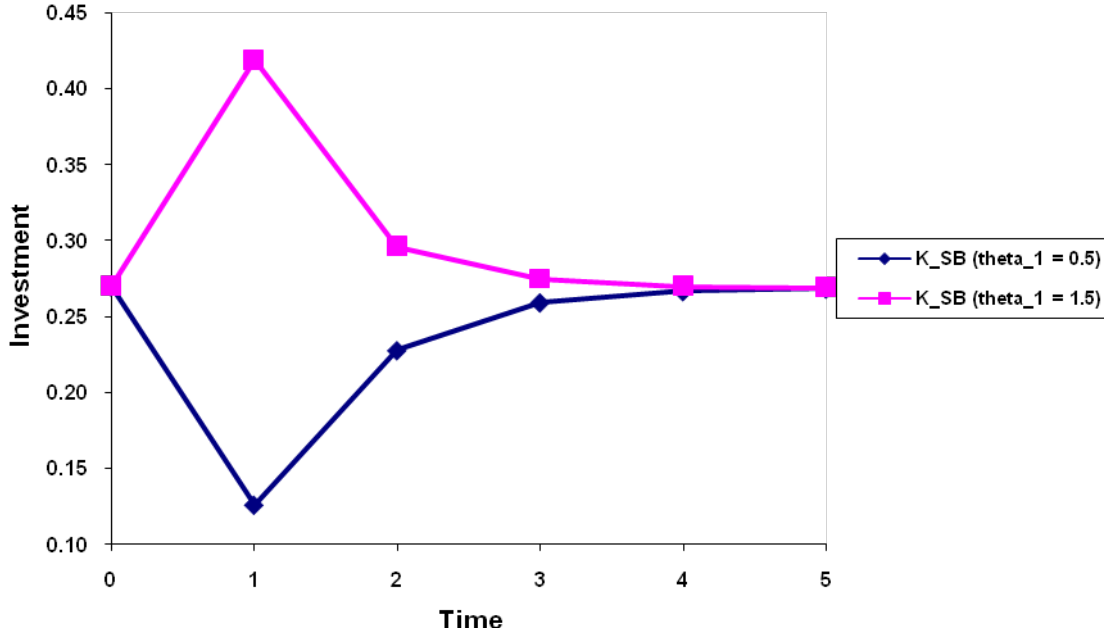

Figure 5a: Investment with and without equity, low goverance case (IPO at t=10)

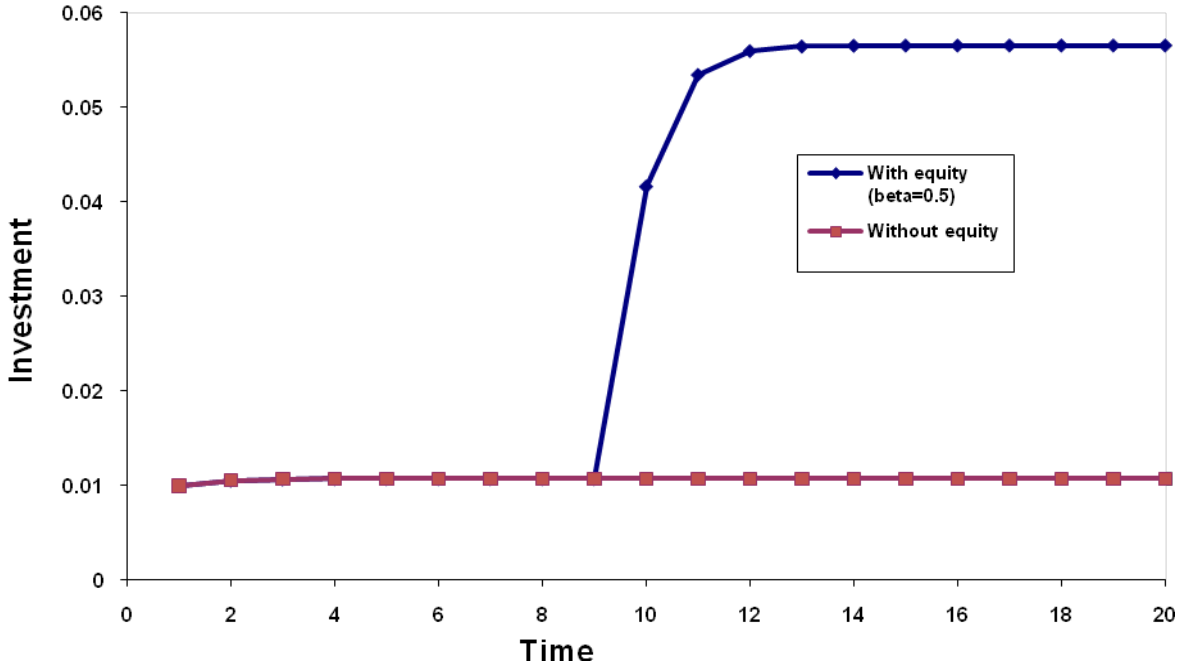

Figure 5b: Investment with and without equity, high governance case (IPO at t=10)

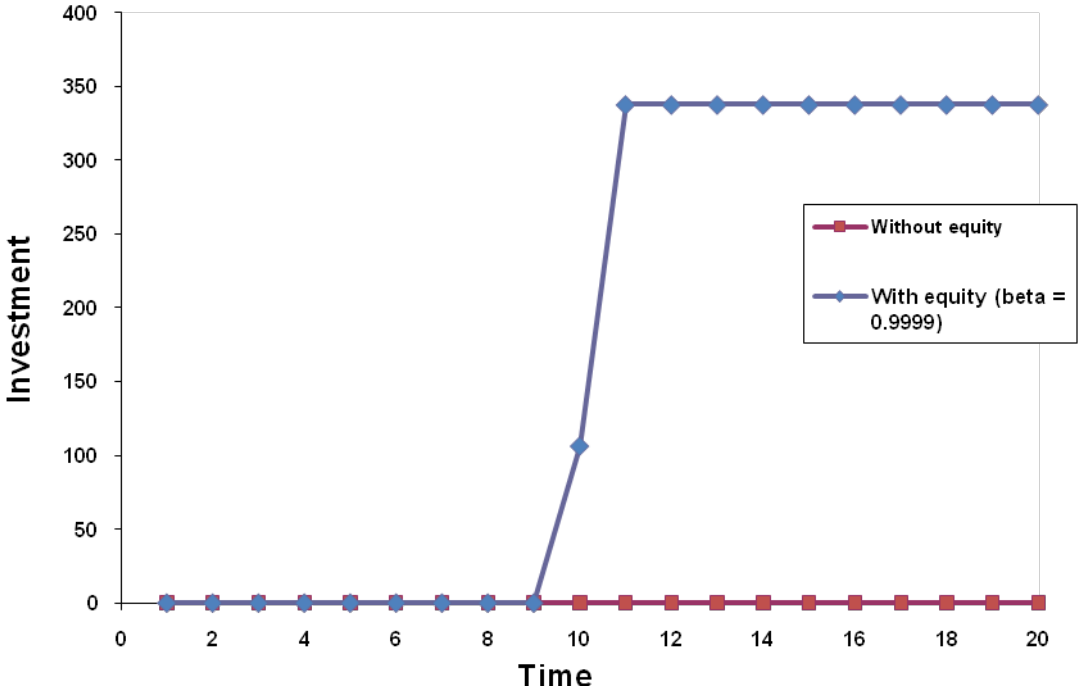

Figure 5c: Net dividends and equity issuances, low governance case (IPO at t=10)

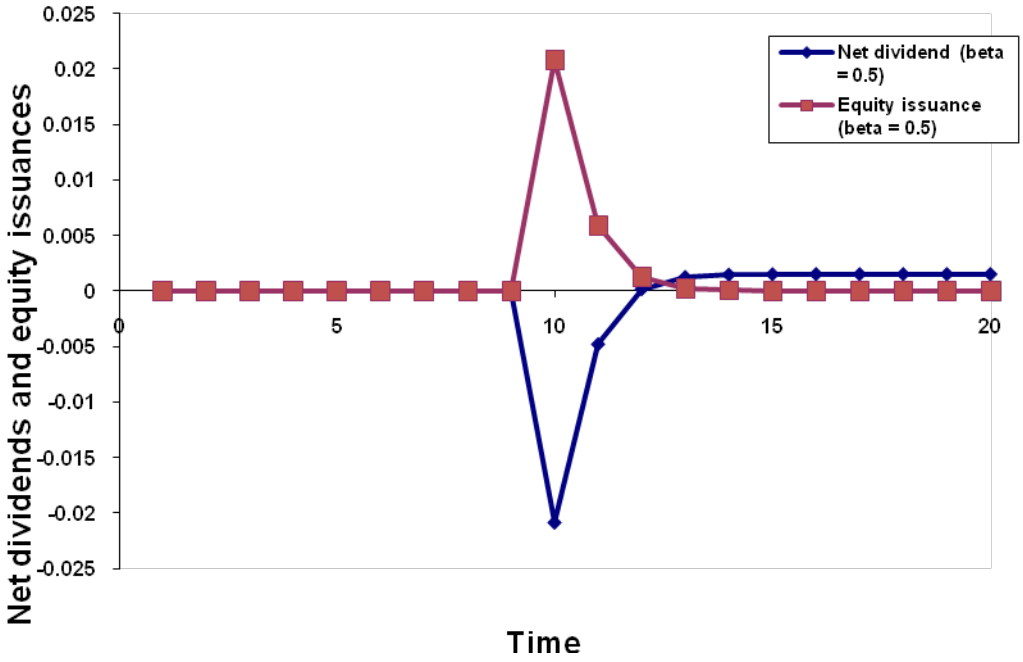

Figure 5d: Net dividends and equity issuances, high governance case (IPO at t=10)

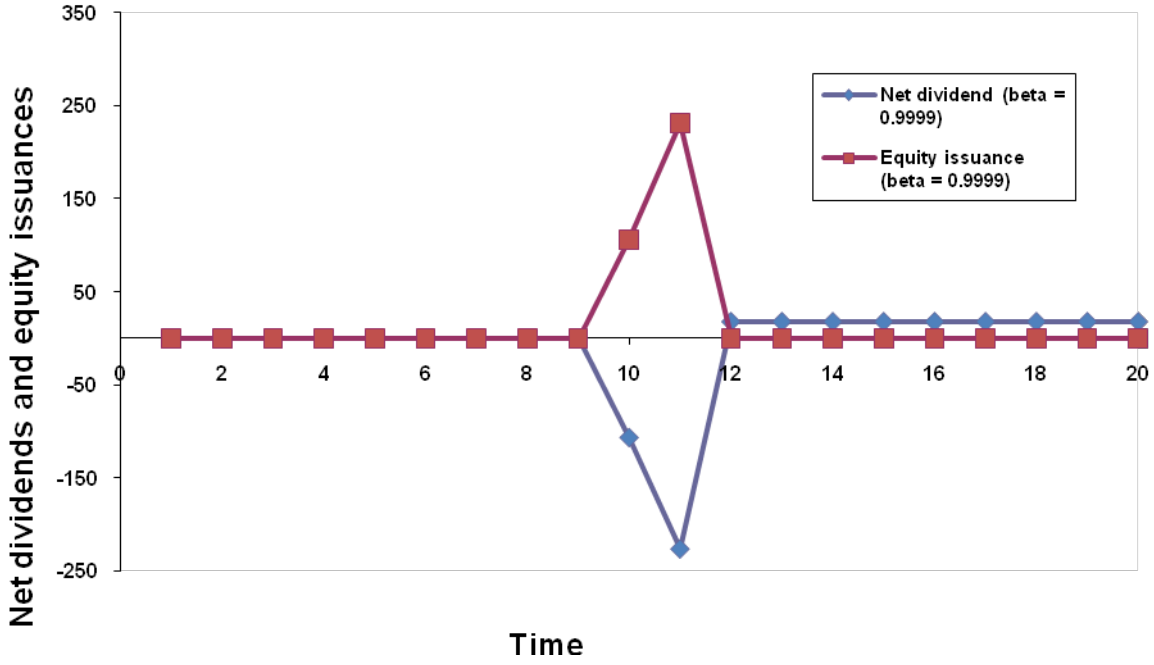

Figure 5e: Manager's net utility for different levels of equity governance (IPO at t=10)