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ABSTRACT

The Internal Governance of Firms

We develop a model of internal governance where the self-serving actions of top management are limited by the potential reaction of subordinates. We find that internal governance can mitigate agency problems and ensure firms have substantial value, even without any external governance. Internal governance seems to work best when both top management and subordinates are important to value creation. We then allow for governance provided by external financiers and show that external governance, even if crude and uninformed, can complement internal governance in improving efficiency. Interestingly, this leads us 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. Finally, we explore how the internal organization of firms may be structured to enhance the role of internal governance. Our paper could explain why firms with limited external oversight, and firms in countries with poor external governance, can have substantial value.

JEL Classification: D23, G31, G32, G34, G35, L21 and M51
Keywords: agency theory, corporate governance, dividends, internal organization and short-termism

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The common view of the public corporation is that of an organization run by top managers, and monitored by a board of directors on behalf of public shareholders. The separation of decision management (the CEO) from decision control (the board) and from risk-bearing (public shareholders) is thought of as a reasonable way to structure firm governance (see Fama and Jensen (1983 a, b), Jensen (2000)), and so long as decisions are made in the interests of the residual claimants, efficiency is maximized.

Yet the clear evidence that the public corporation has survival value has to be set against the equally clear evidence that most shareholders have little control over boards (see, for example, Monks (2007)), that many boards are poorly informed and have little ability to scrutinize top management's decisions (see, for example, Mace (1971)), and that some CEOs are self interested rather than working for shareholders (see, for example, Jensen (1986, 1993), Morck, Shleifer and Vishny (1990), and Shleifer and Vishny (1989, 1997)). Admittedly, the market for corporate control can offer some discipline, but it is hard to see it as effective in controlling operational decisions. How then do we reconcile the survival, and hence presumed efficiency, of the public corporation with the ineffectiveness of the supposed channels through which it is governed?

We will argue in this paper that there are important stakeholders in the firm, such as critical employees, who care about its future even if the CEO has short horizons and is self-interested and shareholders are dispersed and powerless. These stakeholders, because of their power to withdraw their contributions to the firm, can force a self-interested myopic CEO to act in a more public-spirited and far-sighted way. We call this process "internal governance".

The main departure of this paper from much of the existing literature is to not treat the firm as a monolithic single-employee entity, but to see it as composed of diverse agents with different horizons, different opportunities for misappropriation and growth, and different interests. To fix ideas, think of a partnership run by an old CEO who is about to retire, and who has a young manager working under him who will be the future CEO. Three ingredients go into

producing the firm's current cash flows. First, the firm's capital stock, which could be the firm's stock of physical capital (machines), or organizational capital (networks), or relationship capital (client relationships); Second, the CEO's ability to manage the firm based on his talent and his knowledge of its specific problems; Third, the young manager's effort, which allows her to learn to deal with the firm's specific issues.

We assume the CEO can put in place internal audit and accounting mechanisms that would make a pre-determined amount of cash flows and assets verifiable, and ensure they are left behind as the firm's capital stock. The CEO can appropriate the remaining cash flows and assets – more generally, he can consume perks, "tunnel" cash and assets out of the firm through self-dealing, or even not generate cash by shirking on the job.

Note that because the CEO has a short horizon, he could simply decide to appropriate all of the cash flow and assets. However, in order to generate cash in the first place he needs the young manager to put in effort. If the manager sees little future in the firm because the CEO leaves nothing behind, the young manager will have little incentive to exert effort. This can reduce cash flows considerably. To forestall this, the CEO will commit to investing some fraction of the cash flows, and to preserving past capital stock, in order to create a future for his young employee, thereby motivating her.[2] This allows the firm to build substantial amounts of value, despite being led by a sequence of myopic and rapacious CEOs.[3]

We show that internal governance is most effective when neither the CEO nor the manager dominate in contributions to the firm's cash flows. Intuitively, if the CEO dominates, he

[2] It is hard to write contracts with the CEO on investment since both the quantity and quality of investment should depend on business conditions, and the CEO's business judgment, all of which are hard to specify ex ante. Managerial learning effort is equally hard to contract upon, though it can be rewarded ex post through promotion (see Prendergast (1993)).

[3] While our CEO is myopic and self interested, in reduced form he appears to act as if he cares about his subordinates and the survival of the firm. Indeed, Donaldson and Lorsch (1983) suggest from their interviews of top CEOs that continuity of the firm, rather than maximizing shareholder value, appears to be the primary stated objective of CEOs. Of course, most CEOs are not the caricatures that economic models like ours make them out to be, yet it is reassuring that even though we imbue them with no redeeming qualities, the model still has them doing reasonably good things for the firm.

has no desire to limit his appropriation in order to provide incentives for the manager. If the manager's contributions dominate, the manager has little incentive to learn because she cannot appropriate value today, and the learning will be of little use when she does become the CEO and can appropriate value. Also, because both contemporaneous and forward looking elements of the business environment matter for participant incentives, internal governance works best when the business environment is stable and the age profile of employees slopes up the hierarchy.

We have implicitly assumed so far that the firm's capital stock is in intangible assets such as the human capital of employees or client relationships, which cannot be seized or sold. But what if the investment were instead in tangible assets, such as machines or land, which could be seized and sold? This would then offer a role for outside financing (for example, equity), and would allow the firm to be structured as a public corporation. We show that the combination of crude outside governance, together with internal governance, can improve the efficiency of the firm dramatically.

To see this, we assume that, in the spirit of Fluck (1998) and Myers (2000), outside equity has the capacity (through the board of directors) to periodically exercise its fairly crude ownership right of taking over control of the assets. Outside equity thus has no direct effect over the investment or effort decision – it has no operational influence. Even so, it can greatly enhance investment by the CEO and the value of the firm. In our framework, the improvement is not because outside equity monitors the actions of the CEO, but primarily because equity holders are indifferent between being paid in cash or being "paid" via [the control rights inherent in] a higher capital stock. For the CEO, the dollar paid out as dividends and the dollar left behind as investment costs the same, but the CEO prefers to pay by investing to increase capital stock because this will have the collateral effect of motivating greater effort by the manager. This could explain the reluctance of firms to pay dividends, even when returns on investment are not great.

Eventually, as the rate of return on capital falls, the CEO could make the manager worse off by investing more capital. This is because investment will increase the capacity of outside

equity to extract value by more than it increases the capacity of the manager to generate cash (net of this period's effort cost) as CEO next period. This is when the current CEO will switch to paying dividends – not because of the pressures exerted by outside equity alone, but because more investment will de-motivate managers. This then gives us a dividend policy in firms run by self-interested CEOs that corresponds to the observed life cycle of a firm, with dividends not being paid when the firm is young and investment profitable but only when the firm is mature.

Interestingly, this combination of internal and external governance can eliminate the rents extracted by management, even though equity's control rights are very crude. Other forms of providing incentives do not always fare so well. We examine whether giving the CEO equity-based compensation can improve matters. It turns out that under a variety of circumstances, it does not – interestingly, the limited control rights possessed by outside equity imply that equity values do not reflect the entirety of cash flows produced by the firm. Indeed, the dictum to maximize equity value may offer little relevant guidance in such firms.

Our point, more generally, is that the traditional description of the firm in the first paragraph falls short on three counts. First, control need not be exerted just top down, or from outside, it can also be asserted bottom-up. Put differently, the CEO has to give his subordinates a reason to follow, and this, implicitly, is how they control him. Second, the view that there is one residual claimant in the firm, the shareholder, is probably 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 different parties have claims to different residual rents at different horizons means 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 control is weak.

The rest of the paper is as follows. In section I, we present a simple model of internal governance; in section II, we solve it and analyze different outcomes. We then explore the role of

external governance in section III, and discuss extensions of the model in section IV as well as its relation to the prior literature. We then conclude.

I. The model

Consider a firm with a two-level managerial hierarchy. Each agent can work, at most, for 2 periods. At the top of the managerial hierarchy is a CEO who is old. In the second layer is a manager who is young, and who will become CEO next period (see Cremers and Grinstein (2008) for evidence of internal succession). At the beginning of each period t, the current CEO decides the internal audit and accounting procedures to put in place. More comprehensive procedures allow more of cash flows and past investment to be made verifiable or "ring-fenced" ensuring the CEO cannot appropriate them. Since cash flows cannot be paid as dividends (for now), the current CEO effectively determines the firm's end-of-period capital stock, k_t.[4] The manager then decides how much she will engage in firm specific learning effort, s_t, at a cost of s_t.

1.1. Learning by doing

Firm-specific learning is important for a manager to be effective. Not only does such learning help generate business and contribute to firm cash flows when the manager is young (it is thus a form of effort and we will use the terms "learning" and "effort" interchangeably), it 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.[5] More specifically, at the end of any period t, the firm generates cash flows

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

[4] So at the beginning of period *t+1*, the capital stock k_t is verifiable. However, after that, the CEO has the capacity to appropriate both capital stock and cash flows by withdrawing all the audit and accounting procedures put in place by the previous CEO – in other words, he can "tunnel" out both assets and cash flows. This is not critical – with some added notation, we can handle situations where only cash flows are subject to appropriation.

[5] Recent literature has called such learning "organizational capital" (Atkeson and Kehoe, 2005, and Lustig, Syverson and Nieuwerburgh, 2008, being some examples).

θ_t is a measure of how favorable the business environment is at time t for generating cash flows, and γ is a constant less than one. Function f indicates the CEO's contribution to cash flows, and its argument, s^{CEO}, is the firm-specific learning acquired by the CEO when he was a young manager (that is, in period t-1). Function g captures the manager's contribution to cash flows, with s_t being 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 (1+r).

1.2. Appropriation

We assume employee wages are normalized to zero for now. The CEO appropriates 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 in what follows, though technically he determines end-of-period capital stock.[6] 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 later.

1.3. Timing.

The timeline of the model then is:

Period t Period t+1…

CEO hires manager.	CEO commits to end-of-period capital stock k_t	Manager engages in learning effort s_t	Cash generated. Investment made. CEO gets residual.	CEO retires. Manager becomes CEO.

Figure 1: Timeline

[6] They are equivalent if we allow investment to be negative – that is the CEO does not offset even natural depreciation.

II. Internal Governance

We now solve the model and see what it implies for CEO investment and managerial effort.

2.1. First best level of capital stock.

Inspection suggests that the first best level of capital 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.[7] Similarly, s_t^{FB} solves

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

Thus the first-best level of capital stock increases with the prospective quality of the business environment, θ_{t+1}, and importantly, 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.

2.2. Second best

In the second best, 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. To see this simple point, start first by writing down the CEO's income. It is

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

[7] 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 equation (1.1), minus $[(k_t - k_{t-1}) + s_t]$.

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

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

The 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. Critically, it also depends on $\frac{ds_t^{SB}}{dk_t}$ - how the manager's optimal learning effort varies with investment. Indeed, this *sensitivity* of effort to investment is the channel through which the CEO's investment feeds back into contemporaneous cash flows, and will be a central focus in what follows. To see how this is determined, first note the manager chooses s_t^{SB} to maximize her future rents as the CEO. That is, she maximizes

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

Differentiating and setting this equal to zero, we get

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

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

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

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

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 allows us to obtain closed form solutions.

2.3. Specializing functions.

Let $\alpha g = f$, that is for the same amount of learning, the contribution of the CEO to cash flows is α times that of the manager. Further, let $f(s_t) = \frac{1}{b-1}(a + bs_t)^{\frac{b-1}{b}}$ with $a \geq 0$ and $b > 1$.

Substituting these assumptions in (1.8), then (1.5), we get,

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

Substituting f in (1.7) and rearranging, we get

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

This then gives us

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

Note that given 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 – her horizon is different. Of course, the current environment will affect her choice, but only through k_t .

Substituting (1.10) in (1.9) and simplifying, we get

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

Interestingly, the business environment today, θ_t , and beginning-of-period capital stock, k_{t-1}, influence the end-of-period capital stock, 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 by doing today. That, in turn, matters more for current cash flows if today's business environment is good or if 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, $\frac{1}{\alpha}$, the greater is the desire of the CEO to motivate learning effort by increasing investment.

Steady state

In the steady state, $\theta_{t+1} = \theta_t = \theta^{SS}$ and $k_t = k_{t-1} = k^{SB}$. Substituting in (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 (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 equations (1.11) and (1.1).

In Figures 2a, 2b and 2c, we plot the convergence to the steady state of investment, managerial learni ng and net cash flows, respectively, for two initial conditions – one that has initial investment above the steady state and one that has 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 CEO

tenure periods. Further, as is clear from equation (1.14) and the plots, the convergence rate is faster when the firm is farther from the steady state in its initial condition.

Comparison to the first-best steady state

We can also determine the steady state under the first best. Substituting the specific form for f and g in (1.2) and (1.3), simplifying and solving, we 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 (1.13) with the first best steady state capital stock above, we get $\frac{k^{SB}}{k^{FB}} = \left[\frac{(1+r)}{\left(\frac{1+\alpha}{b-1} \right) \left(\frac{1+r+\alpha}{\alpha} \right)^{b-1}} \right]^{\frac{1}{1-\gamma b}}$ (1.16). It can be shown that the ratio in (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, as $\alpha \to 0$ or $\alpha \to \infty$, the ratio in square brackets tends to zero, suggesting that the capital stock under the second best agency solution tends to zero relative to the first best level.

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 exerting effort, because that effort will do little to enhance her future rents. Indeed it is easily seen the ratio is maximized at a positive, finite level of α.

Turn next to cash flows. $\frac{CF^{SB}}{CF^{FB}} = \frac{\left(k^{SB}\right)^{\gamma} (1+\frac{1}{\alpha}) f(s^{SB})}{\left(k^{FB}\right)^{\gamma} (1+\frac{1}{\alpha}) f(s^{FB})}$. 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 investments, the ratio of the agency-modulated second-best cash flows to the first-best cash flows is smaller than one and independent of steady-state business conditions.[8] We summarize this discussion in the following proposition.

Proposition 1: *Under stable business conditions, second-best investment, managerial learning and cash flows are all smaller relative to their first-best counterparts. Further, the efficiency of the organization in generating cash flows, measured as the ratio of cash flows under the second-best to those under the first-best, is maximized when the CEO's contribution to cash flows is neither too large nor too small relative to the manager's contribution.*

Proof: Omitted (available upon request).

2.4. Some implications

Cash flow correlation with investment

Interestingly, internally-governed firms may naturally display a correlation ("sensitivity") between investments and current cash flows. 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

[8] 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 maximized at an interior level of α (again, see Figure 3a).

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 $\left(\theta_{t+1}\right)$).[9]

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

Temporary shocks to business conditions

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

As an illustration, consider Figure 3c wherein we "shock" the business condition at date t=1 to two possible values of θ_1 = 1.5 or 0.5 compared to the steady-state value θ^{SS} = 1. Even though an unexpected temporary shock to business conditions should not affect investment for the future, the 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). Intuitively, an adverse current shock to business conditions reduces current investment. This 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 in our model of internal governance – recessions are likely to be more prolonged in economies where internal governance predominates. If, however, business

[9] 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 $\left(\theta_{t+1} \sim Unif[0.5,1.5]\right)$.

conditions are stable, the differing horizons of the CEO and the manager (the former focused on contemporaneous cash flows, the latter on future cash flows) could combine to make cash flows, appropriately sensitive to business conditions. This is what we see both in (1.16) and (1.17), where, in the steady state, the ratio of second best to first best capital stock or cash flows do not depend on business conditions. It is in this sense that internal governance may work best when conditions are stable, rather than when conditions fluctuate (especially downwards) dramatically.

2.5. Essential aspects of the mechanism of internal governance

We have assumed external governance to be weak, that the CEO's objective function has no forward looking components, and that the CEO is self-interested – 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 "appropriation" with less loaded terms like "investment distortions" or "shirking". None of what the CEO does need be illegal.

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 a future-oriented action should increase current cash flows, and thus his welfare. Clearly, 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 or large amounts of intermediate goods, are unlikely to be appropriately informed or concerned about a seller's future health.

This then leaves employees as the stake holders most concerned, informed, and able to act against mismanagement. Again, whether they can be a reliable part of a mechanism of internal governance depends on whether 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 transition away from 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.[10] However, for this to be effective in improving manager incentives, the CEO should also commit to paying the manager an appropriate share of the rents.[11] This may be difficult since learning effort is hard to contract on. Our model (also see Prendergast (1993)) suggests that the rewards to learning may be prospective control rents from promotion in the firm, which would suggest 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 (probably an easy way to get fired) in Hirschman's terminology, but by reducing effort or by being reluctant to join. None of this needs any coordination on the part of employees, or any appeal to the Board or to forces of outside control.

2.6. Improvements in External Enforcement

What would happen if external institutions such as courts were strengthened so as to increase the costs of appropriation (for example, by increasing the propensity of courts to investigate and punish such appropriation). We can model this by assuming the CEO expects to get only β of the cash flows he appropriates (with $(1-\beta)$ of the cash flows being lost because of the defensive action he has to take vis-a-vis the police and courts). The CEO now maximizes

[10] One could envisage situations where weaker actions by the CEO lead to more compensating effort by the managers. What if, for example, managers greatly fear the opprobrium and the reputational taint associated with bad corporate performance? More underinvestment by the CEO might lead them to greater effort as they struggle to keep the firm out of bankruptcy. Of course, countries or situations where external governance is weak are also likely to be situations where the market inflicts few reputational penalties.

[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).

$\beta\left[\theta_t\left(k_{t-1}\right)^{\gamma}\left[f(s^{CEO})+g(s_t^{SB})\right]-(k_t-k_{t-1})\right]$ w.r.t. k_t. His marginal net return from investing is $\theta_t\left(k_{t-1}\right)^{\gamma} g' \frac{ds_t^{SB}}{dk_t}-1$, which is the same expression as before because both his return from appropriation and his opportunity cost of investment are reduced by the same multiplier, β. However, the manager's rents and hence incentives to exert effort are lower, because she now maximizes $\frac{\beta}{1+r}\left[\theta_{t+1}\left(k_t\right)^{\gamma}\left[f(s_t)+g(s_{t+1})\right]-(k_{t+1}-k_t)\right]-s_t$.

Indeed, for the functional forms of *g* and *f* we have used earlier, we can show that the second best capital stock also falls as β falls -- when the manager's incentive to exert effort is lower, the CEO's desire to invest in order to incentivize that effort also falls. Thus in a world where internal governance is the primary source of managerial incentives, limiting rent extraction, for example through outside courts, can reduce overall value creation. [12]

III. External Governance

Thus far we have been silent about who owns the capital stock. One interpretation is that the capital stock consisted of intangible or non-tradable assets such as human capital or relationships. In that case, what we have described is a partnership (with the CEO having control because of his superior ability to perform the functions of the CEO). An alternative interpretation is that the assets were tangible and tradable, but owned by outside capital that had no control rights and thus played no role in constraining top management. In particular, top management was constrained in its opportunism only by the rest of the organization. In what follows, we grant

[12] It can be verified that $k_t=\left(\frac{\theta_{t+1}\beta}{(1+r)}\left(\frac{\theta_t\left(k_{t-1}\right)^{\gamma}}{\alpha}\right)^{\frac{1}{b-1}}\right)^{\frac{(b-1)}{(1-\gamma b+\gamma)}}$ and $s_t=\frac{1}{b}\left[-a+\left(\frac{\theta_{t+1}\beta(k_t)^{\gamma}}{(1+r)}\right)^{b}\right]$, both of which increase in β.

outside capital crude control rights, and show that interestingly, it may not play as much of a role in "disciplining" the firm's management, as in moving the firm to a better equilibrium.

3.1. Outside Equity

We will examine outside equity, though our point can be made more generally for other forms of outside capital. As before, we assume the CEO can make a commitment at the beginning of the period to make a portion of the cash flows and the beginning-of-period capital stock verifiable at the end of the period. Now, though, he can use the verifiable portion not only to commit to end-of-period capital stock but also to pay a dividend. Let us assume he sets each amount separately, though we will show later that all that matters is he can commit to the total that is made verifiable, and his choice of how much capital stock to leave behind and how much to pay in dividends emerges endogenously.

Following Fluck (1998) and Myers (2000), we model outside equity holders, working through the board, as having a simple control right – the right in the beginning of period *t* to take the firm's capital stock k_{t-1} and sell it if they believe the firm's announced end-of-period dividend, d_t, and capital stock, k_t are inadequate. It will leave the assets in for one more period if it gets an adequate return for leaving them in, that is, if $d_t + k_t \geq (1+r)k_{t-1}$ where r is the required rate of return on equity. We first analyze the dividend and investment decisions of a going concern (where equity was issued in the past); then calculate the value of equity at IPO stage; then, we examine the CEO's investment decision at the time of IPO; finally, we discuss the efficiency of outcomes under equity financing.

Going concern

The new wrinkle is that when the CEO invests capital, he not only gives the manager more of an incentive to invest, he also gives outside equity a harder claim on the firm's cash flows. The enforceable payment to outsiders will reduce the manager's rent in the future.

Therefore, we will need to pay attention to the manager's participation constraint now. Interestingly, from all this we will derive a theory of dividend policy.

The going concern CEO's maximization problem is

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

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

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

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

Let λ_1 be the Lagrangian multiplier for the dividend constraint (1.19) and let λ_2 be the multiplier for the manager's participation constraint (1.21). The CEO's first order condition w.r.t. d_t is

$$-1 + \lambda_1 \tag{1.22}$$

and w.r.t. k_t is

$$\theta_t k_{t-1}^{\gamma} g' \frac{ds_t}{dk_t} - 1 + \lambda_1 + \lambda_2 U'(k_t) \tag{1.23}$$

Complementary slackness requires that

$$\lambda_1\left(k_t + d_t - (1+r)k_{t-1}\right) = 0 \tag{1.24}$$

$$\lambda_2 U(k_t) = 0 \tag{1.25}$$

Now let us describe what this means for dividend policy and investment. Let k_t^{SB} be the second best level of capital stock chosen by the CEO in the previous section, where there was no outside equity. If $k_t = k_t^{SB} > (1+r)k_{t-1}$, then $\lambda_1 = 0$ (from (1.24)), which means that it does not make sense to pay dividends (from (1.22)). Intuitively, the expected second best capital stock at the end of the period gives the equity holders enough power to extract payments in the future so as to exceed their minimum required rate of return – therefore, they do not need to be paid any dividends.

Now what if $(1+r)k_{t-1} \geq k_t^{SB}$? First, let the manager's participation constraint, (1.21), be satisfied with slack so that $\lambda_2 = 0$ (from (1.25)). This means that the return for the CEO from satisfying the dividend constraint by increasing capital stock is $\theta_t k_{t-1}^{\gamma} g' \frac{ds_t}{dk_t} - 1 + \lambda_1$, which beats the return for the CEO from paying more dividends, which is $-1+\lambda_1$ when $\frac{ds_t}{dk_t} > 0$ (that is, when more capital stock induces more managerial effort, which is always true in our framework thus far). Intuitively, "paying" equity holders by increasing capital stock versus paying with cash dividends costs the CEO the same dollar amount of cash flow, but the former is better because the manager has more incentive to put in effort.

This is an important point. It means the CEO will not pay cash dividends, and will instead increase investments in order to meet the rate of return requirements of equity holders, provided the manager's participation constraint is met. In other words, in this region, $k_t = Max[k_t^{SB}, (1+r)k_{t-1}]$ and $d_t = 0$.

Finally, when is the manager's participation constraint likely to be binding? Note that when $k_{t+1} = k_{t+1}^{SB} > (1+r)k_t$, no dividends will be paid next period, nor does investment have to be increased beyond what the next period CEO would willingly implement. So greater investment by the CEO today does not impose any additional repayment requirement on the CEO next period (that is, this period's manager), and we are back in the world of the previous section where the manager's participation constraint does not bind. It must therefore be that when the manager's participation constraint starts binding, $(k_{t+1} - k_t) + d_{t+1} = rk_t$. Substituting in (1.21) and differentiating w.r.t. k_t, we get

$U'(k_t) = \frac{1}{1+r}\left[\theta\gamma k_t^{\gamma-1}\left(f(s_t)+g(s_{t+1})\right)-r\right]+\frac{1}{1+r}\left[\theta k_t^{\gamma} f'(s_t)-1\right]\frac{ds_t}{dk_t}$. The second expression is zero (the Envelope Theorem), so $U'(k_t) = \frac{1}{1+r}\left[\theta\gamma k_t^{\gamma-1}\left(f(s_t)+g(s_{t+1})\right)-r\right]$.

The term in the square brackets, which is the cash return on investment less the return that has to be paid to outside equity, can be negative. Intuitively, a higher capital stock this period, k_t, implies the manager puts in more effort, but it also requires the manager to pay outside equity more next period. If the returns on investment are sufficiently low, the manager's utility can be reduced by more capital stock. This should be contrasted with the last section where we had no outside equity (and hence no negative term in the square brackets), when more capital stock always increased the utility of the manager.

For well behaved functions (see 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 $U(k) \le 0$. Consider, therefore, the first period t where $U((1+r)k_{t-1}) < 0$. Let k_t be such that $U(k_t) = 0$. The CEO cannot set capital any higher for fear of violating the manager's participation constraint, and will have to meet equity's rate of return constraint by paying out Max[$(1+r)k_{t-1} - k_t$,0] as dividends. Intuitively, as the capital stock increases and the rate of return on capital falls, 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 (net of this period's effort cost) as CEO next period. This is when the current CEO will switch to paying dividends.

Formally, for firms with a well-behaved expected utility function for the manager (that is, $\lim_{k\to 0} U(k) > 0$, $\lim_{k\to\infty} U(k) < 0$, $U''(k) < 0$, and $U'(k) < 0$ for some k), and when the business environment is constant at $\theta_t = \theta \; \forall \; t$, we have

Proposition 2: *In the presence of outside equity,*

(i) The capital stock before the firm reaches the steady state is $k_t = Max[k_t^{SB}, (1+r)k_{t-1}]$.

(ii) The firm reaches the steady state in period $\hat{t}$ *when* $Max[k_{\hat{t}}^{SB}, (1+r)k_{\hat{t}-1}] \geq \hat{k}$ *where* $\hat{k}$ *is such that* $U(\hat{k}) = 0$. *The steady state capital stock is* $\hat{k}$ *in period* $\hat{t}$ *and after, and the steady state dividend is* $\hat{d} = r\hat{k}$ *in period* $\hat{t}+1$ *and after.*

(iii) In period $\hat{t}$, *the dividend is* $Max[\hat{k} - (1+r)k_{\hat{t}-1}, 0]$. *The dividend before period* $\hat{t}$ *is zero.*

Proof: Omitted.

The proposition then suggests the life cycle pattern of dividend payments and investment that is empirically observed. In the early stages of a firm (when k_t is low), the capital investment by the firm will be more than enough to meet the return expectations of equity investors. No dividends will be paid. As the firm becomes more mature and rates of return fall, the capital stock the CEO would desire to put in place in the absence of equity could fall below the level needed to meet equity's required rate of return. But now, the CEO will increase capital stock over the desired level instead of paying dividends because the higher capital stock has the collateral benefit of raising managerial effort. However, when capital stock is so high (and return on capital is so low) that investing more would violate the manager's participation constraint, the CEO will start paying out cash dividends, the capital stock will stabilize (when the business environment is stable), and future CEOs will all be at their participation constraint – they will get no excess rents.

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 $\gamma < \frac{1}{b}$. It can be shown that $U'(k_t) = \left[\frac{(\alpha+1)\theta_{t+1}{}^{b}\gamma}{\alpha(b-1)(1+r)^{b}} k_t{}^{\gamma b-1} - \frac{r}{1+r} \right]$, which is ∞ as $k_t \to 0$, and $-\frac{r}{1+r}$ as $k_t \to \infty$. Furthermore, $U''(k_t) < 0$. Finally,

$U(k_t) = \frac{1}{(1+r)}\left[\theta_{t+1}(k_t)^{\gamma}(1+\frac{1}{\alpha}) f(s_t) - rk_t \right] - s_t = \frac{a}{b} + \frac{\theta_{t+1}^{b} k_t^{\gamma b}(b+\alpha)}{(1+r)^{b}\alpha b(b-1)} - \frac{rk_t}{(1+r)}$, 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, $U(k_t)$ 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.

Outside Equity Owned Firms and Rents

Interestingly, in the steady state, the CEO gets no rent in that his participation constraint is just met – he appropriates just enough after paying equity to compensate for his effort. But because he can appropriate all the cash flows at the margin, he has the maximum possible incentive to exercise effort. Indeed, the firm cannot give him a better incentive scheme based on cash compensation, even if effort were verifiable.

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 outsiders to extract their due. Eventually, future CEO rent will fall, even while managerial 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 equity and ensures that rents are driven to zero, even though outsiders have only crude control rights.

3.2. IPO

Let us now see what happens earlier, when the CEO takes the firm public through an initial public offering (IPO) in period τ. The above analysis implies that for a stable business environment θ, there is a period *T* at the end of which the value received by outside equity holders becomes fixed at k_T.[13] Beyond period *T*, either the CEO grows the capital stock at rate $(1+r)$ or he pays dividends of r times the capital stock, or he does some combination of growing the capital stock and paying dividends (for one transition period). This implies that if the IPO takes place in period τ, the value of the equity issued is $\frac{k_T}{(1+r)^{T-\tau+1}}$.

In keeping with the spirit of our analysis, the CEO appropriates the proceeds from the offering entirely. The CEO chooses investment k_t to maximize

$$\theta\left(k_{\tau-1}\right)^{\gamma}\left[f(s^{CEO})+g(s_\tau)\right]-(k_\tau-k_{\tau-1})+\frac{k_T}{(1+r)^{T-\tau+1}} \tag{1.26}$$

where k_T depends on k_τ recursively through the investment decision of the going concern in the presence of equity: $k_t = Max[k_t^{SB},(1+r)k_{t-1}]$. Now, the first-order condition for the CEO's investment is given by

$$\theta\left(k_{\tau-1}\right)^{\gamma} g'\frac{ds_\tau}{dk_\tau}-1+\frac{\partial}{\partial k_\tau}\left(\frac{k_T}{(1+r)^{T-\tau+1}}\right). \tag{1.27}$$

Since the going-concern capital grows *at least* at the rate *r* before date *T,*

$\frac{\partial}{\partial k_\tau}\left(\frac{k_T}{(1+r)^{T-\tau+1}}\right)\geq 0$. Hence, the CEO at the time of IPO has a (weakly) greater incentive to

[13] Note that *T* is not to be confused with $\hat{t}$ which is the date at which dividends start being paid out. Capital will start growing at the rate *r* earlier than dividends being paid out, whereby $T \leq \hat{t}$.

invest (for any 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:

(i) Once the firm goes public and before reaching steady state, its capital stock is always (weakly) higher than in the absence of outside equity.

(ii) The steady state capital stock of the public firm can be greater or less than the first best steady state capital stock.

Proof: Omitted.

IPO and Investment Growth: An example

Now consider our example again where the CEO decides to take the private firm public at t=10, after it has reached (its private) steady state. In its private steady state, $k_t = 0.0108$. Figure 4a shows that in the period of the IPO, $k_{10}^{IPO} = 0.285$. 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 4b shows that once the high level of capital is achieved in the IPO stage, capital continues to grow sharply until it hits a growth rate equal to the return on idle capital (*r)*. Figure 4c illustrates that in this "growth phase", the firm pays outside equity only in capital and there are no cash dividends. What is the current manager's or future CEO's utility over this growth phase? Figure 4d 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 but declines sharply 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 4b) without violating his manager's participation constraint (Figure 4d) and thus is forced to pay outside equity in the form of cash dividends (Figure 4c). The firm thus switches from its extraordinary growth phase to steady-state capital with stable cash dividends.

The IPO expands investment and managerial effort for two reasons. First, and obviously, 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.

Control rights

It is noteworthy that even with crude control rights, outside equity has such an influence on the firm's growth path, even while circumscribing managerial rents. Indeed, in our framework, outside equity's control rights are irrelevant (and could well be non-existent) so long as the firm is growing its capital stock at a rate greater than r. However, outside equity has value at that early stage. And as processes become more stable and well-defined, and as management become more professional and standardized (see Hellman and Puri (2002)), outside equity will acquire the capacity to threaten to replace management. Thus internal governance may be sufficient to preserve substantial firm value initially, and when it weakens, external governance may have become sufficiently developed to add support. The patterns of governance may change over a firm's life cycle in a predictable way.

Perhaps this also explains why firms in emerging markets can issue outside equity, even when minority shareholder rights are currently poorly protected. The firm's resources will keep

growing because of the pressure from internal organization, and the control rights exercisable by outside equity over these resources will improve over time as the country develops, and as firms become more clearly structured. These will eventually allow equity to be paid dividends, which will give equity value long before equity protections are in place.

3.3. Relaxing Some Assumptions.

We have assumed that the CEO owns no equity, and that there are no secondary equity issuances. Let us relax these assumptions. We assume the CEO gets only β of the cash flows left after investments and dividend payments, while he appropriates β_E of the cash flows from any secondary equity issue, with the remaining being dissipated (we will allow for the possibility that $\beta_E = \beta$, though it may be lower since the proceeds from an equity issuance can be tracked through various accounts and may be harder to alter than revenues or costs). Furthermore, let the CEO own a share ω of the existing stock.

First note that, as shown earlier, before steady state is reached, $k_t = Max[k_t^{SB}, (1+r)k_{t-1}]$. However, there are two new effects here. First, if $k_t^{SB} > (1+r)k_{t-1}$, the CEO effectively overpays existing equity. He could pay existing equity exactly $(1+r)k_{t-1}$ if he issued an additional $k_t^{SB} - (1+r)k_{t-1}$ of equity. The CEO will issue if the fraction of cash flows he can appropriate from a secondary issuance, β_E, exceeds his share of the existing equity, ω. If so, the secondary equity offering will "dilute" the rights of existing equity because equity holders collectively will still have claim only to the capital stock, which is unchanged by the secondary equity issuance. The value of existing equity will then be $(1+r)k_{t-1}$ at the end of the period, and the CEO will set

$$k_t \in \arg\max_k \beta\left[\theta_t\left(k_{t-1}\right)^{\gamma}\left[f(s^{CEO}) + g(s_t)\right] - (k - k_{t-1})\right] + \frac{\beta_E}{(1+r)}\left[k - (1+r)k_{t-1}\right] + \omega k_{t-1}$$

Note by committing to leave behind more capital, the CEO can also raise more secondary equity, so the "personal" cost of capital is simply the difference in appropriability between the two , $\beta - \frac{\beta_E}{(1+r)}$. Thus capital investment goes up relative to the situation without outside equity, even ignoring the fact that the incentive to pay dividends in capital rather than in cash will also push up capital investment.

More interesting, so long as the equity share the CEO owns, ω, is less than his ability to appropriate, β_E, the equity share does nothing for CEO incentives to invest or refrain from appropriation. This is because the value of equity simply reflects the past value of capital stock.

It is only when the CEO's equity stake is high enough $(\omega > \beta_E)$ that the CEO stops diluting stock through secondary issuances. Now the value of equity can reflect future capital stock, much as it did in the case of the IPO discussed earlier, and the CEO may want to invest more when he owns more equity because in doing so, he enhances the value of equity.

3.4. Relaxing Other Assumptions.

Consider again the benchmark model. We assumed that the manager could not make investments in the firm (or, equivalently, receive a "negative wage" at the point of hiring). Suppose we relax this assumption and 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 him exactly at the reservation wage of zero. Formally, this amount is

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

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

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

Substituting for $w_t(k_t)$, the CEO objective takes the form

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

which results in 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. In essence, 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)).[14]

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. In this context, the IPO decision can be viewed naturally as the firm availing of capital markets to improve the CEO's ability to "sell" (the tangible part of) the firm to successors, and thus improve his own incentives to invest . Of course, as we have seen, in the case of the IPO, the incentives of the CEO still remain different from first best.

3.5. Connections to the 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

[14] 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).

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) and internal organization (Section 4).

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.[15]

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

[15] 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.

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.

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.

IV. Internal Organization

Thus far, we have examined the effects of capital structure on the incentives for internal governance. Let us now turn to ways the internal structure of the firm itself may affect internal governance. Internal organization typically will alter the sensitivity of the manager's effort to the CEO's investment, and will thus affect outcomes. We explore how.

4.1. Altering the relative importance of the CEO and of the manager.

We have seen that there is an interior optimal level of the relative importance of the CEO, α, which maximizes the net cash flows produced by the firm. α can be altered by changing the responsibilities of the CEO and the manager. For instance, if α is too high, implying the CEO takes on too much responsibility and leaves too little to subordinates, as is typical with many small firms, then value can be unlocked if more tasks are devolved to subordinates. Indeed, one of the roles of a venture capitalist might be to "professionalize" small firms (see Hellman and Puri (2002)) by bringing in professionals and decentralizing more of the founder's functions to subordinates. Not only does this allow more external control of the firm, it can also lead to better internal control.

4.2. Probability of promotion and firm size.

We have assumed that the manager is fully assured of being promoted next period, and is the sole possible successor. Furthermore, we have assumed that no additional managers are needed as the firm's capital stock grows. What if, instead, more managers are needed as the firm's capital stock grows, and each manager's chances of promotion fall proportionately?

Suppose therefore that $N(k_t)$ managers are needed to produce with k_t of capital stock and each manager's chance of getting the CEO's rents are $\frac{1}{N(k_t)}$, with $N' > 0$.[16] Modifying the manager's maximization problem in (1.6) and following some simple algebra, we have $\frac{ds_t^{SB}}{dk_t} = \frac{-f'}{f''}\left[\frac{\gamma}{k_t} - \frac{N'}{N}\right]$. This has to be positive for the current CEO to want to invest to motivate effort, and will be the case if $\gamma > \frac{N'}{\frac{N}{k_t}}$, that is, if the marginal rate of growth of managers with additional capital stock is significantly less than the average number of managers per unit of capital.

Put differently, if there are scale economies in management (N is concave so the number of managers does not increase as fast as the capital stock), then internal governance can still have salutary effect on incentives because, even though a larger capital stock means more managers, the associated rents grow disproportionately compared to the number of managers who expect to share it. But if, for example, there are scale diseconomies in management (N is convex), then internal governance becomes unable to provide the CEO incentives for investment beyond a certain level of capital stock – managers see too little possibility of future rents to be motivated by CEO investment, and consequently the CEO does not invest. This limits the size of the firm.

[16] We assume other managers leave when they do not get the top job. The issue of how the CEO is selected and whether the Board can extract rents from managers when appointing one to the job is interesting (see Goel and Thakor (2008) for a fine recent paper) but beyond the scope of this paper.

4.3. Promotion Tied to Effort

In the case discussed above, one manager's promotion was as likely as another's, independent of the effort she exerted. What if a manager is more likely to get promoted if she exerts more effort, while if she does not exert much effort, it will be easier for the board to find a comparable replacement outside?

To see how this would affect our results, let us go back to the case of one manager, but let her be promoted to CEO only with probability $p(s_t)$, where $p' > 0$. Again, modifying her maximization problem in (1.6) and simplifying, we get $\frac{ds_t^{SB}}{dk_t} = \frac{-\gamma}{k_t\left(\frac{p'}{p} + \frac{f''}{f'}\right)}$. The CEO can provide more incentives for effort through investment if the right hand side is high. Comparing with (1.8), and recognizing the first term in the parentheses in the denominator is positive while the second is negative, we see that the firm can offer the best incentives for the CEO to invest if $\frac{p'}{p}$ reaches its highest positive value (but below $\frac{f''}{f'}$ in magnitude).

Consistent with intuition, the manager's effort will be more sensitive to CEO investment if her chances of capturing the future rent associated with the investment also increase in effort. Therefore, for any given probability of promotion, p, making promotion sensitive to effort will increase the strength of the internal governance effect. Conversely, any form of succession planning, which forces a high p while reducing p', would tend to diminish this effect. [17]

4.4. Labor Market, Reservation Wage, and Entry

What if the reservation wage $\bar{u}$ is positive, implying the firm has to attract the manager away from other lucrative sources of employment, and that the manager's anticipated future rents

[17] The sensitivity comes from comparing the effect of an increase in effort with the effect of an increase in investment, which is why p' is scaled by p. A possible extension would be to examine the effects of an internal tournament between managers on the CEO's incentives to invest.

at the second-best investment level are below the reservation wage. The CEO has a choice of paying for the shortfall of future rents through a greater cash wage w_t or through greater investment (which will give the manager greater future rents). The CEO solves

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

$$\text{s.t.} \quad \frac{1}{1+r}\left[\theta_{t+1} \left(k_t\right)^{\gamma} \left[f(s_t) + g(s_{t+1})\right] - (k_{t+1} - k_t)\right] - s_t + w_t \geq \overline{u}$$

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

Setting up the Lagrangian and taking the partial w.r.t. k_t, we get

$$\theta_t \left(k_{t-1}\right)^{\gamma} g'(s_t) \frac{ds_t}{dk_t} - 1 + \lambda \frac{1}{1+r}\left[\theta_{t+1} \gamma \left(k_t\right)^{\gamma-1} \left[f(s_t) + g(s_{t+1})\right] + 1\right]$$ (where, as in the section on outside equity, derivatives of managerial utility with respect to s_t and k_{t+1} are zero by the Envelope Theorem). This means that we must have

$$\lambda = \frac{1 - \theta_t \left(k_{t-1}\right)^{\gamma} g'(s_t) \frac{ds_t}{dk_t}}{\frac{1}{1+r}\left[\theta_{t+1} \gamma \left(k_t\right)^{\gamma-1} \left[f(s_t) + g(s_{t+1})\right] + 1\right]} \quad (1.28)$$

The numerator in this expression is the cost to the CEO of the marginal unit of investment – note that this is less than 1 because the CEO obtains some benefits from the manager's consequent greater effort. Indeed, the numerator is zero at the unconstrained optimal. The denominator is the incremental rent the CEO generates for the manager next period through an additional unit of investment today. So if λ is less than 1, the CEO can generate more than a dollar of present value of rent for the manager tomorrow by incurring an incremental dollar of net investment cost today. Clearly, he would then prefer "paying through capital" than paying through cash, and would therefore exceed the investment he would make in the absence of a binding reservation wage.

The alternative to paying the manager through investment is to pay through current wage, w_t. Differentiating the CEO's Lagrangian w.r.t. w_t, we find the CEO wants to increase the current cash wage if $\lambda > 1$. Finally if λ starts out less than 1, as the CEO pushes investment higher, λ could reach 1 (from below) before the CEO has met the reservation wage. In that case, he will pay part in investment and the remainder in cash wages.

In sum then, if the CEO cannot meet the manager's reservation wage with the promise of rents at the unconstrained second best optimal, he will have an incentive to invest above that today so as to generate the "currency" with which to pay the current manager her reservation wage. This is over and above any investment intended to elicit managerial effort.

More generally, new recruits to the typical firm in the industry anticipate they will get future rents and thus are willing to settle for low initial salaries. To the extent that they see the CEO compromising the future, they will demand additional compensation, which can reduce the appropriable cash flows to the CEO substantially. Thus the CEO of a firm which requires a steady substantial intake of new entrants – either because its hiring in the past has been staggered or because it is on a fast growth path currently – will have strong incentives to not compromise the future, especially if the new entrants contribute quickly to the bottom line.

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

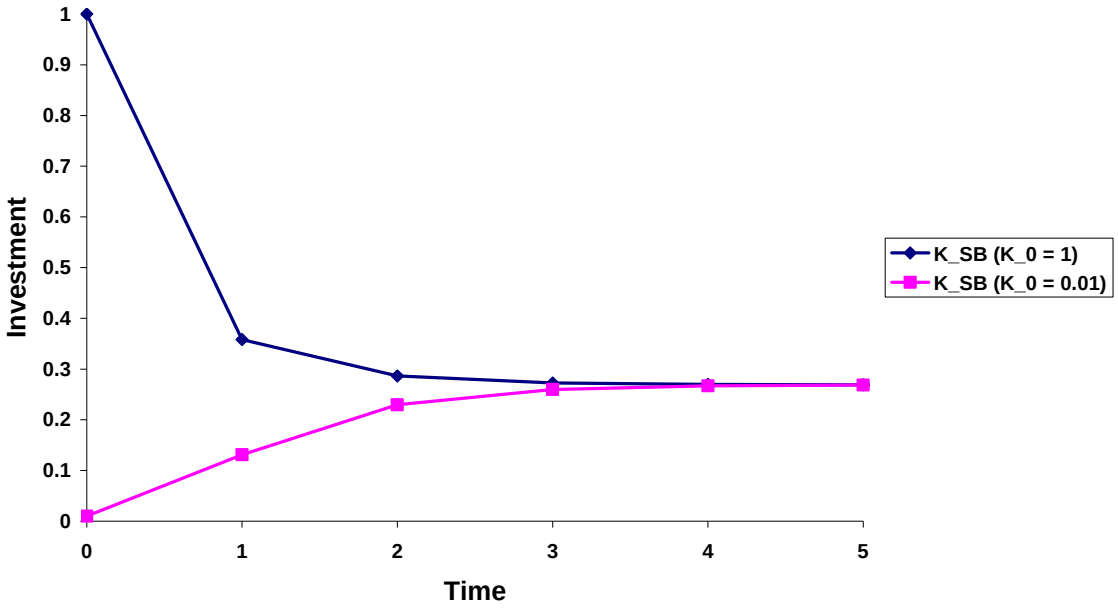

Figure 2b: Convergence of managerial learning in second-best to the steady state

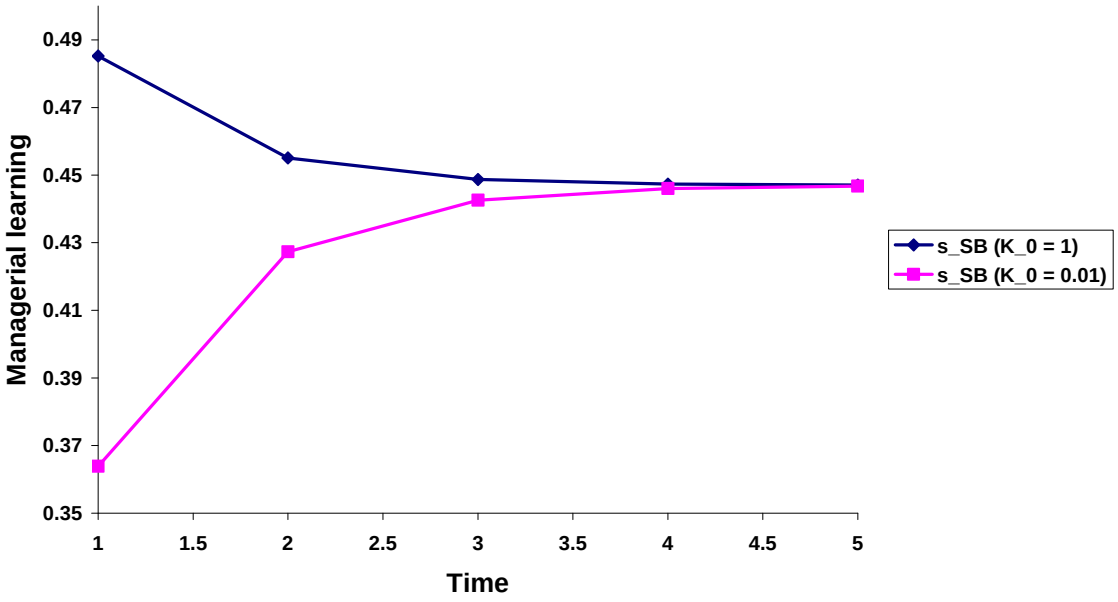

Figure 2c: Convergence of net cash flow in second-best to the steady state

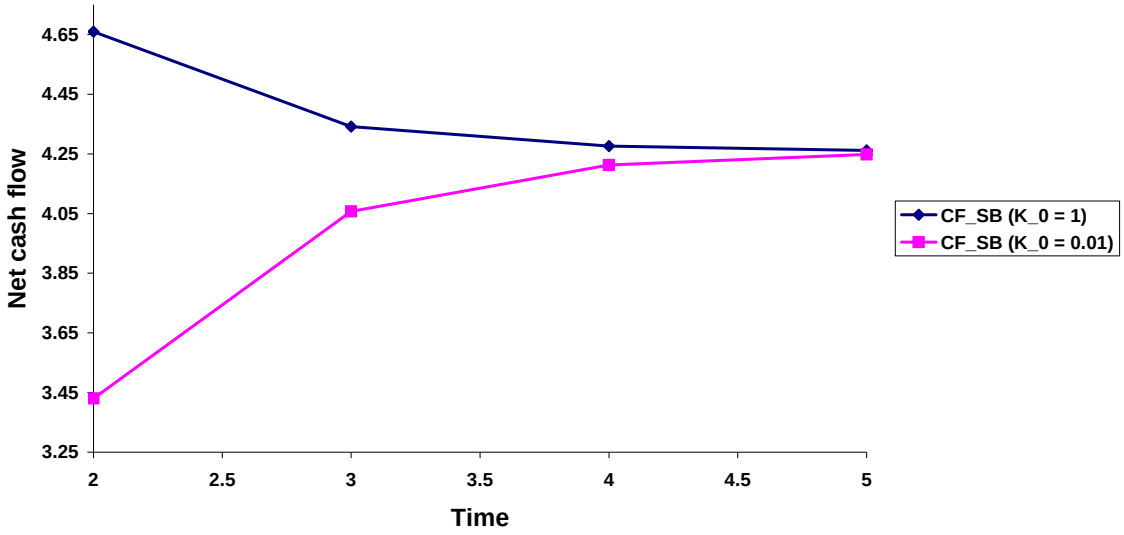

Figure 3a: Ratio of steady-state outcomes between SB and FB

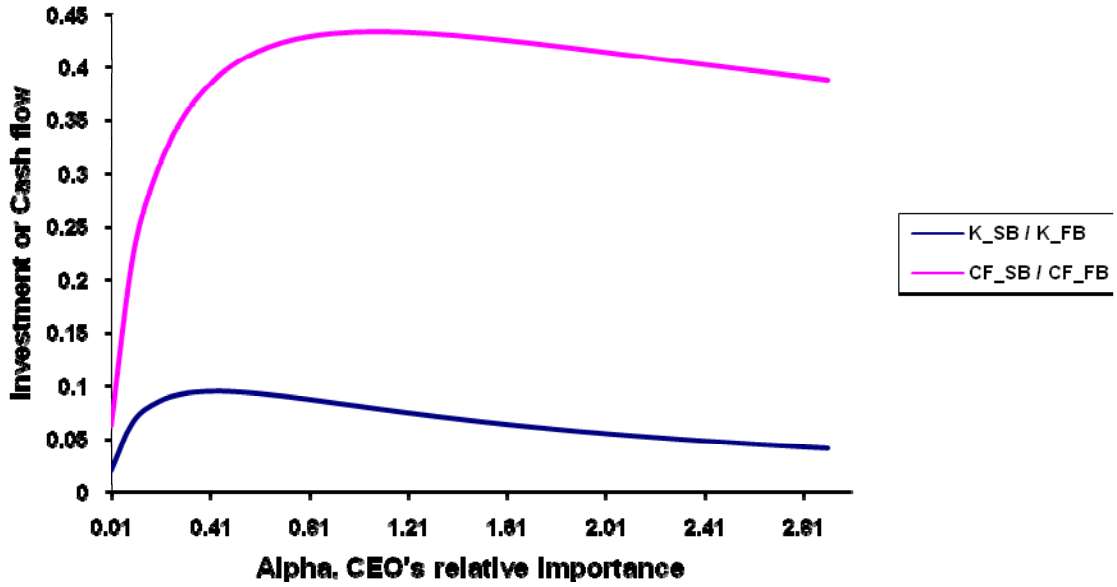

Figure 3b: Sensitivity of investment to cash flow in a regression on cash flow and future conditions

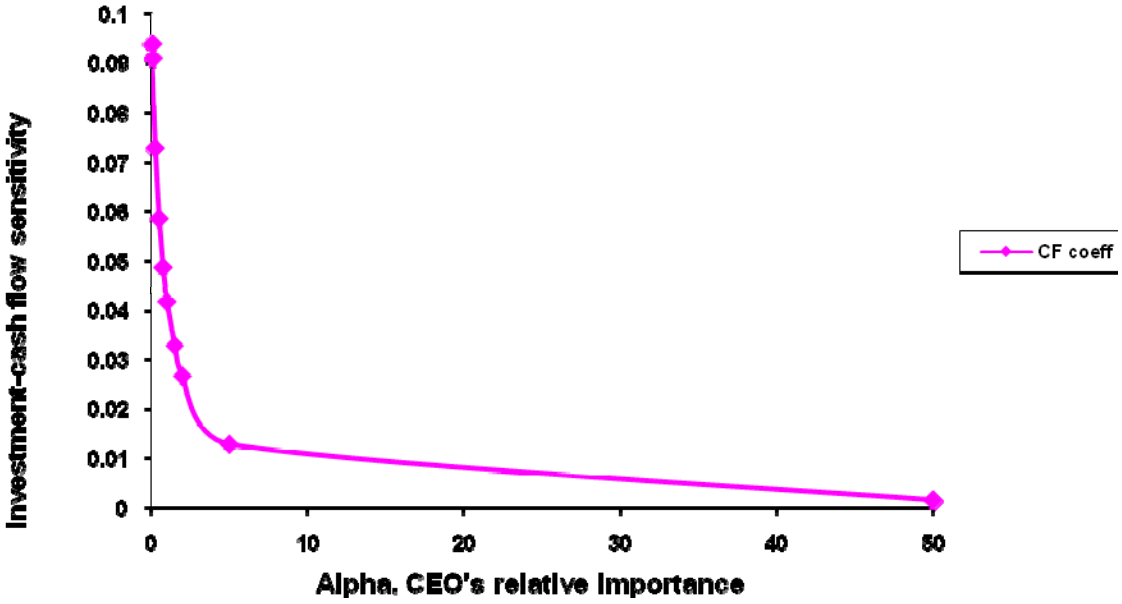

Figure 3c: Sensitivity of investment to future conditions in a regression on cash flow and future conditions

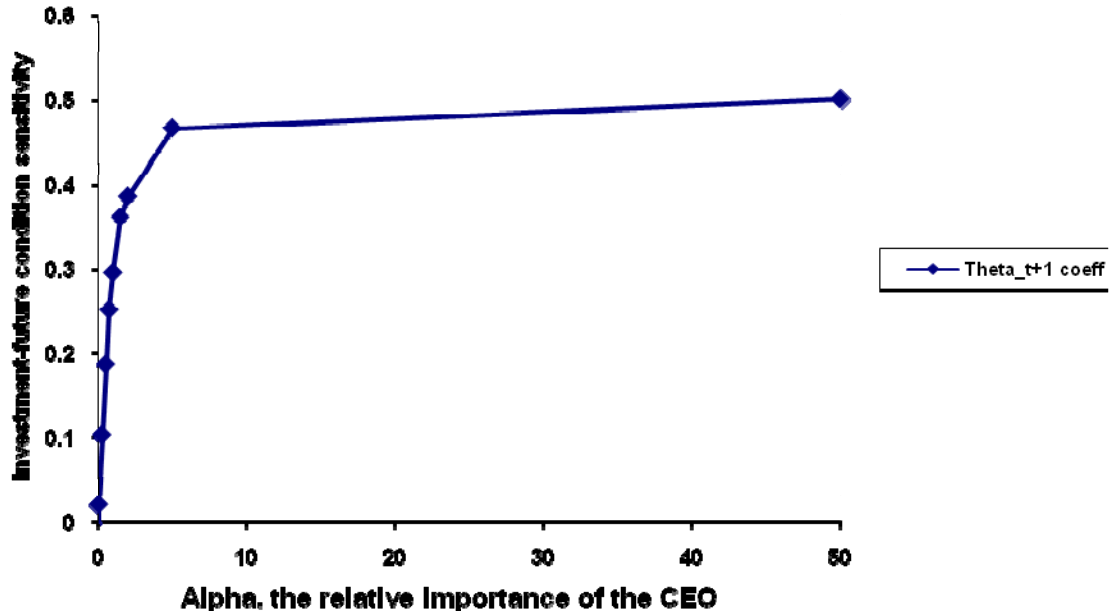

Figure 3d: Convergence of investment after temporary shock at t = 1

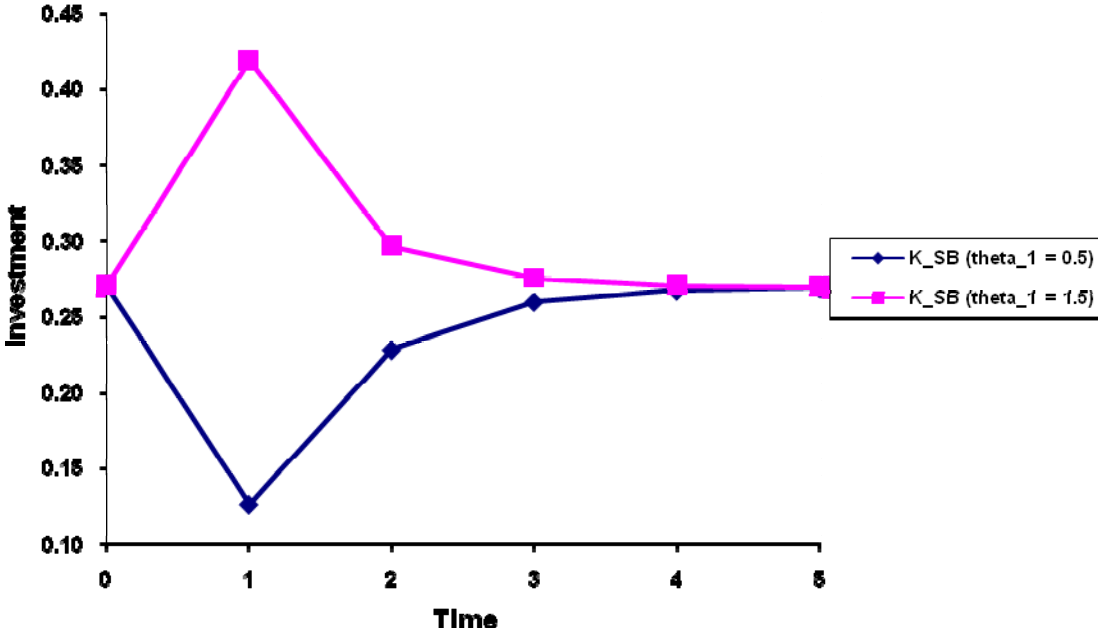

Figure 4a: Transient investment (IPO at t=10)

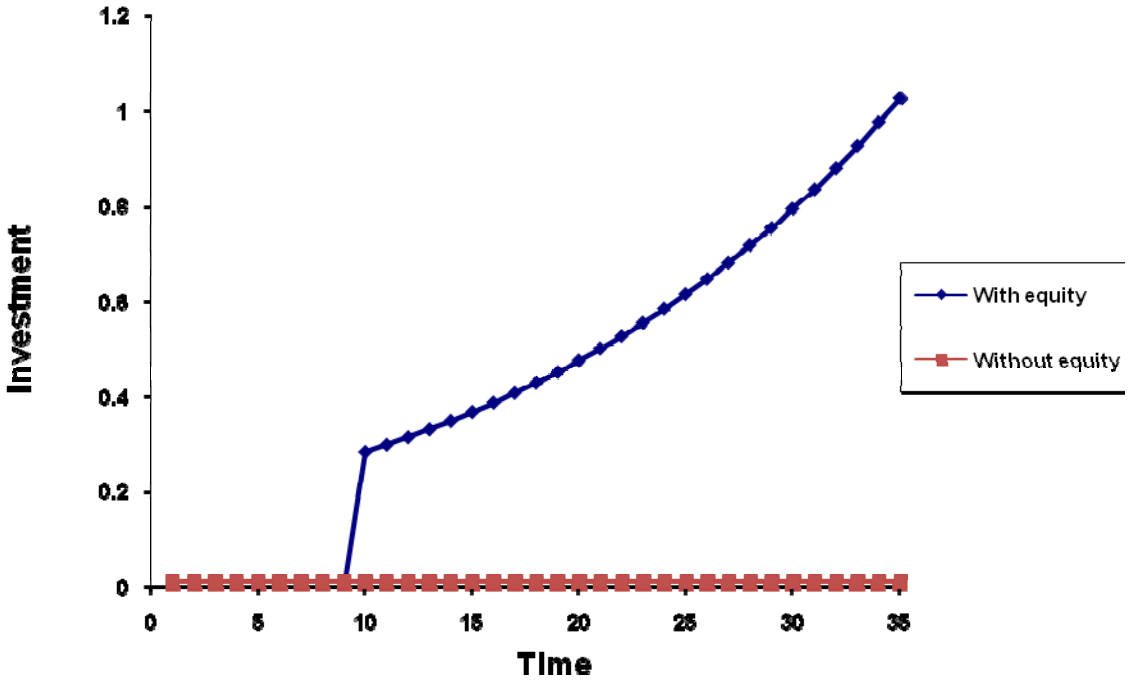

Figure 4b: Steady state investment with equity

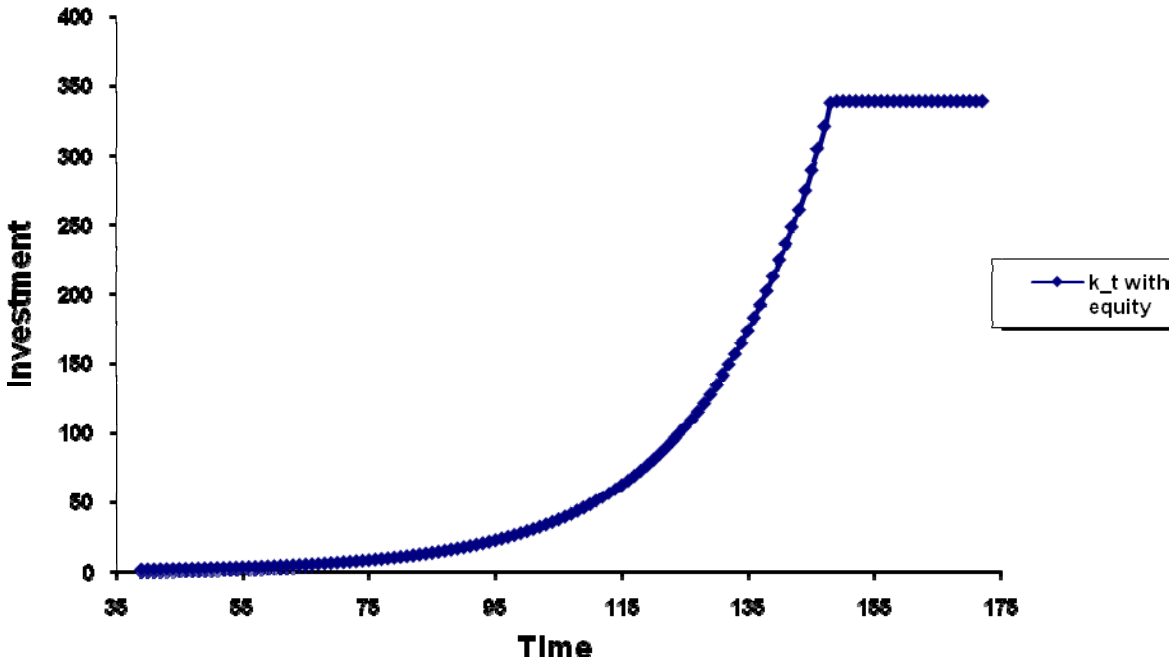

Figure 4c: Dividends to equity (IPO at t=10)

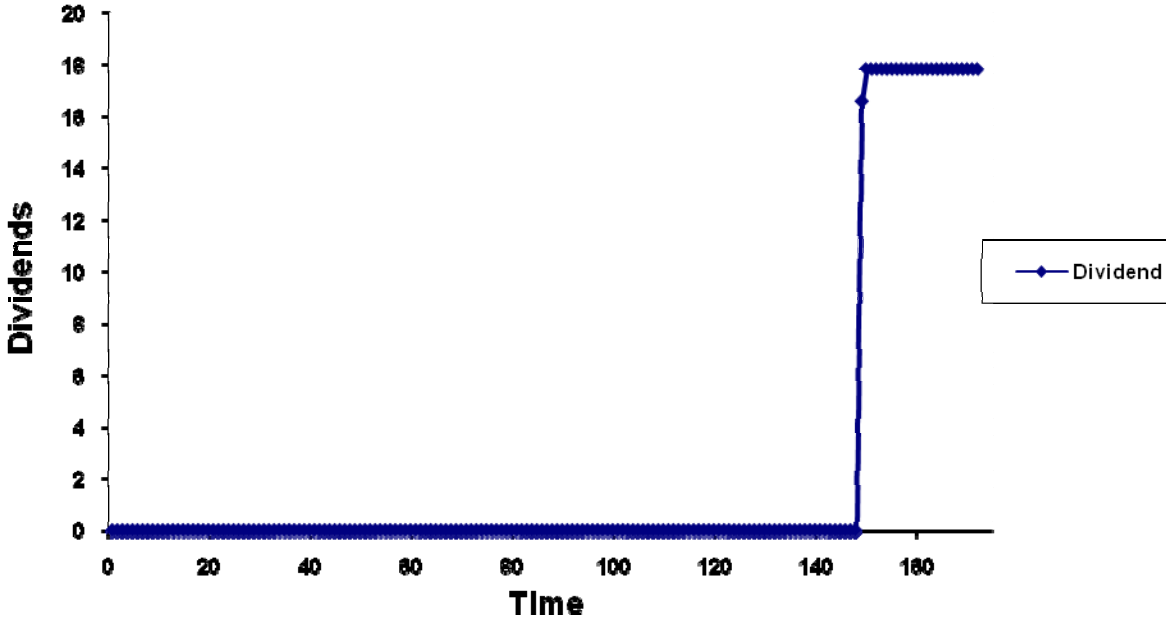

Figure 4d: CEO's net utility (U(k)) with IPO (at t=10)