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Outside Equity

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ABSTRACT

Equity financing is modeled when cash flows and asset values are not verifiable. Investors have enforceable property rights to the firm's assets, but cannot prevent insiders (managers or entrepreneurs) from capturing cash flow. Insiders must co-invest and pay in each period a dividend sufficient to ensure outside investors' participation for at least one more period. Intervention by the investors must be limited by an agreement with insiders or by costs of collective action. Basic models are extended to show why firms go public and why agency costs necessarily arise when the act of investment is not immediately verifiable.

SOONER OR LATER THE THEORY OF CORPORATE FINANCE must deal generally with the self-interest of corporate managers and employees. Theory ought to explain how outside equity financing works when insiders are not inclined to act in outside investors' interests.

Jensen and Meckling so argued in 1976. Since then principal-agent theory has advanced steadily. There are deep analyses of the nature of property rights and control, and of the feasibility and optimality of external financing when the internal affairs of the firm are verifiable only at a cost or not at all. Notable research includes Townsend (1979), Gale and Hellwig (1985), Stulz (1988), Hart and Moore (1994, 1998), Bolton and Scharfstein (1990), and Hart (1995, Chap. 5). But with a few exceptions, particularly Fluck (1998),[1] this branch of the literature does not show how *equity* financing works when insiders are self-interested. Harris and Raviv (1991) summarize most of these papers.

Applied corporate finance accepts outside equity as a fact of life but does not really explain how managers' and stockholders' interests become sufficiently aligned. Why do corporations voluntarily pay dividends when the threat of takeover is remote? How can rational outside equity investors fund capital investments when managers can intercept future cash flows? What can be said about the value of control?

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[1] This paper and Fluck's both assume self-interested managers and employees and nonverifiable cash flows. The firm is financed and survives if cash paid out voluntarily by these insiders satisfies outside investors. But from that common starting point the papers diverge. Fluck emphasizes the conditions under which debt and/or equity are feasible; this paper considers equity only but goes on to other topics, including the decision to go public. I comment further on Fluck's assumptions below. See also Fluck (1999).

Laws, institutions, and practice, including incentive schemes, have evolved to control or mitigate agency problems of insiders versus outside investors. But the modern financial environment is too complex and varies too much from country to country to support ready induction of underlying principles. This paper starts instead with the primitive property rights of equity investors and models investment, dividend policy, and the valuation of outside investors' claims.

I consider a long-lived, positive-NPV venture whose gross value can be cleanly allocated between intangible assets (ideas or human capital) contributed by insiders, and long-lived, general-purpose assets partly or wholly financed by outsiders. These investors directly own part or all of the general-purpose assets and have the right to walk away with them or deny their use to insiders. If this happens, insiders lose their part of the venture's cash flow for the next period. Outside financing works if insiders pay a dividend in each period just sufficient to retain outside investors' participation for at least one more period.

This sufficient dividend can be determined in two ways. First, a deal could be struck at the instant of a dividend payment. If the dividend is sufficient, outside investors commit not to withdraw the assets until the next period. The commitment is like a partnership agreement that limits outside investors' property rights, so I will refer to a "partnership model."

Second, the firm could continue if today's dividend generates a rational expectation of sufficient future dividends. This suggests a public corporation, where outside investors' property rights are not constrained but control is by voting or takeover. I will refer to a "corporation model."

The differences between these two models are interesting. For example, the corporation model requires an infinite or indefinite horizon; the partnership model does not. In the partnership model, all positive-NPV investments are undertaken so long as insiders have some ability to coinvest. In the corporation model, some positive-NPV investments cannot be financed if outsiders' ex post bargaining power is too high. It is also possible that inefficient managers will continue operating firms that should be liquidated.

Both models assume that insiders contribute valuable intangible assets but can walk away with them at any time. Suppose instead that the value of these assets has to be proved by research and development. Once proved, the assets have independent value reachable by outsiders. This creates an incentive problem: why should insiders work to establish the assets' value if they have no control over these assets ex post? The problem can be solved by starting up a private, closely held business, and later taking it public to disperse ownership so that ex post exercise of control is costly. Going public reduces outside investors' bargaining power to preserve incentives for insiders. Burkart, Gromb, and Panunzi (1997) also stress this point.

How do I know that outside equity as modeled in this paper is truly that and not debt in disguise? Debt and equity are sometimes hard to distinguish: with costless default and renegotiation, there are debt contracts that

match the value and payouts of outside equity. For example, debt acts like equity when the probability of default is high. But at lower default probabilities, the essential differences emerge. Debt payoffs are uncertain because equity investors hold a default put. Debt contracts indexed to uncertain ex post asset values could eliminate the truncation, but indexing only works if the asset values are verifiable. Equity financing does not require such verifiability.

This paper touches several branches of finance and economics, including the literature on how property rights support external financing in the face of incomplete contracts or costly state verification. The chief difference here is the focus on equity.

Much of this paper discusses dividends. It follows other papers, for example Zwiebel (1996) and Warther (1997), which model dividends as the minimum payouts necessary to prevent outside investors from intervening.[2] Again, the difference is the focus on how equity works.

Here is a preview of some of the paper's themes and conclusions:

1. Outside equity depends on an intertemporal constraint: the dividend paid today must ensure outside investors' participation for at least one more period.
2. The going concern requires coinvestment of human (intangible) and outside financial capital.
3. Outside equity works only if insiders contribute part of the financial capital, although the contribution may come as sweat equity—the willingness to work for less than an opportunity wage.
4. Firms whose future value depends on human effort and risk taking may go public to *reduce* the bargaining power of outside equity investors.
5. Uncertainty plus nonverifiability of the value of assets in place creates a clear distinction between debt and outside equity.
6. It can be much more difficult to confirm new investment than the existence of assets in place. Therefore, outside equity investors must monitor the disposition of operating cash flows among operating costs, investment, and rewards to insiders. Monitoring then leads to agency costs, not vice versa.

The paper is organized as follows. Sections I and II work out and compare the partnership and corporation models. Section III considers a variation of the corporate model in which it is optimal to raise concentrated equity financing at first and go public later. The final section of the paper links up my analysis of equity financing to the agency and free cash flow hypotheses suggested by Jensen and Meckling (1976), Jensen (1986), and others.

[2] But Zwiebel's paper really focuses on the role of debt when managers are tempted to take negative-NPV projects to enhance private benefits of control. Dividends are paid to keep *net* debt (debt less cash or marketable securities) sufficiently high.

I. Property Rights and the Partnership Model

This paper analyzes financing from outside equity. The inside equity comes from managers and employees, who act as a coalition. "Inside equity" or just "insiders" refer to this coalition and the shares it owns. Intrafirm agency issues are not considered in this paper.

The coalition is self-interested and value-maximizing. This follows the finance tradition of market value maximization, except that the shares of value going to insiders and outside equity investors are explicitly modeled. This objective function was suggested by Treynor (1981), Donaldson (1984), and Myers (1993).

Suppose the modern financial environment is stripped away, leaving debt and equity holders each with only a primitive, enforceable property right:

1. Lenders can seize all of the firm's assets, if necessary to satisfy a debt claim, *only* if a promised payment is not made.
2. Equity investors *own* the firm and its operating assets, and thus can withdraw the assets, or deny their use to insiders, *at any time*.

Equity investors' actions may, of course, be limited by prior debt claims. I do not consider the choice between debt and equity in this paper.

Equity's primitive right does not necessarily require control by voting. In the partnership model, control is exercised through enforceable agreements that must be renewed for the firm to continue. The agreements specify ownership shares, start-of-period dividends, and the length of time for which assets are committed to the business.

I assume that cash flows are not verifiable, so contracts written to prevent insiders from capturing cash flows would not work. But the location and use of assets is assumed verifiable; otherwise insiders could walk off with the assets or use them in another venture. I do not assume that the *value* of the firm's assets is verifiable.

A. The Partnership Model

The firm is a startup venture. Insiders contribute human capital or intangible assets and outside equity investors contribute most of the money to buy the required operating assets. Outside equity is protected only by the primitive right of ownership. Outside equity investors can dissolve the firm and walk away with their shares of the assets. However, they cannot prevent insiders from taking operating cash flows.

The new firm requires capital investment of K. (I confirm later that insiders chose K to maximize NPV.) Assume for simplicity that K does not depreciate and generates a level, perpetual cash flow $C = mrK$, where r is the opportunity cost of capital and $m > 1$ captures the value added by insiders. The firm's NPV, wholly contributed by insiders, is $mrK/r - K = (m - 1)K$. If the insiders leave, the NPV goes with them, leaving behind

assets worth only K. (The assets might be sold for K or operated by new, ordinary managers with $m = 1$.) The cash flow C is net of all costs, including the salaries insiders could earn working in other jobs.

Insiders have only I dollars and must raise $K - I$ from outside investors. These investors understand that insiders will capture part or all of the future cash flows. Let Z_t be the amount captured at date t. The residual cash flow is paid out as a dividend $Y_t = C - Z_t$. Of course part of the dividend goes back to the shares held by insiders. If outside equity investors' fractional ownership is x, they get xY_t and inside equity gets $(1 - x)Y_t$.

Once the firm is up and running, outside equity investors can in any period take out assets worth xK and leave the firm. If they do this, they receive no dividend in that period because insiders have no reason not to capture all cash flow. But if insiders choose to pay a sufficient dividend, outside equity investors commit not to exercise their primitive right, and they wait until the next decision point at $t + 1$.

I assume that both insiders and outsiders want the firm to continue, and decide any ties in favor of the going concern.

Let V_t^{ex} be the ex-dividend present value of all shares if outside equity investors wait. They are willing to wait only if

$$x(Y_t + V_t^{ex}) \geq xK. \tag{1}$$

If the firm continues, the same amount will be paid out each period, so $V_t^{ex} = (C - Z)/r = Y/r$. Equation (1) becomes

$$x(Y + Y/r) = x(Y(1 + r)/r) \geq xK.$$

Insiders minimize Y to maximize Z, so

$$Y = rK/(1 + r) \tag{2}$$

$$V_t^{ex} = Y/r = K/(1 + r). \tag{3}$$

Note that x, outside equity investors' fractional ownership, drops out. Equation (1) is an *intertemporal* constraint and has nothing to do with the cross section of shareholdings. Giving insiders a greater ownership share has no effect on dividends or on Z, the amount of cash flow captured. This differs from Jensen and Meckling (1976), who argue that the private benefits taken by insiders depend on the fraction of shares they own. I resolve this difference in Section IV.

The story behind equations (2) and (3) is simple. Outside equity investors cannot get at current cash flow. Exercising their primitive right gives them only xK. So insiders pay out just enough that the cum-dividend value of outsiders' shares is xK. The dividend is therefore set so that $xK = x(Y_t + V_t^{ex})$. V_t^{ex} depends on the *next* period's cum-dividend market value, which will equal K

regardless of whether outside equity investors take their assets at that time or wait again. Either way the present value is $K/(1 + r)$ at t. Substituting this present value for V_t^{ex} in equation (1), $Y_t = K - K/(1 + r) = rK/(1 + r)$.

The model works just as well with a finite horizon. If $t + 1$ is the last period, outsiders will surely take their share of the firm's assets, worth K at that time.[3] This establishes $V_t^{ex} = K/(1 + r)$, and the outcomes at t are unchanged.

The extension to uncertain future asset values is likewise obvious: just substitute the expected value of K as the $t + 1$ payoff and interpret r as a risk-adjusted discount rate. The time series of dividends Y_t then tracks the randomly evolving asset value K_t. (There could also be uncertainty about m, the measure of insiders' value added. This would not affect the dividend or the value of the firm to outside investors.)

Now look again at the position of outside equity investors. They "ought" to receive a dividend amounting to the opportunity cost of capital times their share of the assets—that is, xrK. Instead they get only $xrK/(1 + r)$, and the market value of their shares, which "ought" to be xK, is only $xK/(1 + r)$. \$1 invested in the firm's equity immediately trades at a discount, that is at $1/(1 + r)$. Therefore equity investment can be attracted at startup only by allowing outside investors to purchase shares at a discount relative to insiders, or by giving "free" shares to outside equity investors. In this way inside equity investors must coinvest, paying up front for the extra cash flows to be extracted later.

The model is closed by showing that insiders are willing to maximize NPV by raising $K - I$ from outsiders and investing the full amount K. The insider's net present value at startup, taking account of their investment I, is

$$NPV(\text{to insiders}) = -I + PV(C) - xK/(1 + r),$$

where $PV(C) = mK$, the value of the firm before any cash flows are extracted by insiders, and $xK/(1 + r)$ is the value of outside equity investors' claim. Note that there is no immediate cash flow C_0.

Outside equity investors will demand a fractional ownership $x = (1 + r)(K - I)/K$. In other words, insiders must put in enough to absorb the discount to the market value of outsider's shares. The minimum $I = rK/(1 + r)$ gives $x = 1$. (Note that $rK/(1 + r)$ is also the required dividend in each later period; insiders must, in effect, pay one dividend in advance at startup.)

Substituting for x,

$$NPV = -I + mK - (K - I) = mK - K,$$

which is maximized when $m = 1$ at the margin for the last dollar invested. This confirms that insiders will choose the NPV-maximizing scale for the firm. The same optimality condition holds ex post when I is a sunk cost.

[3] If assets depreciate to zero value at $t + 1$, then t will be the last period, because outside equity will seize the last positive residual value.

I have assumed nondepreciating assets. Suppose assets decline in value by dK per period. Then V_t^{ex} in equation (1) is $K_t(1 - d)/(1 + r)$, and $Y_t = (r + d)K_t/(1 + r)$.

B. Review of Assumptions and Conditions for Equilibrium

Five basic assumptions underly both the partnership and corporation models.

1. Insiders and outsiders are present-value maximizers. Personal risk aversion is relevant only as it affects asset values and opportunity costs of capital.
2. Assets are clearly identified and observable and have well-defined market values, so that the primitive right of ownership is enforceable.
3. Outsiders cannot prevent insiders from capturing part or all of operating cash flow C.
4. Insiders have enough cash, at least $rK/(1 + r)$, to cover their share of startup investment K.
5. Insiders bear some cost if they are forced to refinance or reconstitute the firm. This cost ensures that ties are broken in favor of the going concern.

Assumption 2 is most natural for tangible, indivisible assets that retain value in alternative uses for several periods. Sale or removal of such assets is normally observable and verifiable. It helps too if the assets are illiquid, which reduces the incentive for insiders to cash in and depart.[4]

Assumption 5, though probably obvious, needs further discussion. Consider the insiders' position. Their value added, which has a present value of $(m - 1)K$, can be taken by them at any time, and they can extract all of the cash flows it generates, that is $r(m - 1)K$. Assumption 3 gives them the additional bargaining power to capture the immediate cash flows generated by the assets, so $Z = r[m - 1/(1 + r)]K$.

If insiders' value added is costlessly separable and transportable, then there is no going-concern value. There is nothing to prevent a solution in which dividends are never paid, outside equity's primitive right is always exercised and assets are *rented* from a fresh set of outsiders in each period.

Insiders will prefer the going-concern solution if, say, they lose one period's cash return on their value added if outside equity investors takes their assets and the firm has to be reformed. Then their value added is worth $(m - 1)K/(1 + r)$ if the firm breaks up, versus $(m - 1)K$ if it continues. I will use this assumption below, although other plausible stories could be told—for example, insiders might acquire firm-specific human capital, and be less productive (lower m) working with other assets or in another organization.

C. Bargaining and the Partnership Agreement

The partnership-model equilibrium rests not on a sequential game, but on negotiated agreements between insiders and outsiders. In exchange for the

[4] See Myers and Rajan (1998).

dividend Y_t, outside equity investors agree to leave their assets in the venture until the next negotiation at $t + 1$. The dividend and agreement are assumed simultaneous, like the execution of a contract.

The Appendix shows that the equilibrium summarized in equations (2) and (3) is stable and robust. For example, it does not require an infinite or indefinite horizon, and does not require outsiders to expect that insiders will follow any particular future strategy.

It seems best to think of the partnership model as applying to a closely held firm so that insiders and outside equity investors can negotiate at low cost. Negotiation occurs every period: the firm cannot continue absent outside equity investors' agreement to forbear for the next period.[5] There may be costs of reaching or ratifying agreement, but these are sunk when the final bargain is struck and cannot affect its outcome.[6]

Why is an explicit agreement necessary? Because without it outside investors would accept the dividend and then immediately take their assets, say at $t + 0.001$. In anticipation, insiders would not pay the dividend and the going concern could not be maintained. Note that outside equity is worth $K/(1 + r)$ ex-dividend, less than the asset value K. The top panel of Figure 1 shows that the value of outside equity reaches K only at the negotiation date just before the dividend is paid. At all other dates outsiders would gain by withdrawing assets.

The partnership agreement may seem ad hoc. In fact it shows an important general point that is amplified and elaborated later in the paper. Outside equity works only if property rights to the firm's assets are qualified and cannot be exercised costlessly at any time. The partnership agreement is a contractual device to restrict outside equity's power. There are other devices, such as independent boards of directors or the laws regulating takeovers. The other way to constrain outside equity's power is to disperse ownership. This is considered in Section III.

D. Financing Growth or Reinvestment

How do dividends and the cash flows captured by insiders change in response to an additional investment of k with present value mk? The investment could be for growth or reinvestment of cash flow generated by a depreciating asset.

[5] What determines the length of a period? There are trade-offs. For example, an agreement written for a long period reduces the costs of bargaining because it is less frequent, but allows more cash to accumulate for capture by insiders. Rapidly depreciating assets, which generate cash more quickly, would presumably require shorter periods.

[6] Bargaining costs incurred by outside investors could have two effects, however. First, they may reduce outsiders' bargaining power, because a perfunctory negotiation is cheaper than a protracted one. Second, the value of outside equity would fall to offset the present value of future bargaining costs. The dividend yield would increase.

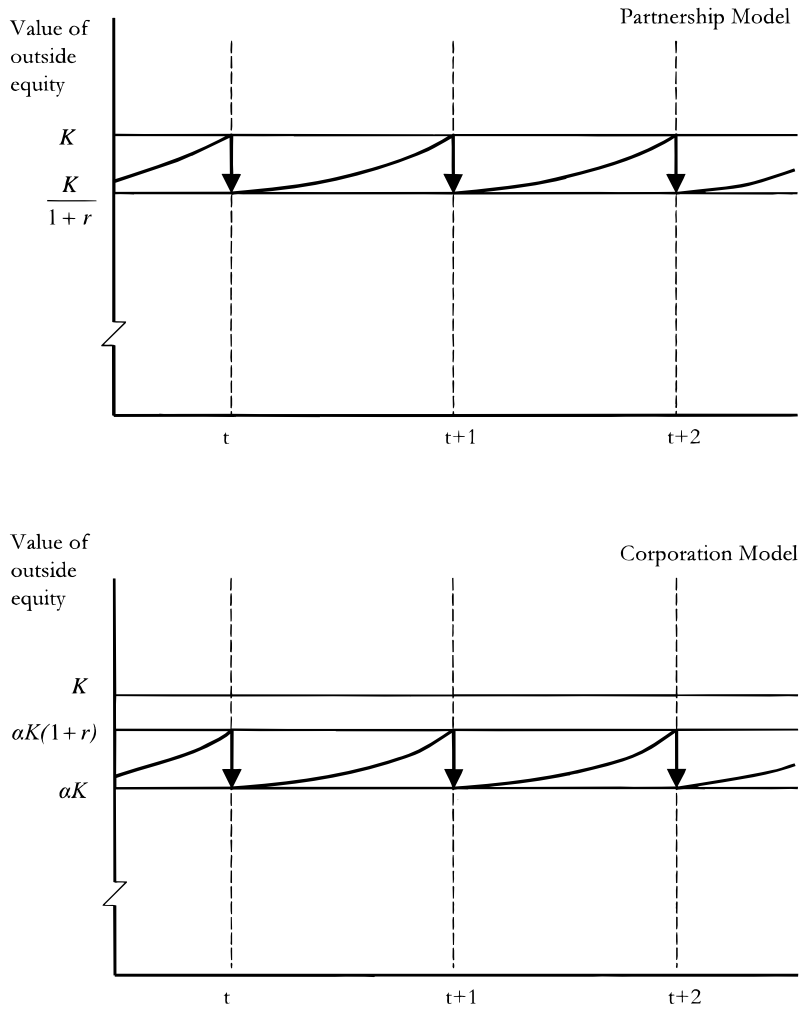

Figure 1. Time-plots of the value of outside equity. The downward-pointing arrows show the fall in value on the ex-dividend date. In the partnership model, value never exceeds liquidation value K. In the corporation model, value never falls below αK, the net value realized by outside equity if they organize and take control. The costs of organizing are captured in the parameter α. The discount rate is r.

This investment cannot be 100 percent financed by reducing the dividend Y, because the value of outside equity investors' xk dollars of reinvested earnings would immediately drop to $xk/(1 + r)$. Outsiders cannot be asked to put up more than this amount—otherwise they will exercise their right to withdraw capital. So the investment k must be split, $k/(1 + r)$ coming from

reduced dividends and $rk/(1 + r)$ from reduced cash flow Z taken by insiders.[7] Thus growth can be financed, but insiders have to coinvest. Insiders in growth firms would capture less cash flow. Insiders in mature or declining firms would capture more.[8]

E. Is Outside Equity Different from Debt?

Under certainty, the equilibrium payoffs to debt and equity may be hard to distinguish. With uncertainty the differences are clear. I use the partnership model for illustration, but the argument is general.

Assume that insiders need $K/(1 + r)$ dollars of external financing. They could write a one-period contract with outside investors to pay "interest" of rD on a face amount of debt $D = K/(1 + r)$. The debt investors could enforce the contract by their right to foreclose if the promised payment is not made, obtaining $\text{Min}(K, (1 + r)D) = K$. (Note that the promised interest payment as well as the principal is secured by the assets.) The payouts to this contract would exactly match the dividends to the company's shares under all-equity financing.

Under certainty the payments from this scheme match those to equity financing of the same initial amount in the partnership model.[9] But with uncertainty the differences between debt and equity are clear, although they depend on whether outside investors have limited liability. If they do not, then the payments to lenders depend on the equity investors' personal assets, whereas payments to equity investors depend only on K. If equity has limited liability, lenders accept a default put exercisable when ex post K is less than $D(1 + r)$. With equity financing, the dividend is always based on the ex post K and varies proportionally.

There are two types of "debt" securities with cash payments indistinguishable from equity. First, insiders with limited liability could promise to pay an extremely high interest rate r_D, so that $D(1 + r_D) \gg K$, thus guaranteeing default. Lenders could foreclose for K—or they might renegotiate for a cash payment of $rK/(1 + r)$ and a promise from insiders to pay off the debt plus another period's interest at $t = 2$. This promise would be worth $K/(1 + r)$. Either way lenders end up with K. The present value of this debt instrument at issue is $K/(1 + r)$, and its cash payments track payments to the same amount of equity. Of course this example is frivolous: debt must act like equity when default is certain.

[7] If insiders' value added is small, Z can go negative as investment increases. This contribution might be covered by sweat equity—that is, by work for less than market wages. See Section III below.

[8] If insiders could raise additional equity without cutting back Z, the market value of existing shares would fall by $r/(1 + r)$ times the amount of the issue. Outside equity investors would of course act to prevent this.

[9] In this case debt dominates equity if it is costly for outside investors to determine K. Debt investors incur this cost only if a promised payment is not made.

Second, the firm could issue debt indexed to the ex post asset value K. Then interest payments could not be distinguished from dividends. Any principal payments could be refinanced with new debt of the same sort. With refinancing, the debt could last as long as the equivalent outside equity.

However, this indexed debt works only if ex post asset value K is *verifiable*; otherwise default is not verifiable and the lender's primitive right to take assets if (and only if) a promised payment is not made has no content. Equity has the right to reach assets at any time, so verifiability is not required. This is a fundamental difference between debt and equity financing.

II. The Corporation Model

The corporation model discards partnership agreements and instead gives outsiders the right to vote out management at any time. Control by voting changes the model in two crucial ways. First, it introduces free-rider problems and costs of collective action.[10] Second, absent the partnership agreement, the firm can continue with the same management only if the value to outsiders from doing nothing is *at all times* no less than the net payoff to throwing the managers out. "At all times" includes every instant between dividend payments.

Suppose the net value reachable by outsiders is αK, where $\alpha < 1$ picks up the costs of organizing to vote to replace management. Then the ex-dividend value of outside equity cannot fall below αK at any time if outsiders are to be kept from taking control.[11] This means that expected future dividends must have a present value of at least αK. Of course insiders will pay the minimum dividend they can get away with. This constraint gives the time pattern of equity values shown in the bottom panel of Figure 1.

A. Assumptions

Assumptions change as follows:[12]

1. Bargaining is replaced by sequential actions. Each period insiders pay a dividend. Outside equity investors pocket the dividend and then decide whether to organize, take control, and replace management.

[10] Costs of collective action include costs of bargaining among outside investors and insiders. Such costs might be added to a more elaborate partnership model.

[11] The parameter α could be interpreted as a probability that a takeover attempt by outsiders would be successful. Then the ex dividend value of outside equity could not fall below the expected payoff from the attempt. Fluck (1999) has a model using this setup, which is similar in some other ways to my corporation model. However, if α is a probability of success, then α depends on x, the fraction of shares held by outside investors.

[12] Assumptions 1 and 4 match Fluck (1998). However, the corporation model differs from Fluck's in several respects. For example, insiders have to coinvest because outsiders know that taking over will give them only αK, which is less than the required investment K. Fluck does not consider the cost of collective action by outside investors or how it might vary, depending, for example, on whether the outside investors' shares are closely held. But see Section III below and Fluck (1999).

2. The payoff to outside investors from taking over is $x\alpha K$, with $\alpha < 1$, versus xK in the partnership model.
3. Outside equity investors must have majority voting control. If outsiders are a minority, and insiders can capture cash flow, outside equity is worthless if control is by majority vote only.
4. The firm has an indefinite life. That does not mean that insiders' value added will last forever, only that it does not stop at some definite future date. For simplicity I will assume an infinite horizon and nondepreciating, infinite-lived assets with starting value K.

Assumption 4 is essential, as Fluck (1998) has shown. Suppose insiders' value added will disappear at some definite future date T. If new managers are to be voted in at that point, existing insiders will certainly take all of T's cash flow. Outside equity investors would anticipate this and take over at $T - 1$, realizing αK at that time rather than a period later. Insiders would then take all of cash flow in $T - 1$, so outsiders would take over at $T - 2$—and everything unravels.

As in the partnership model, I assume that the firm's assets are observable, and that any attempt by insiders to sell them and depart with the proceeds is verifiable and can be stopped.

B. Dividends in the Corporation Model

The corporation can continue under current management only if outside equity investors believe at each date t that insiders will pay future dividends of $r\alpha K$ per period. For an infinite horizon, these future dividends' present value is $r\alpha K/r = \alpha K$, so outsiders are always as well off continuing with current management as organizing to take over.

Outside equity investors do not have to forecast the entire, perpetual stream of future dividends. One future dividend is enough. Outside equity will not continue if investors rationally forecast the ex-dividend value of their shares as less than αK at $t + 1$, because they can always take control and realize αK. So if they expect a dividend $r\alpha K$ at $t + 1$, then the ex-dividend value of their shares at t must be $V_t^{ex} = (r\alpha K + \alpha K)/(1 + r) = \alpha K$.

The conditions for outside equity investors *not* to take over are therefore as follows. In each period they must see the ex-dividend value of continuing as

$$xV_t^{ex} \geq x\alpha K, \tag{1a}$$

where x is the fraction of shares owned by outside investors. Insiders will set dividends so that equation (1a) holds with an equality at dates t, $t + 1$, etc. The ex-dividend value at t is therefore

$$\begin{aligned} V_t^{ex} &= [\mathrm{E}_t(Y_{t+1}) + V_{t+1}^{ex}]/(1 + r) \\ &= [\mathrm{E}_t(Y_{t+1}) + \alpha K]/(1 + r), \end{aligned}$$

where $E_t(Y_{t+1})$ is the expectation at t of the *next* period's dividend. Outside equity will continue if $E_t(Y_{t+1}) = r\alpha K$.

The key to the equilibrium is the link between the current dividend Y_t and the expected future dividend $E_t(Y_{t+1})$. Pending further discussion below, I assume the following: if the firm has just paid out $Y_t = r\alpha K$, then $E_t(Y_{t+1}) = Y_t = r\alpha K$ and the firm continues; if the firm pays out $Y_t < r\alpha K$, outside equity investors expect insufficient future dividends and take over immediately.

If the firm continues, the same amount will be paid out each period, so $V_t^{ex} = Y/r$,

$$Y = r\alpha K \tag{2a}$$

$$V_t^{ex} = Y/r = \alpha K. \tag{3a}$$

These equations treat K as a known constant, but uncertainty is easy to add, for example by having K follow a random walk. The dividend payout rate would then be known but not the dividend itself.[13]

C. The Link Between Current and Expected Future Dividends

Equations (2a) and (3a) rest on an assumption that outsiders will take over immediately if a dividend of $Y = r\alpha K$ is not paid in the current period. This amounts to saying that outside investors will not accept a dividend cut this period in exchange for promises by insiders, for example "We won't do it again," or "We'll make it up later." Such promises could support temporary bubbles.[14]

But bubbles are much less plausible if information is imperfect, in particular if insiders do not know for sure what it would cost outside investors to take over. This cost shows up in α. The higher α, the lower the cost. Suppose insiders do not know for sure whether α is high (α_H) or low (α_L). They think that $\alpha = \alpha_H$ and are paying out $Y = r\alpha_H K$, but they see some chance that the true cost is higher, that is $\alpha_L < \alpha_H$. Therefore insiders are tempted to cut the dividend to $r\alpha_L K$.

Consider the equilibrium given by equations (2a) and (3a) with $Y = r\alpha_H K$. For this to survive, the following must hold:

[13] Of course m could also vary, but this additional uncertainty would not affect the dividends required to prevent takeover by outside equity investors. These dividends are tied to αK. One could also introduce uncorrelated noise in each period's cash flow. This would not affect required dividends or insiders' willingness to pay them. Insiders' *ability* to pay the required dividend might be questioned if negative noise forced cash flow C well below the required dividend Y. The model of debt and equity financing in Yanagawa (1994) hinges on this point.

[14] Long-lived bubbles are unlikely in the corporation model. They would have to be supported by an expectation of steady growth in dividends relative to K, but investors could not rationally project dividends greater than mrK, the total amount of cash available to pay dividends. Note also that both insiders and outsiders can withdraw at any time and shut down the firm. Neither side is required to "play the game" in perpetuity.

1. Insiders must believe that outsiders will take over if $\alpha = \alpha_H$ and the current dividend is cut to $Y = r\alpha_L K$. If the dividend is cut and no takeover follows, insiders must infer that $\alpha = \alpha_L$.
2. Outside investors must translate a dividend cut into an expectation $E(Y_{t+1}) < r\alpha_H K$, giving $V_t^{ex} < \alpha K$ and leading to an immediate takeover.
3. Given (1) and (2), insiders must be better off continuing to pay $Y = r\alpha_H K$ than cutting the dividend and taking the risk of takeover.[15]

Note that (2) follows from (1). If the dividend is cut and outside investors do *not* take over, they cannot expect future dividends to be restored or increased, because insiders will believe $\alpha = \alpha_L$. Therefore, if $\alpha = \alpha_H$ they must take over, and insiders' beliefs in (1) are rational. This fences out the bubble equilibria noted above and supports the corporation model's assumptions.

It also suggests why dividends are stable. Dividends are determined by insiders' beliefs about outside investors' costs of collective action, defined by α. If outsiders do not act when a dividend $Y = \alpha_H rK$ is paid, insiders infer that the true α is less than α_H. Therefore future dividends will not be increased. Insiders may try to lower dividends, but at some point will not dare to reduce them further. Then dividends will be fixed, relative to K, until there is new information or new uncertainty about α.

For simplicity I now return to the assumption of full information. The rest of the paper will concentrate on equilibria of the sort described by equations (2a) and (3a)—not denying that other equilibria may be possible.[16]

D. Will Insiders Bail Out?

The next step shows the conditions under which insiders are willing to pay out a sufficient dividend and limit their take accordingly. Suppose insiders hold the fraction $1 - x$ of the outstanding shares, so that they receive $C - Y + (1 - x)Y = C - xY$ per period if they continue. They also receive $(1 - x)K$, their share of the assets, if they stop. The payoffs are:

$$\text{Stop:} \quad C + [(m - 1)K]/(1 + r) + (1 - x)K$$

$$\text{Continue:} \quad C - xY + (m - x\alpha)K.$$

Here $(m - x\alpha)K$ is the present value of insiders' future cash flows, including their share of future dividends.

[15] A dividend cut increases insiders' capture of cash flow, for sure at date t and with probability p in subsequent periods. But with probability $1 - p$ they are tossed out and have to start again, giving up $(m - \alpha_H)K$ for $(m - 1)K/(1 + r)$. If p is small enough, the expected payoff to the cut is negative. If not, and a new equilibrium is established at $Y = r\alpha_L K$, then insiders will wonder whether the true α is lower still.

[16] For example, suppose that cash flow suffers a dramatic, obvious downward shock relative to K. In this case a temporary dividend cut might be acceptable to outside investors; a promise to "resume regular dividends later" might be more credible. Warther (1997) provides a dividend smoothing model in which companies with the lowest earnings reveal themselves by dividend cuts.

If insiders stop, they take all of the current period's cash flow C but have to wait one period before starting again. The delay reduces the NPV of their value added from $(m - 1)K$ to $(m - 1)K/(1 + r)$.[17] If they continue, they take out only $C - xY$ and can look forward to the same amount in perpetuity. The perpetuity's present value is $(m - x\alpha)K$. Insiders continue if

$$m \geq (1 - x) + x\,[\alpha\,(1 + r)^2 - 1]/r. \tag{4}$$

Equation (4) says that insiders may stop inefficiently if outside equity investors' bargaining power is too high. If $\alpha = 1$, insiders continue only if $m > x(1 + r) + 1$, that is only if they can earn *much* more than the cost of capital. If insiders add no value ($m = 1$), they stop unless $\alpha < 1/(1 + r)$.

What if incumbent managers become *inefficient* ($m < 1$)? In this case the payoff to stopping is simply $C + (1 - x)K$: after leaving the managers would have to retire or move to another type of work. (Their NPV from restarting would be negative.) But as incumbents they will continue if

$$m > (1 - x) + x\alpha(1 + r). \tag{4a}$$

Figure 2 shows the implications of equations (4) and (4a). For each level of value added (m), insiders resign if α exceeds a critical value, in other words if the costs to outsiders of organizing and taking control are sufficiently low. Remember that insiders must pay a dividend of $Y = r\alpha K$ to continue. If α is too high, insiders are better off departing with all the current period's cash flow than paying Y in order to continue.

The shaded areas of Figure 2 are inefficient. If $m > 1$, high αs are bad when they prompt insiders to depart when they should continue. If $m < 1$, high αs are good when they force out the incumbents. Notice the critical value $\alpha = 1/(1 + r)$ at which insiders always continue if $m \geq 1$ and stop otherwise. At this point the partnership and corporate models are identical. The partnership model's temporary suspension of ownership rights reduces outside equity investors' power to extract cash flows by just enough to ensure that insiders make the right stop-continue decisions.

The shaded areas in Figure 2 shrink as the fraction x of outside ownership declines.[18] But when outside equity is needed ($x > 0$), they never disappear. (Note that x cannot fall below 50 percent without further legal protection for outside equity.)

[17] This assumes that financing to restart is available on fair terms next period. Insiders would have to restart the business in the partnership model if $\alpha > 1/(1 + r)$. See Figure 2 below. Of course in real life stopping today would affect the insiders' reputations and make it harder to raise money to restart.

[18] Notice that the cost of collective action is a fixed fraction of K; that is, $(1 - \alpha)K$. It could depend on the fraction of shares held by outsiders, as in Stulz (1988). A more "realistic" version of Figure 2 would interpret α more broadly to include all the costs of a takeover, including the probability that the takeover does not succeed, and make α a function of x. But in most of this paper x is either fixed or cancels out of the intertemporal conditions for outside equity. Therefore I have not modeled possible interactions between x and α.

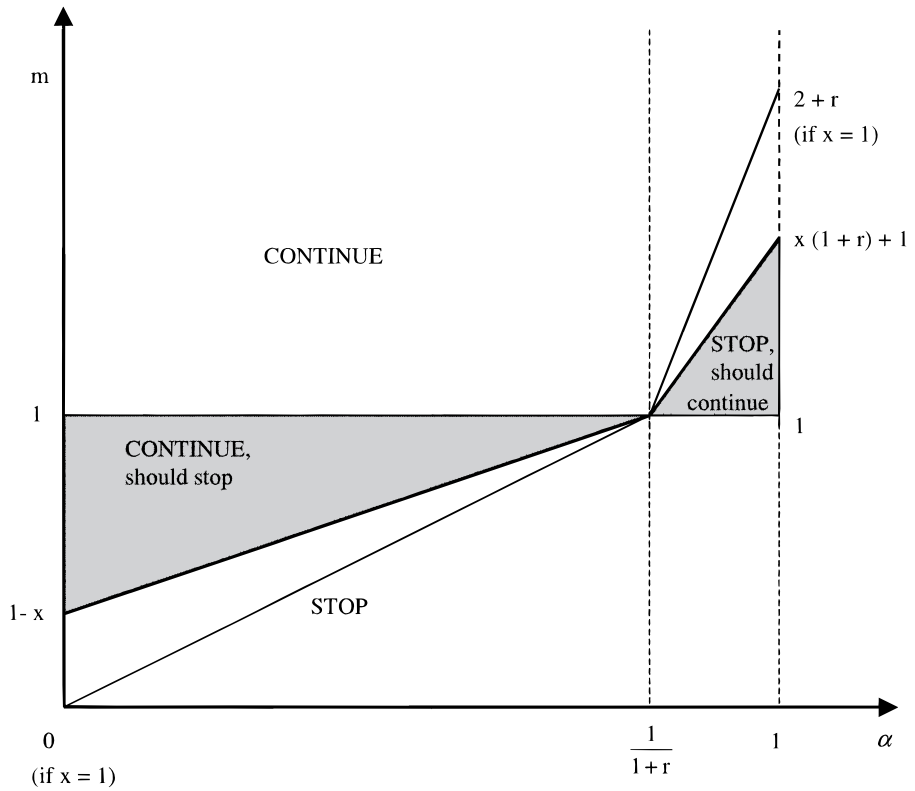

Figure 2. Insiders' willingness to pay a dividend sufficient to continue the corporation. The conditions for continuing depend on insiders' value added m, outside equity's costs of organizing to take control (high costs mean lower α), and the fraction x of outside ownership. In the shaded regions the corporation does not continue or continues inefficiently. The shaded regions shrink as x decreases. The discount rate is r.

Suppose the firm lands in one of the shaded regions. Can insiders and outsiders make a deal so that insiders do the right thing? Consider first the "continue, should stop" region. Here outside equity gains if insiders decide to depart.[19] Outside equity investors could afford to bribe them to do so. But the costs to outsiders of organizing to offer the bribe are presumably the same as the costs of organizing to take control. If they do organize, these costs are sunk and outsiders have no need to pay the bribe. They can just fire the managers, realizing xK instead of xK minus the bribe. In other words, organizing to bribe is the same as organizing to take over, which a dividend of $Y = r\alpha K$ prevents.

[19] In this case insiders take the immediate cash flow and outside equity investors get xK. Outsiders' cum-dividend value if insiders do not depart is $x\alpha(1 + r)\ K$, which is less than xK because $\alpha < 1/(1 + r)$ in the shaded region.

Perhaps a proposal from the insiders could work. They could propose to sell the fraction s of the assets and depart with the proceeds as well as the entire current-period cash flow C—a golden parachute, so to speak. Outside equity investors would acquiesce if $(1 - s)K$ exceeds $(1 + r)\alpha K$, the cum-dividend value of outside equity with existing managers in place. But there is a serious problem here too. In order for the corporation to work in the first place, the sale of assets has to be verifiable, and the outsiders must have the right to prevent sale or to capture the proceeds if a sale occurs. If it is the latter, they can wait until a sale takes place and then demand all the proceeds. In this case insiders will not sell assets, except with prior agreement from outside investors. If agreement can be achieved without triggering costs of collective action, fine. But if a proposal to sell assets forces outside investors to organize, they will just take over.

When insiders are inefficient, their departure is in their joint interest with outside equity investors. But the insiders benefit from the cost of collective action ($\alpha < 1$). They will not orchestrate a negotiation with outside investors if the costs of collective action are sunk and irrelevant ($\alpha = 1$) when it comes time to strike a deal.

Now consider the "stop, should continue" region. Here the cum-dividend value of outside equity exceeds xK, and outside investors lose if insiders decide to depart. It seems, therefore, that insiders could safely reduce the current period's dividend to $Y = rK/(1 + r)$—the same as in the partnership model!—and keep the cut as an incentive to stay on. But in this case the ex-dividend value of outside equity would fall below xK and with $\alpha = 1$ outside investors would take over anyway. In other words, the "bribe" necessary to keep managers on board in this region would have to be supported by a partnership agreement to prevent an ex-dividend takeover. It seems that only the partnership model works in this region.[20]

I have not analyzed debt financing, but one advantage of debt is obvious here: if it allows higher insider ownership (lower x), then the inefficient regions in Figure 2 shrink. Think of an LBO largely financed by outside investors. After the LBO, these investors' costs of collective action will be low (α close to 1.0). This in turn would require that insiders be given a substantial stake in the firm (low x) in order to obtain a stable financial architecture.[21]

E. Initial Financing and Expansion

In the corporate model the maximum initial outside financing is αK. This is the total value of outside equity at startup, which is of course less than K,

[20] In other model specifications, the "stop, should continue" region may be less of a problem. Suppose there is a fixed cost incurred if outside investors take over. If time periods are shortened, so that dividends are smaller but more frequent, insiders could be protected. Capture of any one dividend would not be motive enough to incur the fixed cost.

[21] Options may suffice. Note that LBO organizations are set up to ensure that the LBO is sold, either to the public or to another company, if the venture is successful. See Baker and Montgomery (1996) and Myers (1999).

the value of the startup corporation's assets. Even if insiders hold no shares, they still must put up $(1 - \alpha)K$. In effect they are paying in advance for their ex-post ability to restrict dividends to $r\alpha K$.

Insiders only seek out financing (and coinvest) if $m > 1$. They only get financing if m and α fall outside the "stop, should continue" region of Figure 2. It is easy to show that insiders will choose the NPV-maximizing scale for the firm whenever financing is feasible.[22]

If insiders want to expand the scale of the corporation from K to $K + k$, they have to coinvest, just as in the partnership model. The additional assets are worth only αk to outside investors, so the current dividend can be cut by only that amount. Thus,

$$Y = r\alpha K - \alpha k \tag{5}$$

$$Z = C - Y - k = r(m - \alpha)K - (1 - \alpha)k. \tag{6}$$

The coinvestment is $(1 - \alpha)k$. In the partnership model it is $rk/(1 + r)$. In both models insiders accept all positive-NPV investments.

Insiders will also disinvest if NPV is negative at the margin, even if the corporation is trapped in the "continue, should stop" region. Suppose assets are depreciating—that is, declining in value and throwing off extra cash to compensate. If one dollar of this extra cash is reinvested, insiders have to coinvest $1 - \alpha$ dollars. In exchange they get future cash flows worth $m - \alpha$. The trade is only worthwhile if $m > 1$ at the margin.

The same reasoning seems to apply to asset *sales* when $m < 1$ at the margin. Insiders are willing to sell if they can keep the fraction $1 - \alpha$ of the proceeds. But remember that outsiders must be able to restrict sale of assets for cash because once assets become cash, insiders can take them and depart. Sale of assets requires agreement from outside equity investors, and probably costs of negotiation, monitoring, etc. Decisions to reinvest cash generated in the course of business, whether labeled earnings or depreciation, are made by insiders, and interfered with only if outside equity investors organize to take control.

These distinctions between the sale of assets and the failure to reinvest cash are discussed further in Section IV.

III. Private Equity and the Value of Going Public

In the models presented so far, insiders capture more than a "fair share" of each period's cash flows. Since they contribute the NPV of $(m - 1)K$, they should get $(m - 1)K$, but take more. But there is no inefficiency. All positive-

[22] Fluck (1998) shows conditions under which 100 percent outside equity financing is feasible. In her setup it is *not* possible to finance all positive-NPV projects. Under certainty, NPV (for a two-period project) must be at least r times required investment. See her equation (4), and note that $\delta \equiv 1/(1 + r)$. When cash flow uncertainty is added, project NPV must be even higher; see her equation (6).

NPV projects are undertaken if outside financing is feasible and insiders can coinvest. Insiders pay up front for capturing too much period-by-period cash flow, for example by allocating extra shares to outsiders in the initial financing.

There is a problem waiting in the wings, however. It emerges when α is too high and insiders' incentives are weakened. Consider the extreme case where outside investors can reach all of the firm's value ex post—that is, mK. In this case financing ought to be easy. If α is high enough, but not in the "stop, should continue" region of Figure 2, insiders could raise K by selling the fraction $x = 1/\alpha m$ of the firm, keeping a minority stake for themselves.

Insiders may not be disadvantaged as minority owners. The cost of collective action deters takeover by outside equity investors, and if takeover does occur then insiders can still claim and take their share of the firm's assets. But can they extract their share of its *value*? The difference between value as a going concern and liquidation value is normally an intangible asset. Minority partners may get only their share of liquidation value if they withdraw. They may also destroy some of the going concern value as they depart. One great advantage of a corporation is that ownership shares can be freely transferred without disrupting the business.

But if control is by voting, the difference between 49 and 51 percent ownership is crucial. When insiders do not have enough personal wealth to buy a majority of shares, and outside investors can reach most or all of the firm's NPV ex post, insiders' incentives to create the NPV evaporate. I now show how to solve this problem by taking the firm public to reduce outside equity investors' ex post influence.

A. Investing in R&D

Figure 3 shows a two-stage research and development project. For simplicity, the risk of failure is concentrated in the first "R" stage. The final payoff, assuming research success (with probability p) and continued effort by insiders, is mK at $t = 2$. But if the research fails, the initial capital K is recovered at $t = 1$ (with probability $1 - p$). If the project is worthwhile,

$$\text{NPV} = -K + pmK/(1 + r)^2 + (1 - p)K/(1 + r) \geq 0. \tag{7}$$

This NPV may be zero or only moderately positive. But if the research stage succeeds, the NPV of continuing is large. Successful research *and* development depends on insiders' effort. The cost or disutility of effort is not modeled explicitly, but insiders break ties in favor of no effort.

Insiders' funds are limited, so they set up a corporation and go first to a private equity investor to fund most of the project. The private investor thus starts with voting control.

A successful project has independent, appropriable value at $t = 2$. New managers could run the firm just as well as the original insiders. No value is lost if these insiders are fired ex post. The private investor, having voting

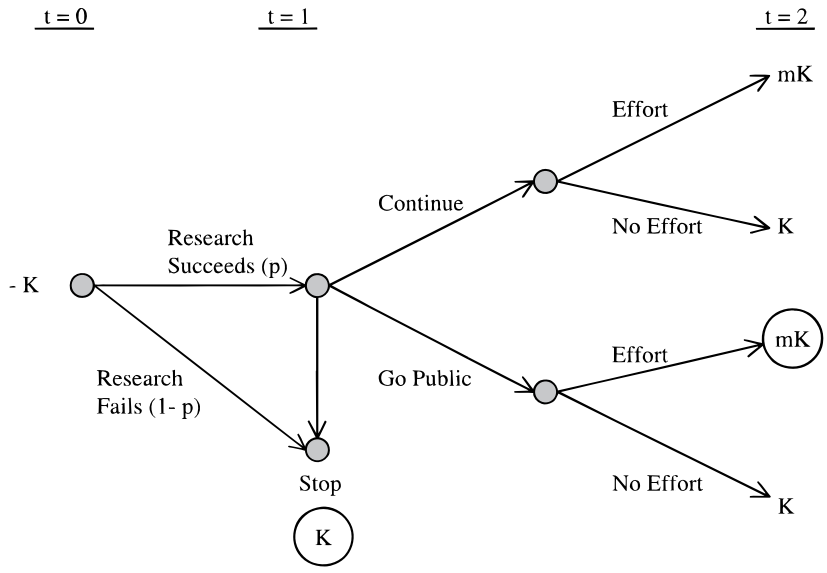

Figure 3. The decision to go public. An R&D project is funded by a private equity investment of K at time $t = 0$. The probability of success in the "R" stage is p; for simplicity there is no uncertainty about "D" given success by $t = 1$. Project NPV, assuming effort by insiders in both periods, is

$$NPV = -K + \frac{pmK}{(1+r)^2} + \frac{(1-p)K}{(1+r)} \geq 0,$$

where $m \geq 1$ measures insiders' potential value added and r is the discount rate. The last term represents recovery of investment at $t = 1$ if R fails. If R succeeds, the NPV of continuing from $t = 1$ to 2 is positive. At this point, the private equity investor can go public, and insiders' effort continues. Otherwise there is no additional effort, and the payoff is just K. Equilibrium outcomes are circled.

control, cannot credibly promise continued employment or the chance for insiders to capture part of the ex post cash flows. Note that the first operating cash flow does not arrive until $t = 3$.

The private investor can sell out and take the firm public at $t = 1$. If it does, however, some value is transferred to insiders because exercising control is more costly for public outside investors: they can only reach αmK of the ex post value, where $\alpha < 1$. The private equity investor can reach all of the value ($\alpha = 1$). In both cases, α is a fixed number; I assume no party can augment its bargaining power ex post.

The possible interpretations of α are now broader. It could be the cost of collective action, as before, or simply the fraction of total value mK reachable by outside investors in a takeover. Liquid assets with a good secondary market would have higher α's.

The insiders will have to put some personal funds into this venture, perhaps from sweat equity. The private equity investor has low monitoring costs and is well placed to enforce a sweat equity agreement.

The essential differences from the corporation model are (1) all ex post value is locked up in the firm, (2) effort is required from insiders to realize NPV, and (3) there is a difference in bargaining power for public outside investors versus private equity investors.

B. Why Startups Go Public

The initial private equity investor takes the firm public at $t = 1$ and by this strategy brings forth the optimal investment decision and the required effort from insiders. The argument is as follows. For simplicity, I assume the private investor puts up all of the initial investment and owns all the shares ($x = 1$).

1. When control is by voting and cash flows are appropriable, a minority stake in a corporation controlled by insiders is worthless. Once NPV is fixed in the firm, the private investor takes all the cash flow ($Z = C$) and dividends are $Y = 0$. The remaining shareholders are a minority and cannot vote the private investor out.
2. Therefore the private equity investor, owning a majority of shares, will throw out the original insiders at $t = 2$ and take their place. Any shares held by the original insiders will then be worthless, and any value added by insiders will be locked up in the firm. The original insiders will have to depart empty-handed. (In real life minority stakes in private companies are not worthless, but there is a well-recognized minority discount.)
3. Shares (or options) bought by, or given to, the original insiders before $t = 2$ cannot extract effort from them. Insiders know they will be thrown out, and their shares will be worthless in any case.
4. Assume that the first research stage succeeds, so that the NPV of continuing from $t = 1$ ($mK/(1 + r) - K$) is large. If private equity investment simply continues, insiders have no incentive to work. So the payoff to private equity from just continuing is only K at $t = 2$. Private equity investors will therefore stop the project in this case and recover K a period earlier.
5. However, private equity investors can sell the firm and go public. The selling price has to be worked out before the argument continues.

Assume to start that going public will bring forth the required effort from insiders. Consider the choice facing the new, public, outside investors at $t = 2$. They can vote to take over the firm, to them worth αmK, or can continue. They clearly will take over unless they can expect future dividends of $Y = \alpha rmK$ per period. But this situation (at $t = 2$) is identical to the startup period in the corporation model. So investors will continue,[23] and the total market value of equity will be αmK. Therefore the IPO value one period earlier will be $\alpha mK/(1 + r)$. Note there is no operating cash flow available to pay dividends until $t = 3$.[24]

[23] This assumes $\alpha < 1/(1 + r)$. See Figure 2.

[24] If insiders' effort generated $C_2 = rmK$, they might be sufficiently motivated even if private equity investors refuse to go public. The insiders would be fired once their effort is no longer needed, but at least they could take C_2 with them.

6. So private equity investors *will* sell and go public at $t = 1$ and insiders *will* put out the effort required to realize potential NPV. Private investors are better off because $\alpha mK/(1 + r) > K$, given success in the research phase, and assuming that α is not too far below 1.[25] Insiders are better off working, because with effort they capture part of future cash flow on a gross firm value of mK rather than K.
7. Therefore both private equity investors and the insiders prefer going public if the research phase is a success.
8. How is the firm financed at $t = 0$? Suppose the ex ante NPV of the venture is zero:

$$NPV = -K + pmK/(1 + r)^2 + (1 - p)K/(1 + r) = 0.$$

Private equity investors have to put in K in exchange for a present value of

$$PV = p\alpha mK/(1 + r)^2 + (1 - p)K/(1 + r),$$

where the term on the right-hand side takes account of the possible recovery of capital at $t = 1$ if the research phase fails. The difference of $(1 - \alpha)pmK/(1 + r)^2$ has to be funded up front by insiders. This is a zero-NPV investment for them if the venture has NPV = 0, since their upside payoff at $t = 2$ is $(1 - \alpha)mK$. If the venture has positive NPV, then insiders' NPV is also positive.

9. Insiders will choose the scale of investment to maximize NPV. This is easily shown.
10. From $t = 3$ on, outside equity investors retain the right to take over the firm and realize αmK. Thus insiders pay a dividend of $Y = r\alpha mK$ and take out cash of $Z = C - Y = rm(1 - \alpha)K$. Paying this dividend is always rational for insiders so long as $\alpha < 1/(1 + r)$.

This completes the model and shows that the financing sequence, which uses private equity at first and then public outside equity, is efficient. The financing does require investment by insiders, to pay (at $t = 0$) for the markdown in value (due to $\alpha < 1$) when the firm goes public. This investment is rational if the venture itself is worthwhile. Financing problems may arise, however, if α is so low that insiders cannot raise sufficient cash, either from their own pockets or by sweat equity (accepting low salaries in exchange for shares or options). The shares or options have value because both insiders and private equity investors understand the firm will go public at $t = 1$.

[25] If research is not too risky (p close to 1), and α is well below 1, it is possible for the selling price at $t = 1$ to fall below K, so that $\alpha mK/(1 + r) < K$. But in this case insiders will *pay* the private equity investors to sell the firm—that is, they will pay $K - \alpha mK/(1 + r)$. The payment could come as sweat equity. The NPV of continuing the project, $mK/(1 + r) - K$, must of course be positive.

The decision by private equity investors to go public is rational and efficient because it *reduces outside equity investors' ex post bargaining power* and therefore preserves the proper incentives for the insiders who have to build the business.[26]

C. Why Not Go Public at Startup?

It is clear why going public is so important for high-tech or rapidly growing startups: it prevents venture capitalists from ripping off inside entrepreneurs ex post. But why not go public at startup ($t = 0$)? What special role does the initial private investor play?

1. The private investor chooses which projects to launch and support. Sorting and selecting projects could be extremely costly for outside investors. Once a project is selected, the private investor's willingness to commit financing is a public signal that the project is worth funding.
2. The startup's first asset is cash, the asset most easily appropriated by insiders. The private investor makes sure the cash is actually spent on R&D.
3. The private investor is well placed to administer sweat-equity arrangements, in which insiders get shares or options in exchange for personal risk-bearing and below-market wages.
4. The private investor is needed to *stop* the venture at $t = 1$ if it fails. Figure 3 assumes complete success or failure at $t = 1$. In practice failure is not so clear, and insiders will have an incentive to continue as long as there is still a possible upside payoff to their (sunk) personal investments.[27] A large fraction of high-tech startups fail, not because of some conclusive technical failure, but because private investors choose to shut them down. (The secret of success in venture capital is not so much picking winners as shutting down losers early, before too much money is spent on them.)

[26] This point is also stressed in Burkhart et al. (1997). Brennan and Franks (1997) find that underpricing of IPOs in the U.K. fosters dispersed shareholdings and helps to prevent large blockholdings. That fits my argument: there would be no point going public if the new shareholders reclaimed the power of the initial private investor. However, the private equity model might not fit a mature firm subject to agency costs (see Section IV) or a new venture subject to a serious risk of falling in the "continue, should stop" region of Figure 2. In these cases it could be efficient to arrange the IPO and subsequent financing to encourage powerful outside blockholders. See Mello and Parsons (1998) and Stoughton and Zechner (1998). But if it is important to leave power in the hands of equity investors (versus insiders), why go public in the first place?

[27] Suppose insiders arrive at $t = 1$ in Figure 3 without demonstrating success. They will clearly want to try again if investors allow it. If insiders abandon the effort, they receive nothing—they cannot credibly walk away and ask for a fresh round of financing for the same project, with another round of transaction and setup costs. But if they try again in the same firm, there is some chance of realizing a part of $m(1 - \alpha)K/(1 + r)^2$, which is always positive.

Now suppose the firm is already public. Outside equity will take over only if $p\alpha mK/(1 + r)^2 + (1 - p)K/(1 + r) < \alpha K$, where p is the updated probability of success. But the project requires investment K, not αK. Insiders will continue inefficiently if $0 > \text{NPV} > -[(1 - \alpha)/\alpha][(1 - p)/(1 + r)]$. Thus it makes sense to arrange a high α in early stages.

The last three reasons require low costs of action by equity investors—that is, α close to 1. It is efficient to start with high α then switch to a lower α by going public. The switch occurs *after* the probability of success is proved sufficiently high, but *before* the entrepreneur's task is complete.

D. Final Comments on the Models

Coinvestment. The partnership, corporation, and "private equity" models all require some investment by insiders. The investment may be small—it is only $rK/(1 + r)$ in the partnership model. But if your goal is a model of stable equity financing with penniless insiders, this paper will not help.

Insiders often have natural sources of cash, however. The first is sweat equity. Second, when insiders contribute NPV to the firm, they may be able to sell part of it to outside investors. In the private equity case, for example, where outside equity can capture most of the NPV ex post, the amount of up-front cash required from insiders declines as NPV increases. If NPV is large enough, insiders' cash is negative; this means that insiders can raise all the investment K from outside equity without giving up 100 percent of the shares.

Third, insiders contribute their share of *ongoing* investment by reducing their capture of operating cash flow. Their fraction of investment is $r/(1 + r)$ in the partnership model and $1 - \alpha$ in the corporate model.

Jointly Owned Value. In all three models the value reachable by outside equity is clearly defined. But if the firm's ex post NPV is *jointly owned* going-concern value, which neither insiders or outsiders can claim exclusively, raising outside financing is more complicated. Outside equity investors may attempt to capture part of the joint NPV by threatening to withdraw capital, or vote out insiders, to force a reduction of Z. Insiders could offer a counterthreat to depart and destroy value.

There are easy extensions of the models if insiders' and outsiders' relative bargaining power is fixed. Let a be outsiders' bargaining power, as in Hart and Moore (1994). This applies only to the firm's NPV of $(m - 1)K$ after any costs of collective action have been incurred. Insiders have complete bargaining power over the immediate cash flow C, and outsiders can always reach the asset, worth αK to them.

The basic intertemporal constraint and value and dividend equations for the corporation model now are

$$x(Y_t + V_t^{ex}) \geq x\alpha K(1 + a(m - 1)) \tag{1b}$$

$$Y_t = r\alpha K(1 + a(m - 1)) \tag{2b}$$

$$V_t^{ex} = Y/r = \alpha K(1 + a(m - 1)). \tag{3b}$$

Outside equity receives more, and is worth more, as NPV and its bargaining power increase. The maximum feasible amount of outside equity financing likewise increases. All the other properties of the model follow, but not much is added.

One might live with a fixed positive coefficient of bargaining power if agency costs could be introduced in an interesting way. But that is difficult in a full-information setting. Suppose, for example, that insiders are given another degree of freedom, the chance to shift some of the assets generating value reachable by outsiders to a use that generates only jointly owned value. This reduces the future dividends that have to be paid out. Can insiders gain at outsiders' expense by doing this? No, because with full information outside equity investors just demand a higher current dividend to compensate for the loss of end-of-period value. Insiders do *not* gain, and investment remains efficient.

A satisfactory treatment of agency issues therefore requires differences in information and costs of monitoring. One approach is sketched in the next, concluding section.

IV. Conclusions—Outside Equity and Agency

Jensen and Meckling (1976) say that increased equity ownership by insiders reduces agency costs:

> As the owner-manager's fraction of the equity falls, his fractional claim on the outcome falls and this will tend to encourage him to appropriate larger amounts of the corporate resources in the form of perquisites. This also makes it desirable for the minority shareholders to expend more resources in monitoring. . . . (p. 313)

This assumes laws or contracts that go beyond the simple property rights assumed here and that are at least partially enforceable at the cost of monitoring. It is easy to see why such laws and contracts are necessary. For example, in the private equity model, where control is by voting, minority stockholders' property rights are worthless if the majority owners are also the insiders.

But there is a more striking difference between the analyses in this paper and those in Jensen and Meckling (1976). In this paper, the fraction of shares held by insiders has no effect on the "amounts of corporate resources" taken by insiders. The reason is dividend payout policy, which is not given much attention by Jensen and Meckling. In this paper, insiders have to adjust payout when their actions affect V_t^{ex}, the continuation value of equity. So insiders have to pay *in every period* to maintain their position. The amount they have to pay is given by an intertemporal constraint. Given cash flow and payout, insiders' take is fully determined.[28] There is no reason to spend money to monitor.

[28] However, the corporation model can generate behavior consistent with Jensen's (1986) free-cash-flow behavior, because it implies that inefficient inside managers will be able to continue if the costs to outside equity investors of taking control are too large. Of course, firms with inefficient managers will be natural targets for takeovers.

A. Property Rights for New Investment

The bridge from the intertemporal conditions for outside equity financing to standard agency theory rests on the lack of verifiability of new investment.

I have assumed that outside equity has complete, enforceable property rights to both existing assets and new assets. These rights are the models' sole support. Outside investors do not need to monitor the amount or disposition of cash flow. They only need to watch the dividend paid relative to asset value.

New investment is financed mostly by outside investors (who accept dividend cutbacks) and partly by insiders (who capture less cash flow). But how do outside investors know that dividends forgone are actually invested? If the new assets are discrete and tangible, like a ship or office building, or a large greenfield venture such as GM's investment in Saturn, verifiability may be relatively easy. But if investment is supposed to go generally to a line of business, verification is difficult. When an upbeat press release says that "planned cost improvement programs will depress earnings in the short run but add to the long-run competitive strength of our business," outside investors wonder what is in it for them.

Myers (1977) said that the NPV of new investment is almost never verifiable. (It is hard for outsiders to know NPV, much less verify it.) The point was too narrow: the *act* of investment, defined as current expenditure that produces future value appropriable by outside investors, is usually not verifiable absent monitoring. Investment in going concerns is not instantly transformed into visible, valuable assets. Instead it usually goes to building up lines of business, which are collections of assets—many intangible. It is hard for an outsider to know whether such expenditures are aimed at generating additional appropriable value or are just being absorbed by the coalition of insiders. The outsiders would have to know the true *purpose* of the outlays, which is almost as hard as knowing their NPVs.

Consider an extension of the corporation model. Suppose that outside investors have enforceable property rights to assets in place, but not to new assets *until* they are in place. If at date t dividends are cut by αk as partial financing for new investment k, outside investors will not know until date $t + 1$ whether the investment was in fact made.

In the corporation model, insiders never take a negative-NPV investment. But will they coinvest at positive NPV if they have the chance to take the money instead?[29] The answer is "no" unless NPV is strongly positive.

Suppose outside equity investors do not monitor and cannot prevent insiders from consuming cash earmarked for new assets. The cost of the new

[29] I assume the insiders either invest to maximize NPV or just take the money. Of course there are intermediate cases, such as entrenching investments chosen to augment insiders' bargaining power (see Shleifer and Vishny (1989)).

assets is k. If outside investors accept a dividend cut of αk, the insiders' payoffs are:

$$\text{Invest:} \quad -k + \alpha k + (m - \alpha)k$$

$$\text{Consume:} \quad \alpha k.$$

The NPV to insiders of investing *instead of* consuming is:

$$\text{NPV} = -k + (m - \alpha)k,$$

which is positive only if $m > 1 + \alpha$.[30] If insiders do not have to invest, their opportunity cost is the full outlay k, but they capture only $m - \alpha$ times the resulting value. Therefore they will reject some investments with positive NPVs.

Knowing this, outside equity investors will not accept any dividend cutback unless (1) the existence of the new asset is immediately confirmed or (2) they are convinced that m for that asset is greater than $1 + \alpha$, so that investment will be positive-NPV for insiders. In other words, low or zero dividend payouts will be more readily tolerated by outside investors when the firm is known to have plenty of high-NPV growth opportunities. Of course, even growth firms will have investments at the margin with $m < 1 + \alpha$, but positive NPV.

The first purpose of monitoring, therefore, is to confirm whether and when investments are made. Absent monitoring, positive-NPV investments are passed by. If monitoring can confirm investment, thereby ruling out excess consumption by insiders and allowing most of k to be financed by dividends forgone, then all positive-NPV investments will be made.[31]

This argument can of course be reversed. If an asset is sold for k, outside investors will demand a payout increase of αk. Insiders take $(1 - \alpha)$ from the proceeds of the sale. In this case, insiders never sell unless $m < 1$.[32] But if they can pocket all the proceeds, they will sell assets with $m > 1$ but less than $1 + \alpha$. This is inefficient, thus the need for monitoring arises again.

[30] If outside investors can capture αmk, as in the private equity model, the invest-versus-consume hurdle is even higher: $m > 1/(1 - \alpha)$.

[31] This does not require outside investors to know how good the investment opportunity is. For example, consider the worst case from the insiders' point of view: outside investors believe that investing k today will give them appropriable value of αk only, but in fact the investment's positive NPV will be locked up in the firm, as in the private equity model. So outside equity investors contribute αk, gain αmk, and are surprised with a positive NPV. The NPV to *insiders* is then

$$NPV = -k + \alpha k + (1 - \alpha)mk = (1 - \alpha)(m - 1)k,$$

which is always positive if $m > 1$. There is always NPV left over for insiders.

[32] But if $m < 1$ *on average* for the firm's assets, insiders' calculations for asset sales change, because they cannot start up another firm if outside investors take over.

Monitoring is nevertheless likely to be more important for investment than disinvestment, because sale of existing assets is more readily verifiable by outsiders than is investment in new assets.

B. Monitoring and Agency

When ownership is dispersed and costs of collective action are important, monitoring should occur each period without triggering costs of collective action.[33] So insiders and outsiders would agree at startup to operate a delegated monitoring system. Monitoring cannot be done by insiders, and dispersed outside investors cannot monitor efficiently on their own. For example, accountants can be hired and given rules for distinguishing the purchase and sale of assets from operating costs and revenues.

Once established, such monitoring procedures inevitably lead to agency costs. There are two reasons. First, monitoring of investment cannot be perfect because the monitor needs to know the purpose of expenditure. (For example, is the retention of well-paid managers with allegedly special skills an investment for "long-run competitive strength" or private benefits to insiders? Does absorption of operating losses from a struggling division amount to investment to retain a valuable call option on revenues from the division's markets, or just protection for the division's workers and managers?) Wherever there is a fuzzy line between expenditure to create value for outsiders and outlays captured by insiders, the insiders have a strong incentive not to invest but consume. But they have to find ways to consume that are not obvious. Thus they seek private benefits of control, such as perks or overemployment.

Second, once procedures to monitor investment are set up, they can also be used *at relatively low marginal cost* to reduce insiders' capture of operating cash flow. In other words, monitoring may be used not only to confirm new investment, but also to prevent insiders from taking their "fair share" of cash flows generated by assets in place. Again, insiders will try to limit the value reachable by outsiders or to hide cash they would rather consume in private benefits of control.

Thus traditional agency costs seem unavoidable. Because the act of investment is frequently nonverifiable, monitoring is necessarily imperfect, but also indispensable if the firm's growth opportunities are valuable. But monitoring cannot be designed or operated to protect assets-in-place only. It has to watch how cash flows are used. In many cases the purposes of expenditure will not be obvious: apparent investments may actually benefit insiders, and operating costs may actually be investments. Once monitoring

[33] Insiders and outside equity investors have a joint interest in avoiding costs of collective action, not just to avoid the costs but also to preserve the intangible assets and opportunities contributed by insiders. Once costs of collective action are triggered and sunk, outside investors have a strong incentive to take over the company. If they take over, they get K or possibly mK. If they walk away, they get only αK or αmK, respectively.

procedures are set up, promises by insiders not to seek private benefits, or by outsiders not to try to capture too much of operating cash flow, are not sustainable.

This is, of course, the standard agency view, but in this instance the destination may be less interesting than the route taken. If outside equity rests on property rights to the firm's assets, then the difficulty of verifying reinvestment of operating cash flow leads to monitoring of investment. Then monitoring leads to agency costs, *not* the other way around.

This is the connection to the literature which *assumes* that nonpecuniary, private benefits of control are important to insiders. No such benefits appear in the three models presented above. In those models, private benefits of control would be inefficient. If outside equity investors' participation can be supported by property rights alone, all are better off if insiders' ability to capture operating cash flow is unconstrained.

The interactions of dividend policy, monitoring of investment, and traditional agency costs have not been fully investigated. For example, I have not considered compensation schemes that prespecify how pecuniary awards for insiders are to be determined. Ideally these would give managers the correct fraction of cash flows from assets in place. Then monitoring that prevented insiders from taking additional cash or private benefits would also ensure the right investment decisions. But such schemes cannot work perfectly. For example, the cash given in each period to insiders should depend on the NPVs of that period's investment opportunities, because insiders coinvest in new assets by cutting back their capture of cash flow. But the NPVs are not verifiable, and usually not knowable by outside investors or monitors.

If a close-enough-to-optimal compensation system could be set up—or perhaps administered ex post by independent directors—it could be efficient ex ante for insiders to promise to forswear any additional capture of cash flow or private benefits. Then ex post monitoring could shift to trying to enforce this promise rather than verifying investment. As was shown in this section, if insiders cannot take money intended for investment, they will accept all positive-NPV projects.

C. Some Implications

This paper starts with simple property rights and tries not to lean on intuition about current practice and institutions. It nevertheless generates some empirical suggestions or observations.

Because insiders share the firm's added value, they have to coinvest with outside equity. Coinvestment may come as cash, by grant of extra shares to outside investors, or as sweat equity, defined as a commitment to bear risk and work for less than an opportunity wage in exchange for a share of future cash flows or value. Of course sweat equity works only if insiders can be prevented from reaching cash contributed by outsiders and earmarked for investment. That is one reason why early-stage companies are funded by venture capitalists, not the public equity markets.

But as the private equity model shows, insiders may invest in exchange for shares only if they believe the shares will be publicly traded if the firm succeeds. That is one reason why venture capitalists voluntarily take their successful startups public. The right time to go public is after most of insiders' sweat equity investment is made but before their efforts are complete and embodied in cash flows or value appropriable by outside investors.

Pop quiz: Why have hundreds of biotech companies gone public at early stages of their research programs, while most commercial real estate is still privately held? (Despite the recent popularity of REITs, only a small fraction of commercial real estate is securitized.)

Answer: Success in biotech research means an FDA-approved drug. The value of such a drug no longer depends on the people who created it[34] and can be captured by outside investors. Biotech companies go public to reduce the power of outside equity and preserve incentives for insiders. Developed commercial real estate does not need to be publicly held because value does not depend as much on effort or intangible assets provided by insiders.

In general, the efficient design of outside equity financing achieves the right balance of power between insiders and outside investors. Outside equity investors' ownership rights have to be curtailed to the right extent. The curtailment can be achieved by law or contract, for example by a rolling partnership agreement, or by legal constraints on takeovers. It can also be achieved by dispersing ownership.

Given the right balance of power, insiders can have the right incentives for effort and for new investment, even if outside investors do not try to prevent insiders from capturing operating cash flows. Of course this rests on a critical and unrealistic assumption: that outside equity can verify not only the existence of assets in place but also new investment. Outside investors may be able to verify assets in place, but absent monitoring they cannot usually verify new assets *until* they are in place. Verifying new investment at the moment cash is committed requires, in most cases, understanding of the purposes for which cash is spent. Monitoring is therefore essential when the firm may have valuable growth opportunities. If there are no positive-NPV opportunities, outside equity just monitors assets in place and demands a dividend proportional to the assets' appropriable value.

The first purpose of monitoring is to verify assets. Accountants should concentrate first on the balance sheet and should try to determine whether cash flow not paid out or properly taken by insiders is spent on assets that will have value appropriable by outside investors. The point is not to value the assets but to confirm their existence. Perhaps that is why accountants do not try to estimate true economic income and are content with reporting historical costs on the balance sheet.

But once monitoring systems are set up, they inevitably lead insiders to try to capture private benefits rather than cash. This leads to the well-known agency problems emphasized by Jensen and Meckling (1976) and many others.

[34] This is, of course, an oversimplification. The people who develop and test an FDA-approved drug have an advantage in developing new indications for the drug or related follow-on drugs.

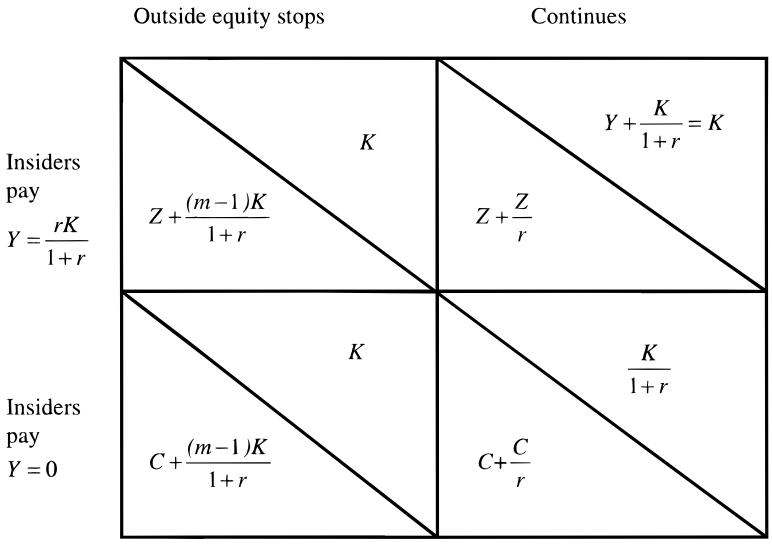

Figure A1. Payoffs in the partnership model. This table assumes for simplicity that insiders own none of the assets K. Insiders can pay no dividends, capturing the entire cash flow C, or pay $Y = rK/(1 + r)$, capturing $Z = C - Y$. Insiders' present value, if the dividend is paid and the firm continues, is $Z + Z/r$. Outside investors can stop, taking out assets worth K, or continue. If they continue, they get the continuation value $K/(1 + r)$ plus a dividend of Y or zero. If outside equity stops, insiders have to start the firm up again after a one-period delay. In this case their future cash flows are worth $(m - 1)K/(1 + r)$. Payoffs to outside equity are shown above the diagonals.

Appendix

This appendix shows that the partnership model is stable and robust even when the firm has a definite finite horizon. Once a sufficient dividend is paid at the start of the period, outside investors will rationally agree to forbear taking out assets for the remainder of the period.

Figure A1 shows the payoffs for the possible outcomes of the negotiation between insiders and outside investors. Insiders can pay out either Y_t or zero, and outsiders can stop, taking their assets, or continue. Present values are given above the diagonals for outside equity and below for insiders. For simplicity I assume that outside investors own 100 percent of the shares.

The upper left and lower right boxes can be immediately eliminated: insiders will not pay out Y_t if outsiders stop, and outsiders will surely stop if there is no dividend.

The going-concern equilibrium prevails if the value to insiders is less in the lower left box than in the top right—that is, if

$$C + (m - 1)K/(1 + r) < Z + Z/r$$

$$C - Z = Y < Z/r - (m - 1)K/(1 + r). \tag{A1}$$

$C - Z$ is the immediate cash gained by paying no dividend. The right-hand side of the inequality is the value lost by giving up the going concern, worth Z/r to insiders, and starting again next period. Z/r is

$$Z/r = (C - Y)/r = [mrK - rK/(1 + r)]/r = [m - 1/(1 + r)]K.$$

This exceeds insiders' present value added, $(m - 1)K$. It is also greater than $(m - 1)K/(1 + r)$, the value to insiders of starting again next period.

Substitute back in equation (A1), with $Y = rK/(1 + r)$. The inequality quickly resolves to $m > 1$, so that insiders continue whenever their value added is positive.

Thus the top right-hand box in Figure A1 is the only equilibrium. This solution stands up to the following off-equilibrium possibility. Suppose insiders worry that outsiders will take out assets *next* period, forcing insiders to reform the firm at that time. Should insiders jump the gun, paying no dividend *this* period?

The preemptive strike yields the immediate cash flow C plus the insiders' value added, which is worth $(m - 1)K/(1 + r)$. Waiting gives the same payoff *next* period, assuming the firm does break up, plus $Z = C - Y$ immediately. Insiders wait because

$$C + (m - 1)K/(1 + r) < Z + [C + (m - 1)K/(1 + r)]/(1 + r),$$

when $Y = rK/(1 + r)$. In other words, there is no incentive to preempt even if insiders know for sure that outside equity investors will close the firm down next period.

What if outsiders expect insiders to cut out dividends next period? They too should not preempt. Outside equity investors do not lose by waiting, since equation (A1) holds. Thus the equilibrium holds this period even when future strategies are expected to change.

The equilibrium does not depend on an infinite horizon. Suppose insiders can add value for only one more period. Thus they will capture all of next period's cash flow, and outside investors will then definitely seize their share of the assets. Insiders can cut dividends now, accelerating the seizure but gaining C immediately. By waiting they get $Z + C/(1 + r)$. It is easy to show that insiders are better off waiting.

Therefore outside equity investors are always indifferent between continuing, with a dividend of Y, or stopping and realizing K. Insiders may have to pay a slightly higher dividend to maintain the going concern, but I have not shown this explicitly since the "bribe" would be very small. On the other hand, if outside equity investors face a small cost of taking out assets, then Y, as given by equation (2), is sufficient.

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