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ABSTRACT

This paper explores the necessary conditions for outside equity financing when insiders, that is managers or entrepreneurs, are self-interested and cash flows are not verifiable. Two control mechanisms are contrasted: a "partnership," in which outside investors can commit assets for a specified period, and a "corporation," in which assets are committed for an indefinite period but insiders can be ejected at any time. The paper also shows how going public to reduce outsiders' power can be efficient if it preserves appropriate incentives for insiders. The concluding section explains how the difficulty of verifying the act of investment leads to monitoring costs and insiders' pursuit of private benefits of control.

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Sooner or later the applied theory of corporate finance must deal generally with the self-interest of corporate managers and employees. The temptation to pay high salaries, capture perks or empire-build cannot be assumed away; nor can we assume, without explicit modeling, that such temptation necessarily leads to inefficiencies when all constraints and tradeoffs are considered. Theory ought to explain how external 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), Hart and Moore (1989), Bolton and Scharfstein (1990) and Hart (1995, chapter 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.[2]

Applied corporate finance accepts "outside equity" as a fact of life but does not really explain how managers' and stockholders'

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[1] This paper and Fluck's both assume self-interested managers and employees and non-verifiable 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. For example, Fluck emphasizes the conditions under which debt and/or equity are feasible. This paper considers equity only, but goes on to other topics, for example the decision to "go public." I comment further on Fluck's assumptions below.

[2] Harris and Raviv (1992, section 1.2) summarize most of these papers.

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?

Laws, institutions and practice, including incentive schemes, have evolved to control or mitigate agency problems of insiders vs. outside shareholders. 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 rights of equity investors and models investment, dividend policy and the valuation of outside equity investors' claims.

I start with the simplest case of a long-lived, positive-NPV venture whose gross value can be cleanly allocated among 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 at the start of each period just sufficient to retain outside investors' participation for at least one more period.

This sufficient dividend could be determined in two ways. Model 1 assumes that a deal can be struck at the instant of a dividend payment. If the dividend is sufficient, outside investors commit not to withdraw assets after the dividend is paid or before the start of the next period.

Model 1 suggests a partnership. Think of the commitment not to withdraw assets as a partnership agreement which limits outside investors' property rights for a definite period.

Model 2 describes a corporation where control is by voting or takeover.[3] There is nothing to prevent stockholders from intervening

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[3] The terms "partnership" and "corporation" are not legal descriptions but convenient labels. There are publicly traded partnerships with almost all the attributes of corporations and privately held corporations with shareholder agreements like Model 1's.

at any time, although there must be some costs of collective action. The firm continues only if stockholders hold a rational expectation of sufficient future dividends. The firm has no definite life -- in fact, as Fluck (1998) has shown, an indefinite or infinite horizon is essential in models of this type.[4]

The differences between the two models are interesting. For example, dividends are generally lower in Model 2 because costs of collective action reduce outside stockholders' bargaining power. But these costs are to some extent offset because outsiders can take over at any time -- they are not restricted by the partnership agreement.

In Model 1 all positive-NPV investments are undertaken so long as insiders have some cash to coinvest. In Model 2 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. Model 3 supposes that the value of these assets has to be proved by R&D or business experiments. Once proved, the assets are embodied, that is locked up, in the firm. 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. Model 3 works this out, showing the benefits of reducing outside investors' bargaining power to preserve incentives for insiders. Burkart *et al.* (1998) 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 which 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

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[4] Model 1 works with a definite horizon because dividends are, as explained below, prepaid. Fluck shows how 100-percent equity financing can be supported in a model with an infinite or indefinite horizon.

emerge. Debt payoffs are truncated, 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.

All the models rest on the same basic framework. Cash flows are not verifiable, and so are taken by insiders unless some feature of the financing arrangement forces payout. Why then is equity so easy here and yet infeasible in most earlier work? There are three reasons at least. First, assets and cash flows are set out in the style of applied corporate finance, so uncertainty is readily introduced. Differences between debt and equity are naturally hard to see in a two- or three-period certainty model. Second, I assume long-lived assets which retain value in alternative uses. Intertemporal conditions drive dividends and support equity value. Third, I do not require 100 percent outside financing. In Model 1, for example, a small coinvestment, roughly equal to the cost of capital times the initial asset value, is required from insiders.

The final part of the paper uses a version of Model 2 to link up my analysis of equity financing to the agency and "free cash flow" hypotheses suggested by Jensen and Meckling (1976), Jensen (1986) and others.

This paper touches several branches of finance and economics. It joins the literature on how property rights support external financing in the face of incomplete contracts or costly state verification. References are given above. The chief difference here is the focus on equity. As just noted, the paper is at the end connected to the literature on agency in corporate finance. Much of this work assumes that insiders seek private benefits of control, for example, perks, empire building and entrenchment.[5] But in most of this paper, private benefits do not exist; insiders just take cash. Private benefits finally come on stage in Section 4, as a result of the difficulty of verifying new investment.

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[5] Examples include Stulz (1990). See Shleifer and Vishny (1989) on entrenching investment.

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. Again, the difference is the focus on how equity works.

1. Primitive rights and the partnership model

This paper analyzes financing from "outside" equity. The inside equity comes from managers and employees, who act as a self-interested, risk-neutral, value-maximizing coalition[6] (intra-firm agency issues are not considered in this paper). "Inside equity" or just "insiders" refer to this coalition and the shares it owns.

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

> Lenders can seize all of the firm's assets, if necessary to satisfy a debt claim, only if a promised payment is not made.
>
> 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 Model 1, control is exercised through enforceable agreements which must be renewed for the firm to continue. The agreements specify ownership shares, start-of-period dividends,[7]

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[6]This follows the finance tradition of market value maximization, except that the shares of value going to insiders and outside equity are explicitly modeled. This objective function was suggested by Treynor (1981), Donaldson (1984) and Myers (1993).

[7] Although Model 1 applies most easily to partnerships, I use the vocabulary of corporations, for example "dividends" and "equity."

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.[8] I do not assume that the value of the firm's assets is verifiable.

Model 1

The firm is a startup venture. Insiders contribute human capital or intangible assets and outside equity contributes 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 cash flow C is net of all costs, including the salaries insiders could earn working in other jobs. Model 1 will show how C is divided up to compensate outside equity for financing provided and insiders for creating the firm's NPV.

Insiders have only I dollars and must raise K - I from outside investors. These investors understand that insiders will capture part

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[8] This assumption is most plausible if assets are tangible and illiquid. Liquid assets tempt insiders to sell the assets and capture the cash proceeds. See Myers and Rajan (1998).

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's 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 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 agrees not to exercise its primitive right, and waits 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 waits. They are willing to wait only if:

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

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

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

Insiders minimize Y to maximize Z, so

$$Y = rK/(1 + r) \qquad (2)$$

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

Note that x, outside equity's fractional ownership, drops out. Eq. (1) is an intertemporal constraint and has nothing to do with the cross-section of share holdings. 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. (This fraction plays a more important role in Model 2.)

The story behind Eq. (1) is very simple. Outside equity cannot get at current cash flow. Exercising its primitive right gives it 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 takes its assets at that time or waits again. Either way the present value is $K/(1+ r)$ at t. Substituting this present value for V_t^{ex}, $Y_t = K - K/(1 + r) = rK/(1 + r)$.

The model works just as well with a finite horizon. If t + 1 is the last period, outside equity will surely take its share of the firm's assets, worth K at that time.[9] 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.[10]

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 $xK/(1 + r)$.[11] $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. In this way

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[9] 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.

[10] In addition, there could 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.

[11] Insiders "ought" to take out only $Z = r(m - 1)K$, their contribution to the annual cash flow. Instead they take out $Z = r[m - 1/(1 + r)]K$.

inside equity coinvests; it pays 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 outside equity and investing the full amount K. The insider's net present value at startup, taking account of their investment I, is

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

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's claim.[12]

Outside equity 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 outside equity'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 for the last dollar invested. This confirms that insiders will choose (and maintain[13]) the NPV-maximizing scale for the firm.[14]

Review of assumptions and conditions for equilibrium

Six basic assumptions hold in Model 1.

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[12]Note there is no immediate cash flow C_0 in a discrete model.

[13]The same optimality condition holds ex post when I is a sunk cost.

[14] A comment on depreciating assets: suppose assets decline in value by dK per period. Then V_t^{ex} in Eq. (1) is $K_t(1 - d)/(1 + r)$, and $Y_t = (r + d)K_t/(1 + r)$.

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. The primitive right can be exercised only once per period. In other words, if a sufficient dividend is paid at date t, outside equity investors accept a "partnership" agreement committing them not to take out assets before t + 1. This commitment is enforceable.
4. Outside equity cannot prevent insiders from capturing part or all of operating cash flow C.
5. Insiders have enough cash, at least rK/(1 + r), to cover their share of startup investment K.
6. 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 which 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.[15]

Assumption 6, though probably obvious, needs further discussion. Consider the insiders' position in Model 1. 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 4 gives them the additional bargaining power to capture the immediate cash flows generated by the assets,[16] so $Z = r[m - 1/(1 + r)]K$.

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[15]See Myers and Rajan (1998).

[16]Assumption 4 follows from 3 if operating cash flows are produced continuously between the discrete bargaining dates. If the cash flows were always received exactly at the bargaining dates, outside equity might arrange to "be there" and prevent insiders from taking them.

If insiders' value added is costlessly separable and transportable, then there is no going-concern value, 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.[17]

Insiders will prefer the going-concern solution if, say, they lose one period's cash return on their value added if outside equity takes its assets and the firm has to be reformed. Then their value added is worth $(m - 1)K/(1 + r)$ if the firm breaks up, vs. $(m - 1)K$ if it continues.

Bargaining and the partnership agreement

Model 1's equilibrium rests not on a sequential game, but on negotiated agreements between insiders and outsiders. In exchange for the dividend Y_t, outside equity investors agree to leave their assets in the venture until the next negotiation at $t + 1$.

The Appendix shows that the equilibrium summarized in Eqs. (2) and (3) is stable and robust. For example, Model 1 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 Model 1 as applying to a closely held firm so that insiders and outside equity can negotiate at low cost. Negotiation occurs every period: the firm can't continue absent outside equity's agreement to forbear for the next period.[18] There

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[17]Rentals would be prepaid. Asset owners would demand r dollars up front for every dollar invested.

[18] What determines the length of a period? There are tradeoffs. For example, an agreement written for a long period reduces costs of bargaining, since 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 period lengths.

may be costs of reaching or ratifying agreement, but these are sunk when the final bargain is struck and cannot affect its outcome.[19]

Why is an explicit agreement necessary? Because without it outside investors would accept the dividend and then immediately take their assets, say at t + .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 can not 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 built into in Models 2 and 3.

Financing growth

How do dividends and the cash flows captured by insiders change in response to an additional investment of k with present value mk?

This investment cannot be 100% financed by reducing the dividend Y, because the value of outside equity's 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

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[19] 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 should fall to offset the present value of future bargaining costs. The dividend yield would increase.

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.[20] 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.[21]

Is the outside equity different from debt?

Under certainty, debt and equity may be hard to distinguish, but Model 1 can be used to show the essential differences.

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 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. But with uncertainty the differences between debt and equity are clear, although they depend on whether outside equity has 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), and cash payments to lenders are truncated. With equity financing, the dividend is always based on the ex-post K and varies proportionally.

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[20]If insiders' value added is small, Z can go negative as investment increases. Such "sweat equity" contributions, in the form of lower-than-market salaries, for example, are offset by the ability of insiders to extract future Zs from a larger capital base.

[21]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 would of course act to prevent this.

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 $D(1 + r_D) >> K$, 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.

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.

Financing in Model 1 is, however, unlike ordinary equity in one respect: outside investors have to agree to suspend their property rights, one period at a time. This requirement is eliminated in Model 2.

2. Model 2

Model 2 discards the partnership agreements assumed in Model 1 and instead gives outsiders the right to vote out management. This eliminates the costs of bargaining every period.

But control by voting changes Model 1 in two crucial ways. First, it introduces free-rider problems and costs of collective action. 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 greater 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 must exceed αK at all times if outsiders are to be kept from taking control. 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 Model 2's time pattern of equity values, as shown in the bottom panel of Figure 1.

Model 2 assumptions

Model 2's assumptions differ from Model 1's as follows:[22]

1. Bargaining is replaced by sequential actions. Each period insiders pay a dividend and then outside equity decides whether to organize, take control and replace management.
2. The payoff to outside investors from taking over is αK, with $\alpha<1$, vs. K in Model 1.
3. Outside equity has majority voting control. (If outsiders are a minority, and control is by majority vote only, outside equity is worthless.)
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 non-depreciating, infinite-lived assets worth K.

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[22] Assumptions 1 and 4 match Fluck (1998). However, Model 2 differs from Fluck's in several respects. For example, in Model 2 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 taking over or how it might vary, depending, for example, on whether the outside investors' shares are closely held. See Model 3 below.

Assumption 4 is essential, as Fluck (1998) has shown. Suppose insiders' value added were known to 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 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 T - 1's cash flow, so outside equity would take over at T - 2 -- and everything unravels.

As in Model 1, 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.

Dividends in Model 2

The corporation can continue under current management only if outside equity believes 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 outside equity is always as well off continuing with current management as organizing to take over. (As in Model 1, I assume that ties are broken in favor of the status quo. Insiders might have to pay a dividend slightly above $Y = \alpha K$, but this bribe to continue is not shown explicitly.)

It is not necessary for outside equity to believe in a perpetual stream of future dividends. One future dividend is enough. Outside equity will not continue if they 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 <u>not</u> to take over are therefore as follows. In each period they must see the <u>ex</u>-dividend value of continuing as:

$$xV_t^{ex} \geq x\alpha K, \qquad (1a)$$

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

$$V_t^{ex} = [\, E_t(\, Y_{t+1}\,) + V_{t+1}^{ex}\,]/(\,1 + r\,)$$

$$= [\, E_t(\, Y_{t+1}\,) + \alpha K\,]/(\,1 + r\,),$$

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 $E_t(\, Y_{t+1}\,)$. I assume the following, pending further discussion below: 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 expects insufficient future dividends and takes over immediately.

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

$$Y = r\alpha K \qquad (2a)$$

$$V_t^{ex} = Y/r = \alpha K \qquad (3a)$$

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.[23]

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[23] Of course m could also vary, but this additional uncertainty would not affect the dividends required to prevent takeover by outside equity. These dividends are tied to αK. However, insiders will not pay those dividends if m falls too low -- see below, for example Figure 2.

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.

The link between current and expected future dividends

Equations (2a) and (3a) rest on an assumption that outside equity 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 "bubble" equilibria in a full-information, infinite-horizon setup.

But such equilibria 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 a small probability 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 Eqs. (2a) and (3a) with $Y = r\alpha_H K$. For this to survive,

1. Insiders must believe that outside equity 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.[24]

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[24] 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 $(m - 1)K/(1 + r)$.

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 they must take over, and insiders' beliefs in (1) are rational. This fences out the bubble equilibria noted above and makes Model 2's assumptions about outside investors' behavior more plausible.

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 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 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 Eqs. (2a) and (3a) -- not denying that other equilibria may be possible.[25]

Will insiders bail out?

The next step shows the conditions under which insiders are willing to pay out $Y = r\alpha K$ and to limit their take to $C - Y = r(m - \alpha)K$. Suppose that all shares are held by outsiders. Assuming that $m > 1$, the insiders' payoffs are:

If p is small enough, the expected payoff to the cut is negative. If not, the equilibrium is established at $Y = r\alpha_L K$, and insiders will wonder whether the true α is lower still.

[25] 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.

STOP: $C + [(m - 1)K]/(1 + r)$

CONTINUE: $C - Y + (m - \alpha)K$

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 $(m - 1)K/(1 + r)$. (This assumes that financing to restart is available on fair terms next period.[26]) If they continue, they take out only C - Y and can look forward to the same amount in perpetuity. The perpetuity's PV is $(m - \alpha)K$. Insiders continue if

$$m \geq [\alpha (1 + r)^2 - 1]/r \qquad (4)$$

Eq. (4) says that insiders may stop inefficiently if outside equity's bargaining power is too high. If $\alpha = 1$, insiders continue only if $m > 2 + r$, that is only if they can earn more than double the cost of capital. If insiders add no value ($m = 1$), they stop unless $\alpha < 1/(1 + r)$.

What if incumbent managers become <u>inefficient</u> ($m < 1$)? In this case the payoff to stopping is simply C: after leaving the managers would have to retire or move to another type of work. They could not refinance and restart. (Their NPV from restarting would be negative.) But as incumbents they will continue if $C - Y + (m - \alpha)K > C$, or if

$$m > \alpha(1 + r) \qquad (4a)$$

Figure 2 shows the implications of Eqs. (4) and (4a). For each level of value added (m), insiders resign if α exceeds a critical

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[26] This is the best case for insiders. In real life stopping today would affect the managers' reputations and make it harder to raise money tomorrow.

value, in other words if the costs to outside equity of organizing and taking control are sufficiently low. Remember, 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 α's are bad when they prompt insiders to depart when they should continue. If $m < 1$, high α's 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 Models 1 and 2 are identical. Model 1's temporary suspension of ownership rights reduces outside equity's power to extract cash flows by just enough to insure that insiders make the right stop-continue decisions.

But in Model 2 the shaded areas can not be ruled out. Can insiders and outside equity make a deal so that insiders do the right thing?

Consider first the "continue, should retire" region. Here outside equity gains if insiders decide to depart.[27] Outside equity could afford to bribe them to do so. But the costs to outside equity of organizing to offer the bribe are presumably the same as 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 K instead of K 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. It appears there's no escape from the "should retire" region if the initiative has to come from outside equity.

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 would acquiesce if $(1 - s)K$ exceeds $(1 + r)\alpha K$, the cum-dividend value of outside equity with

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[27] In this case outside equity gets K. Their cum-dividend value if insiders do not depart is $\alpha(1 + r)K$, which is less than K because $\alpha < 1/(1 + r)$ in the shaded region.

existing managers in place. But there is a serious problem here too if Model 2's assumptions are taken strictly. In order for the corporation to work in the first place, the sale of assets has to be verifiable, and outside equity 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.

Now consider the "stop, should continue" region. Here the cum-dividend value of outside equity exceeds K, 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 Model 1! -- and keep the cut as an incentive to stay on. But in this case the ex-dividend value of outside equity would fall below K, as in the top panel of Figure 1, and 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 Model 1 works in this region.[28]

When outside equity can act at low cost, investors may have to give up some property rights to maintain a going concern. This allows insiders to pay a lower dividend, to keep more cash for themselves and to see a sufficient incentive to continue. Of course insiders will have to coinvest more at startup to compensate outside investors for lower dividends later.

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[28] 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 locked in. Capture of any one dividend would not be motive enough to incur the fixed cost.

Ownership by insiders

However, there is a way to shrink the shaded areas in Figure 2. 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 now:

STOP: $C + [(m - 1)K]/(1 + r) + (1 - x) K$

CONTINUE: $C - xY + (m - x\alpha)K$

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

Figure 3 shows how the "stop, should continue" and "continue, should retire" regions change. Increasing insider ownership, i.e. decreasing x, favors continuation if $\alpha > 1/(1 + r)$ and stopping otherwise.

In Model 1, the ownership position of insiders is irrelevant once the firm is up and running. They can be minority owners, so long as they can assert their ownership to part of the firm's assets.. When control is by voting, as in Model 2, some inside ownership may be necessary to support the corporation as a going concern. However, the inefficient regions in Figure 3 cannot be completely eliminated, because x can't fall below 50% without further legal protection to outside equity. In Model 2 an outside minority can extract no dividends and outside minority financing is infeasible.

But if outside equity financing works in Model 2, insiders' fractional ownership has no effect on dividends, insiders' take or equity value. As in Model 1, actions and values are driven by an intertemporal constraint.

Initial financing

In Model 2 the maximum initial outside financing is αK. This is the total value of outside equity at startup, which is of course less than K, 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 3. It's easy to show that insiders will choose the NPV-maximizing scale for the firm whenever financing is feasible.

Expansion

If insiders want to expand the scale of the corporation from K to K + k, they have to coinvest, just as in Model 1. The additional assets are worth only αk to outside equity, so the current dividend can be cut by only that amount. Thus

$$Y = r\alpha K - \alpha k \qquad (5)$$

$$Z = C - Y - k = r(m - \alpha)K - (1 - \alpha)k \qquad (6)$$

The coinvestment is $(1 - \alpha)k$. In Model 1 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 retire" 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 - α of the proceeds. But remember that outside equity 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, 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 -- e.g., between the sale of assets and the failure to invest cash -- are discussed further in Section 4.

3. Private equity and the value of going public

In Models 1 and 2, 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 r(m - 1)K, but take more. This accounts for the discount of ex-dividend equity value to rK/(1 + r) in Model 1 and αK in Model 2.[29]

But there is no inefficiency. All positive-NPV projects are undertaken. 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.

What if part of the positive NPV is locked up in the firm once the investment is made? This is <u>not</u> a problem if the positive NPV is cleanly divided between insiders and outsiders. Outside equity has to accept fewer shares at startup financing, but all investments are NPV-maximizing.

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, i.e., mK. In this case financing ought to be easy. If α is

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[29] In this paper, outside equity's initial investment in the firm is always zero-NPV. This is not the case in Fluck (1998), where outside equity always provides all the required investment, gets 100 per cent ownership, but may be able to extract dividends worth more than they put in.

high enough, but not in the "stop, should continue" region of Figure 3, insiders could raise K by selling the fraction $x = 1/\alpha m$ of the firm, keeping the rest for themselves. But will this be sufficient motivation for insiders when its value is not fully established and ready to produce cash at startup? If the company is privately financed, insiders can be easily ejected as managers and left as minority owners.

Insiders may not be disadvantaged as minority owners in the partnership considered in Model 1. They 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 its 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. Model 3 shows how to solve this problem by taking the firm public to reduce outside equity investors' ex post influence.

Model 3's setup

Figure 4 shows a two-stage R&D 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). NPV of

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

is zero or 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[30] and go first to a private equity investor to fund most of the project. The private investor thus has voting control.

The value at t = 2 of a successful project is entirely locked up in the firm. No value is lost if insiders are fired ex post. The private investor, having voting 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; no party can influence 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 Model 2 are (1) all ex post value locked up in the firm, (2) effort required from insiders to realize NPV and (3) the difference in bargaining power for public outside investors vs. private equity. The two-stage investment is not strictly required, but does supply a helpful economic setting.

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[30] I assume a partnership would not work for the reasons given earlier in this section.

In Model 3, 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 private equity puts up all of the initial investment and owns all the shares (x = 1).

1. A minority stake in a corporation controlled by insiders is worthless.[31] Once NPV is fixed in the firm, insiders take all cash flow (Z = C) and dividends are Y = 0. Outside equity as a minority can't vote insiders 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. Therefore insiders will have to depart empty-handed.
3. Shares (or options) bought by, or given to, 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 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 will therefore stop the project in this case and recover K a period earlier.
5. However, private equity 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,

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[31] In real life minority stakes in private companies are not worthless, but there is a well-recognized minority discount. Therefore shares or options given to managers provide more powerful incentives if the managers believe that their firm, if successful, will go public. That is one important point of Model 3.

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 the situation at t = 2 in Model 3 is identical to the startup period in Model 2. So investors will continue,[32] 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.[33]

6. So private equity <u>will</u> sell and go public at t = 1 and insiders <u>will</u> put out the effort required to realize potential NPV. Private equity is better off because $\alpha mK/(1 + r) > K$, given success in the research phase, and assuming that α is not too far below 1.[34] 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.[35]

7. Therefore both private equity 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 has to put in K in exchange for a present value of[36]

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

[33] If insiders' effort generated $C_2 = rmK$, they might be sufficiently motivated even if private equity refuses 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.

[34] If research is not too risky (p close to 1), and α is well below 1, it's 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 <u>pay</u> the private equity 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, i. e. $mK/(1 + r) - K$, must of course be positive.

[35] Insiders' value at t = 2 is $Z/r = (1 - \alpha)mK$. Without effort m goes to 1 and Z/r decreases.

[36] The right-hand-side term takes account of the possible recovery of capital at

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

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's 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 retains 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 $\alpha < 1/(1 + r)$. Other properties of the Model 3 match Model 2.

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, i.e. accepting low salaries in exchange for shares or options. (The shares or options have value because both insiders and private equity understand the firm will go public at t = 1.)

The decision by private equity to go public is rational and efficient because it reduces outside equity's ex post bargaining power and therefore preserves the proper incentives for the insiders who have to build the business. This point is also stressed in Burkhart *et al* (1998).

Model 3 may help explain why going public is so important for high-tech or rapidly growing startups: it prevents venture capitalists

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t = 1 if the research phase fails.

from ripping off inside entrepreneurs ex post. Note the importance of going public before the entrepreneur's task is complete.[37]

Comments on Models 1-3

Coinvestment. Models 1, 2 and 3 always require some investment by insiders. The investment may be small -- it is only $rK/(1+r)$ in Model 1. But if your goal is a model of stable equity financing with penniless insiders, this paper won't help.

Insiders often have natural sources of cash, however. The first is sweat equity. Second, when insiders contribute NPV to the firm, they can "sell" part of it to outside investors. In Model 3, for example, where outside equity can capture most of 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 per cent 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 Model 1 and $1-\alpha$ in Models 2 and 3.

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 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 Models 1 and 2 if insiders' and outsiders' relative bargaining power is fixed. Let a be outside

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[37] Going public too early would raise problems not considered in Model 3. For example, dispersed shareholders could not provide the intense monitoring typical in early-stage venture capital.

equity's 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 Model 2 now are:

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

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

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

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.[38] All the other properties of Model 2 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 model. 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 which 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 just demands a higher current dividend to compensate for the loss of end-of-period value. Insiders do <u>not</u> 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.

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[38] In Model 3, the incentives for effort by insiders would diminish as a increases.

4. Conclusions -- Outside equity and agency

Models 1, 2 and 3 do not describe current financial practice. Practice happens in a web of laws, institutions and habits that have evolved over two centuries at least. But when the web becomes second nature, it's hard to discern what's really going on, so "primitive" models may identify tradeoffs or relationships that would not otherwise be obvious.

Such models may also clarify some aspects of the corporate finance literature. Take Jensen and Meckling (1976), who link agency costs to the lack of compete equity ownership by insiders:

> 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 which go beyond the primitive rights assumed here and which 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 Model 3, where control is by voting, minority stockholders' primitive right is worthless if the majority owners are also the insiders.

But there is a more striking difference between this paper's models and Jensen and Meckling's. 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 <u>in every period</u> 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.[39] There is no reason to spend money to monitor.

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.

The effects of new investment are obvious in Models 1 and 2. These assume 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.

Models 1 and 2 say that 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 foregone are actually invested? If the new assets are discrete and tangible, like a ship or office building, or a large greenfield venture, like 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's 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.) This point was too narrow: the act of investment, defined as current expenditure which 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

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[39] However, Model 2 can generate behavior consistent with Jensen's "free cash flow" behavior, because it implies that inefficient inside managers will be able to continue if the costs to outside equity of taking control are too large.

business, which are collections of assets, many intangible. It's hard for an outsider to know whether such expenditures are aimed at generating additional appropriable value, or 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 Model 2.[40] 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 Model 2, insiders never take a negative-NPV investment. But will they coinvest at positive NPV if they have the chance to take the money instead?[41] The answer is no unless NPV is strongly positive.

Suppose outside equity does not monitor and can not prevent insiders from consuming cash earmarked for new assets. The cost of the new assets is k. If outside equity accepts a dividend cut of αk, as in Model 2, the insiders' payoffs are:

INVEST: $- k + \alpha k + (m - \alpha)k$

CONSUME: αk

The NPV to insiders of investing instead of consuming is:

$$NPV = - k + (m - \alpha)k$$

which is positive if $m > 1 + \alpha$.[42] If insiders do not have to invest, their opportunity cost is the full outlay k, but they capture only $1 - \alpha$

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[40] I dare not ask the reader to absorb four models in one paper.

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

[42] If outside investors can capture αmk, as in Model 3, the invest-versus-consume hurdle is even higher: $m > 1/(1 - \alpha)$.

times the resulting value. Therefore they will reject some investments with positive NPVs.

Knowing this, outside equity will not accept any dividend cutback unless (1) the new asset is immediately verifiable or (2) they are convinced that $m > 1 + \alpha$. Condition (2) is of course implausible: there should always be investments at the margin with $m < 1 + \alpha$, but positive NPV.

The first purpose of monitoring is, therefore, to confirm when and whether investments are made. Absent monitoring, positive-NPV investments are passed by. But if monitoring can confirm investment, thereby ruling out consumption by insiders and allowing most of k to be financed by dividends foregone, then all positive-NPV investments will be made.[43]

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 $m < 1$.[44] 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.

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

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[43] This statement does not require outside investors to know how good the investment opportunity is. 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 Model 3. So outside equity contributes αk, gains αmk, and is surprised with a positive NPV. The NPV to <u>insiders</u> 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.

[44] But if $m < 1$ <u>on average</u> for the firm's assets, insiders' calculations for asset sales change, because they can not start up another firm if outside investors take over. See Section 2.

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.[45] So insiders and outside equity would agree at startup to operate a delegated[46] monitoring system. 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 can not be perfect, since in many cases the monitor needs to know the purpose of expenditure. (For example, is the hiring or 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 in 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

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[45] Insiders and outside equity have a joint interest in avoiding costs of collective action, not just to avoid the costs, but 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 in Model 2 and mK in Model 3. If they walk away, they get only αK and αmK, respectively.

[46] Monitoring can't be done by insiders, and dispersed outside investors can't monitor efficiently on their own.

by outsiders or to hide cash they would rather consume in private benefits of control.

Thus traditional agency costs seem unavoidable if the firm has potentially valuable growth opportunities. Because investment is frequently -- or usually -- non-verifiable, 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 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 procedures are set up, promises by insiders not to seek private benefits, or by outside equity 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 Models 1, 2 or 3. In those models private benefits of control would be inefficient. If outside equity's 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 which 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 which prevented insiders from taking additional cash or private benefits would also assure the right investment decisions. But such schemes can't work perfectly. For example, the cash given in each period to insiders should depend on

the NPVs of that period's investment opportunities,[47] which are impossible to know in advance.

If a close-enough-to-optimal compensation system could be set up,[48] 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.

Some implications

This paper starts with 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 in the firm's value added, 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 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. Private investors can enforce the sweat equity arrangement.

But as Model 3 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.

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[47] Remember that in Models 1 and 2 insiders coinvest in new assets by cutting back their capture of cash flow.

[48] -- or perhaps administered ex post by independent directors.

Pop quiz: Why have hundred of biotech companies gone public at early stages of their research programs, while most commercial real estate is still privately held?[49] Developed commercial real estate is much easier for dispersed outside investors to evaluate and monitor. Information costs would be much smaller if real estate were public and biotech private.

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[50] 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.[51]

In general, the efficient design of outside equity financing achieves the right balance of power between insiders and outside investors. Outside equity's ownership rights have to be curtailed to the right extent. The curtailment can be achieved by law or contract, for example the rolling partnership agreement in Model 1, or the legal constraints on takeovers. It can also be achieved by dispersing ownership.

Given the right balance of power, I have shown that 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 can not usually verify new assets <u>until</u> 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

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[49] Despite the recent popularity of REITs, only a small fraction of commercial real estate is securitized.

[50] 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.

[51] To the extent that the value of commercial real estate can be objectively appraised, it may be possible to compensate insiders with minority ownership.

therefore essential when the firm may have valuable growth opportunities.[52]

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 which 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.

But once monitoring systems are set up the 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 and many others.

[52] If there are no positive-NPV opportunities, outside equity just monitors assets in place and demands a dividend proportional to the assets' appropriable value.

Appendix

This appendix shows that Model 1 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% 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

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

$$C - Z = Y < Z/r - (m - 1)K/(1 + r) \qquad (A1)$$

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 insider's present value added, i.e. (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 (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 will close the firm down next period.

What if outside equity expects insiders to cut out dividends next period? It too should not preempt. Outside equity does not lose by waiting, since Eq. (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 equity will then definitely seize its 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's easy to show that insiders are better off waiting.

Therefore outside equity is 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 faces a small cost of taking out assets, then Y, as given by Eq. (A1), is sufficient.[53]

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[53] I have given insiders nearly all the bargaining power. There are other bargaining outcomes in which outside equity, by threatening to shut down the venture, would be able to force insiders to pay a dividend higher than Y from Eq. (1). This would of course generate higher dividends and equity values, but would not change the model's basic structure or implications.

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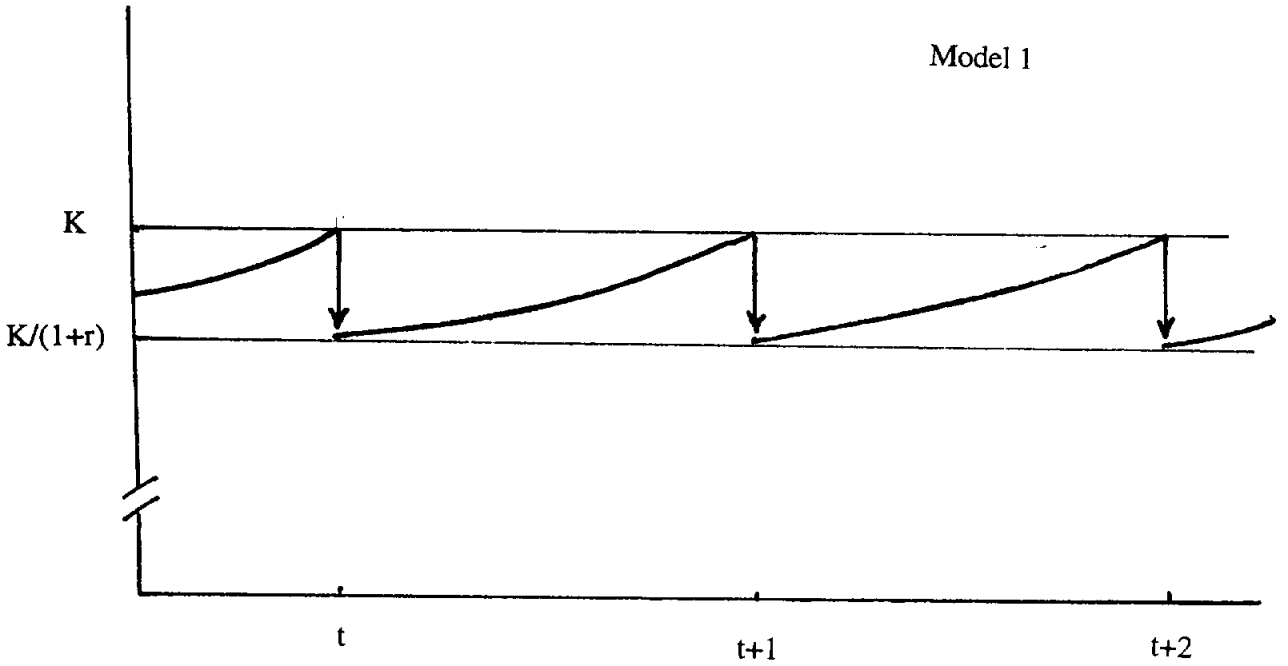
Figure 1. Time-plot of the value of outside equity in Models 1 and 2. The downward-pointing arrows show the fall in value on the ex-dividend date. In Model 1, value never exceeds liquidation value K. In Model 2, value never falls below the net liquidation value αK reachable by outside equity.



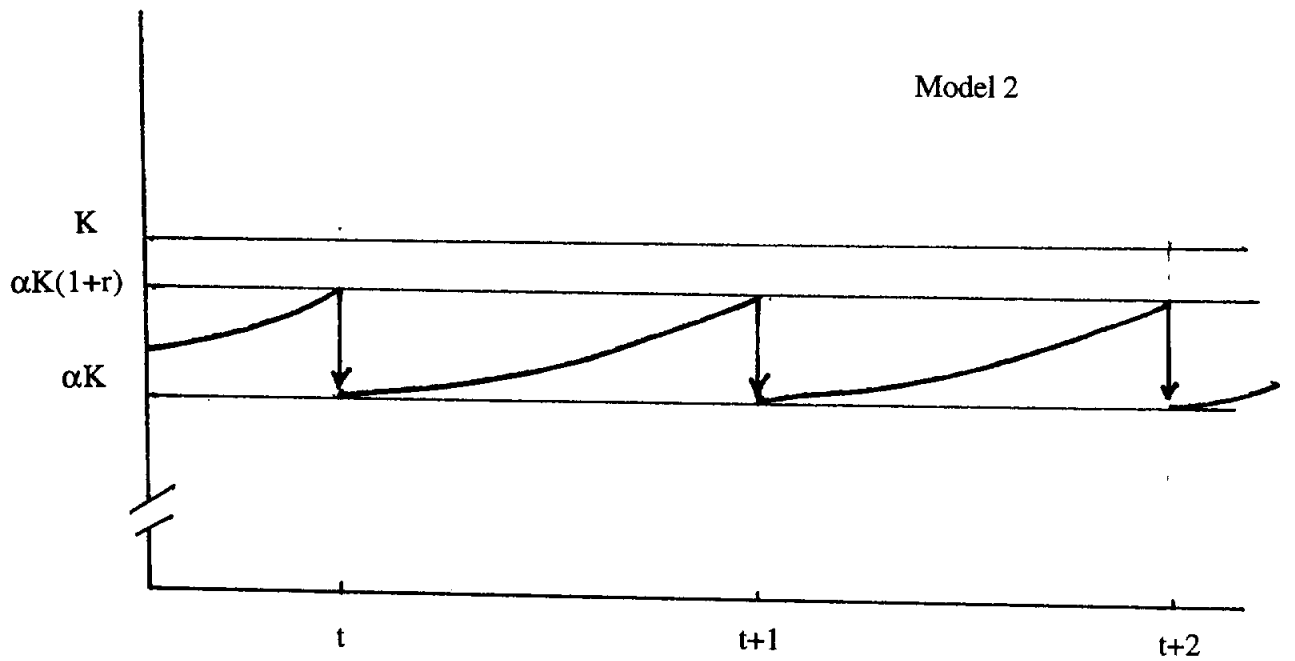


Figure 2. Insider's willlingness to pay a dividend sufficient to continue the corporation depends on their value added m and outside equity's bargaining power α. In the shaded retgions the corporation cannot continue or continues inefficiently.

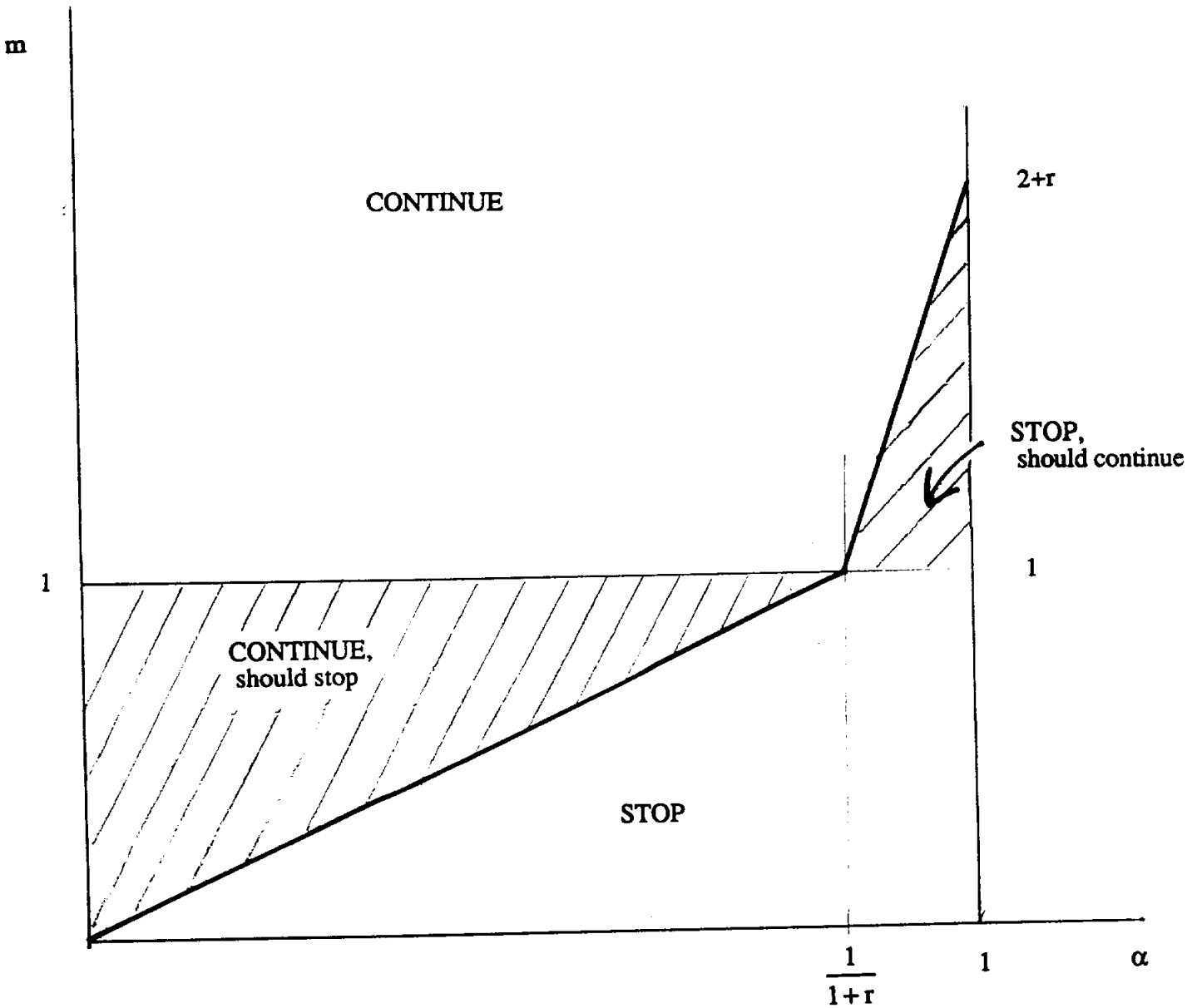


Figure 3. The inefficient shaded regions shown in Figure 4 shrink if insiders own the fraction 1-x of outstanding shares.

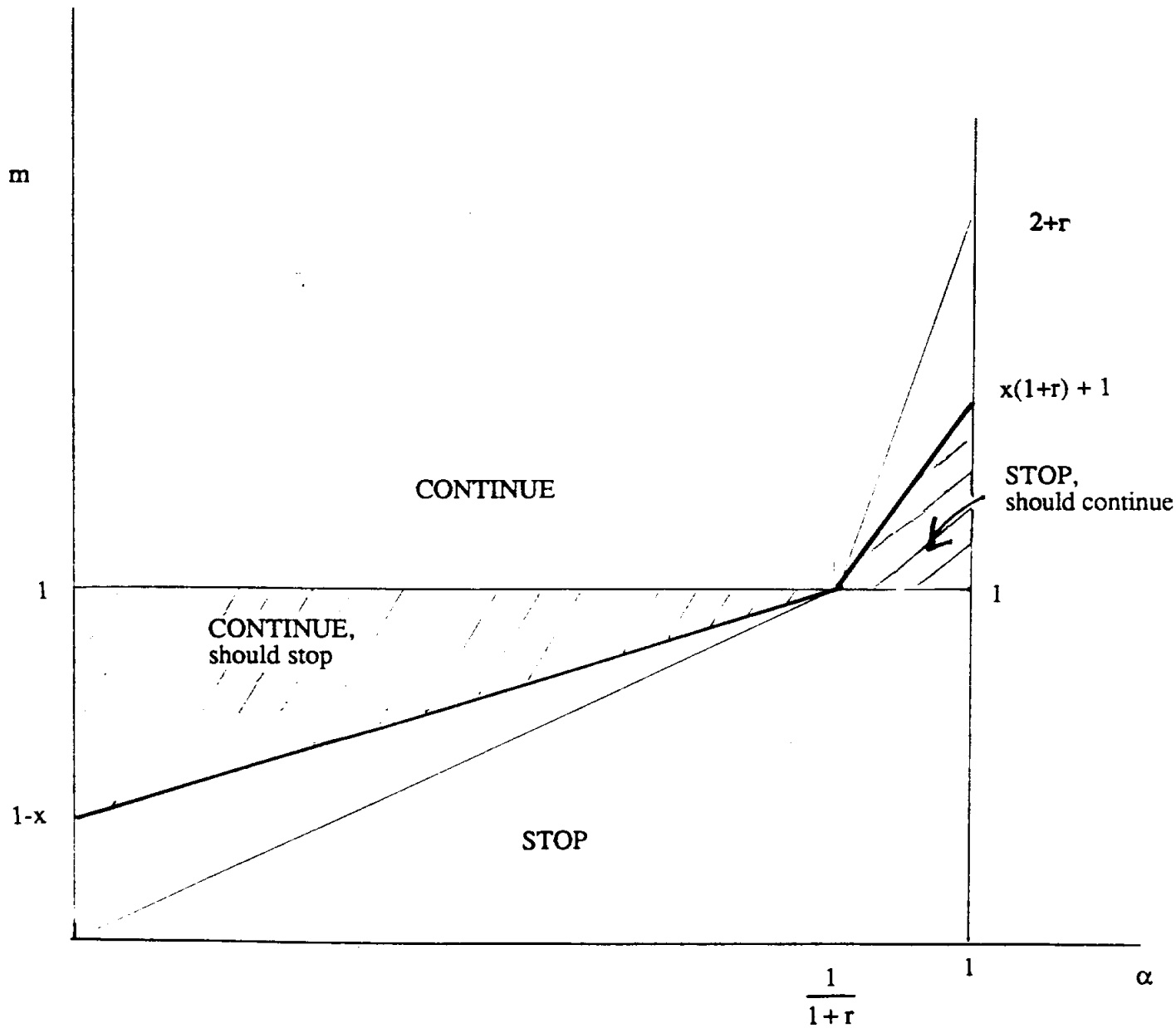


Figure 4. A R&D project funded by a private equity investment of K at time t = 0. The probability of success in the "R" stage is p; for simplicity success in "D" is assumed certain given success by t = 1. Project NPV, assuming effort by insiders in both periods, is

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

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 strongly positive. At this point, the private equity investor can sell the company, that is go public. Insiders' effort continues only if it is sold. If it is not, no additional effort is expended, and the final payoff if the firm is continued is just K.

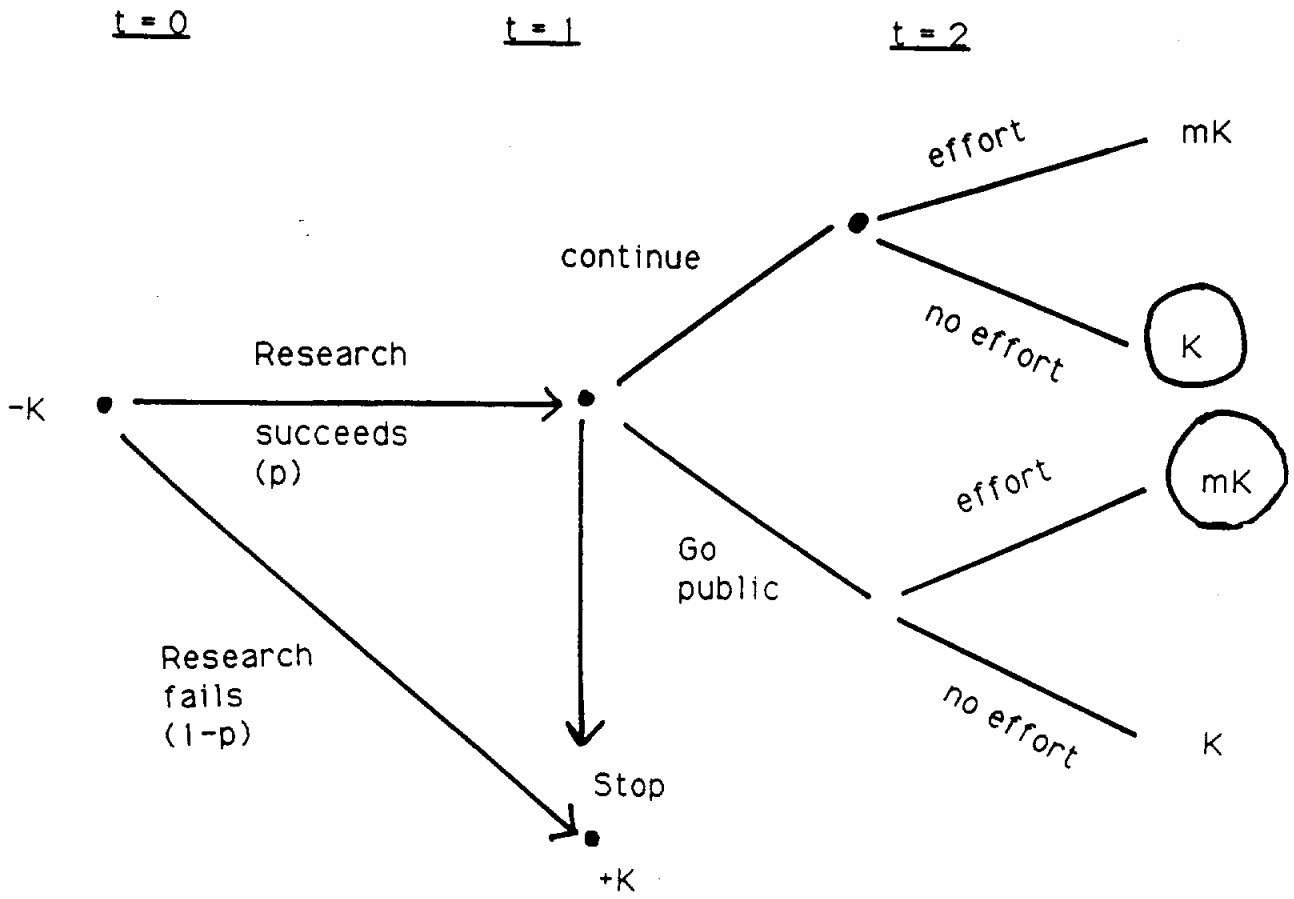


Figure A1. Payoffs to the period-by-period game, assuming for simplicity that insiders own none of the assets K. Insiders can pay no dividends, capturing the entire cash flow C, or pay $Y = rK/(1 + r)$, capturing $Z = C - Y$. Insiders' present value, if the dividend is paid and the firm continues, is $Z + Z/r$. 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.