Managers, Entrepreneurs and Investors: The Consequences of Corporate Cheating for Firm Structure Under Different Wealth Distributions

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Abstract

When a manager, an entrepreneur and outside investors interact under asymmetric information**,** outsiders limit their stake to eliminate insider cheating; and entrepreneurs offer managers a contractual wage sufficient to deter cheating. When capital is too expensive, this contract is infeasible, and owner-managers rule, otherwise entrepreneurial-managerial pairs emerge. Individuals with managerial ability endogenously prefer working for entrepreneurs to establishing their own firms, and the latter to playing a non-managerial role while hiring another manager. We endogenize firm formation and structure and establish a unique equilibrium for any distribution of wealth and managerial ability. The model has many developmental applications.

Keywords: Moral hazard, firm size, managerial compensation, repeated games, inequality and development.

JEL Classification: D82, L21, M52, O11.

1.Introduction and Literature Survey

The explosion of corporate cheating in recent years has rekindled interest in problems of moral hazard in corporate governance. The classical context of moral hazard – the two-party agency problem as in Holmstrom and Tirole (1989) – fits the relationship between the investor and the firm. However, in all major recent episodes of cheating, a key role has been played by managers with interests that diverge from both the entrepreneur's

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(or board's) and the investor's.[2] In this paper we examine this three-way interaction and consider whether it modifies the strategies deployed by the three players when cheating is possible. In our model, investors must decide not just whether the entrepreneur is interested in playing fair with them but also whether he has the ability and the incentive to make his manager do likewise. Our main objective in this paper is to relate firm formation and the organizational structure of a firm (for example, whether it is owner-managed or hires a professional manager) to the distribution of wealth and of managerial ability in the economy, and our main tool is a model of repeated moral hazard (both from the manager and the entrepreneur) which we embed in a general equilibrium setting. Consequently, our model also has many developmental implications.

We visualize an asymmetric information set-up in which the entrepreneur and the manager are the knowledgeable insiders, with interests that differ from each other's and from those of outside investors. While the manager decides whether or not outside investors are cheated, or whether indeed he should help himself out of the corporate till, the entrepreneur – who has his own axe to grind, separate from that of the outside investors – may influence him through instruments like the managerial compensation contract and threats of dismissal. It may be felt therefore that if managerial contracts were common knowledge, investors could decide whether they are likely to be cheated. However, public observability of managerial contracts does not itself eliminate moral hazard, given the possibility of secret renegotiation between entrepreneur and manager; the requirement of renegotiation – proofness of managerial contracts imposes a credibility ceiling on the ratio of outsider to insider financing. This limit pins down firm size in equilibrium as a function of the personal wealth of the insiders.

Persons with managerial ability have two options – to set up firms on their own or to join another (who may or may not have managerial ability). The distribution of managerial talent in the population is exogenously determined by nature**.** In an owner-managed firm, there is no question of a managerial contract: the credibility ceiling on the outsider's stake in the firm is not just necessary but also sufficient to protect him against

[2] In our model the "manager" makes all executive decisions within a firm, and the "entrepreneur" has the authority to hire and fire him. Both are insiders and have private knowledge about the true state of firm performance. Only individuals with managerial ability can become managers, but there is no such restriction on becoming an entrepreneur, unless the firm is owner-managed (in which case the distinction disappears).

being cheated. However, we show that capable managers prefer working for a non-managerial owner to managing their own firms. This in turn requires a credible managerial contract with a managerial salary high enough to deter the manager from cheating (*a la* Shapiro-Stiglitz (1984)). Such a salary is feasible only below a specific cost of outsider capital. When capital costs are below this, partnerships between a manager and a non-managerial entrepreneur are the preferred form of organization. Owner-managed firms develop when capital costs exceed this critical level or when no partners can be found, assuming of course that the owner-manager is wealthy enough.

As credibility limits the amount of outsider finance forthcoming, the personal wealth of potential owner-managers or of entrepreneur-manager pairs has to exceed a certain floor if there is a minimum size requirement on the enterprise. Further, the number of firms is limited by the supply of individuals with managerial ability, even when there is a surplus of wealthy individuals without managerial ability. On the other hand, even when the supply of individuals without managerial ability runs out, new firms may be formed by those with managerial ability, either singly or in pairs, provided they have enough wealth. The number of firms shrinks discontinuously when capital costs go above the critical level mentioned– when only owner-managed firms are feasible, far fewer individuals have sufficient wealth – and managerial ability - to start a firm as opposed to the situation where entrepreneurial-managerial combinations are feasible and pooling of insider funds and talents is a reality. We also show that managers will generally prefer to invest all their wealth in the firm for which they work[3].

We endogenize entry into entrepreneurship and characterize possible equilibria (there is a unique equilibrium for a given distribution of initial wealth). Apart from implications for firms and managers, our model also explains features of poor countries such as the prevalence of family firms, moral hazard induced "vicious circles" retarding industrialization, and the possible advantages of inequality in the industrialization of a small open economy. The link with development economics lies in the fact that our equilibria are influenced by the level and the distribution of wealth.

Market outcomes in our model are stochastic, and the true performance of a firm is only observable by insiders. Insiders can therefore exploit their asymmetric information

[3] Individuals are risk neutral, hence the diversification motive does not apply.

about firm performance to pretend to outsiders that the firm has been unlucky, appropriating the excess returns due to outsiders in a good state. We explicitly introduce an incomplete contracting feature in the agreement between insiders and outside investors, due to the inability of the latter to observe firm performance.

Investor payoffs are common knowledge, but this does not tell the public whether the insiders have cheated. This is because outcomes being stochastic, poor investor returns may reflect either bad luck or cheating by insiders. This is similar in some sense to the Green-Porter (1984) models of games with imperfect public information[4].

The manager has the ability to cheat outside investors in the manner described. A public signal detects cheating with a probability of q – but only in the next period. Past cheating by a firm, once exposed, is collectively remembered for ever.

Our work is connected to many strands in the literature. Agency conflicts between managers and shareholders have of course been the subject of a vast literature in corporate finance (eg. Aghion and Bolton [1992], Jensen [1986], and Zwiebel [1996]). All these papers consider managers whose objectives differ from those of shareholders, or of investors in general. The difference in objectives may be reflected in the manager's choice of projects inimical to investor interests, or in his diverting free cash flow into his own pocket. The latter option is closer to the situation we study in this paper. Our focus is on a three-way relationship between entrepreneurs, managers and outside investors, rather than only on manager-shareholder conflicts.[5] Moreover, we endogenize individuals' entry into entrepreneurial, managerial, owner-manager or outside investor roles, subject to two exogenous requirements – one, that firms need to reach a minimum size to be operational, and second, that at least one person with managerial ability is required to run a firm.

Our problem is closest to Legros and Newman's [1996] study of firm formation in a general equilibrium context, but differs in several significant aspects. While theirs is a one-period model, ours is an indefinitely repeated game. Cheating runs the gauntlet of a costly random audit in their formulation, while in ours it incurs the risk of exposure by a public

[4] Green and Porter (1984) discuss how low sales may reflect either low demand or rival pricing strategies by other firms.

[5] Other work which shares the common feature of looking *within* the "black box" of the firm includes models dealing with information flows (eg, Blackwell (1953)), costly supervision limiting the number of hierarchical tiers (eg, Calvo and Wellisz (1978)), career concerns (eg, Milgrom (1988)), authority (eg, Williamson (1975)), and the possibility of side-payments in an owner-supervisor-worker relationship (Tirole (1986)).

signal which is costless but delayed. In Legros and Newman, punishment after detection would presumably require deterrent legal penalties; our cheats are punished on exposure by loss of investor confidence and consequent inability to establish enterprises ever after – whether this deters or not is endogenously determined. All members of a Legros and Newman world are identical except in wealth and firms are simply coalitions of such individuals; we have individuals differing not just in wealth, but in managerial ability as well and both these inputs are essential for firm formation. Suppliers of external finance are outside Legros and Newman's model and the return to outside capital is exogenous. In our model, however, outside investment is simply one of the possible roles that a wealth-holder may assume: his choice of this role and the rate of return it entails is endogenized in general equilibrium. Effort is a variable in Legros and Newman's firm and affects expected profit: monitoring of effort is a major concern. We, on the other hand, make expected profit a function only of luck so as to focus exclusively on cheating and its preemption.

A consequence of these differences in assumptions is a substantial difference in results. While Legros and Newman endogenize the formation of externally-financed M-firms and internally-financed I-firms, we are concerned only with firms that need outsider funds: within this group, we endogenize the formation of owner-managed firms and of entrepreneur-manager pairings. As for the latter subgroup, we examine the matching process and show that it leads to wealthier managers teaming up with wealthier boards (positive assortative matching, indeed segregation), in contrast to Legros and Newman's result that rich individuals may prefer poorer ones as partners (heterogeneous, or negative assortative matches). We also show that risk-neutral managers and entrepreneurs prefer to invest all their wealth in their own firms.

Our model belongs to a broader class (eg. Bernanke and Gertler [1989], Banerjee and Newman [1993]) in which moral hazard in a corporate setting serves to restrict long run firm size.[6] Our model pinpoints two distinct ways in which firm size could be limited due to credibility concerns. The first – due to insider-outsider tensions – is common to owner-managed firms as well as firms with both a manager and a non-managerial financier

[6] Kehoe and Levine (1993) also consider a model where the possibility of default gives rise to an endogenous debt limit. Unlike in our model, where the true state of nature is only known to insiders, all information in the Kehoe-Levine model is public.

(entrepreneur) ; given a minimum size requirement on enterprise, it translates into a floor to the personal wealth of entrepreneurs and is also a feature of Banerjee and Newman. The second is specific to firms run by separate financiers (entrepreneurs) and managers: here the manager has to be paid a high enough salary to credibly deter him from cheating and this ensures that the firm cannot pay too high a rate of return on outside capital. When outside capital is expensive, only owner-managed firms will be credible. Such firms have access to less insider capital (from one individual rather than two) and are therefore smaller.

A large literature is now in existence on the interaction of entrepreneurs, managers and outside shareholders and specifically on the monitoring of managers to deter cheating. The focus in most of this literature is on the legal regime of shareholder protection. Thus Burkart, Panunzi and Shleifer [2003] describe how the decision to separate management from ownership is "shaped by the legal environment." Shleifer and Wolfenzon [2000] seek to explain various "empirical regularities concerning the relation between investor protection and corporate finance." To the best of our knowledge, however, none of this literature relates the financial and organizational structure of firms to the distribution of managerial ability and of wealth. While our analysis identifies the investor protection parameters as determinants of firm structure, we show that, for given values of these parameters, firm structures will indeed be shaped by these distributions. The prevalence of family firms in poor countries, for example, is due not just to their weaker legal regimes but to their distributions of wealth and managerial ability.

This brings up the issue of profit-based executive compensation. Many have pointed out the incentive effects of such compensation, arguing that bonuses induce greater efficiency. However in our story, output, though stochastic, does not depend on the manager's effort but on luck. So the effect of giving the manager a share in insider profits is to increase his incentive to cheat the investors by exploiting his asymmetric information about whether the firm has been fortunate or unlucky.

More generally, we present a stripped-down model that focuses exclusively on the possibility of cheating and all that it implies. To this end, we assume that managerial ability is only a binary variable, that managerial effort is not a variable at all (so that sustaining the manager's incentive to work is not a concern though inducing him not to

cheat is). We assume also that there is no saving.[7] The objective is to create a benchmark model in which contracts and the structure of the firm are driven purely by the possibility of cheating. The rather sharp predictions that the model yields can then be used to check the extent to which concern about cheating is the dominant force shaping the behavior of the firm in a particular economy. Such a check is in fact part of our agenda for later work.

A summary of our argument is as follows. We show that, given our assumptions, there exists an optimal investor contract and a managerial contract which, *together*, guarantee the outsider against cheating as long as the cost of capital is above a minimum and total outsider stake in the firm does not exceed a certain threshold. Profit-maximization, on the other hand, drives this stake up to this ceiling. We show further that when firm formation is feasible, entrepreneur-manager pairings are credible only if the cost of capital is below a certain limit, but owner-managed firms may continue to be viable above it. We also show that the contracts imply a positive assortative matching process between entrepreneurs and managers according to wealth. This enables us to endogenize the role played in equilibrium by each holder of wealth or possessor of managerial ability as well as the structure and number of firms as functions of the cost of capital, the distributions of wealth and managerial ability and the other parameters of the model. All this is partial equilibrium analysis for a given cost of capital. We then embed this in a general equilibrium framework to endogenize the cost of capital. This gives rise to a range of implications for development economics.

In section 2, we provide a detailed discussion of the assumptions underlying our model. In section 3, we describe the timing of the game while in section 4, we characterize the requirements for equilibrium. Our main results are presented in sections 5, 6 and 7. Section 8 discusses some implications of our model, while section 9 concludes.

2. Assumptions

Individuals live forever in a closed population with fixed and inelastic wealth. There is no saving, depreciation or borrowing, though lending is possible at an outside opportunity cost R. Agents are all risk-neutral.

Individuals differ, not only in personal wealth, but in managerial ability as well. Managerial talent is a binary variable with values 0 and 1: its distribution in the population

[7] A detailed justification for this assumption is provided in an appendix.

is independent of that of wealth. There is thus a separate class of individuals with managerial ability. But members of this class do not necessarily work as managers in firms set up by wealthy people without managerial talent: they also have the option of working as managers for wealth-holders with managerial talent who do not however have a managerial role, or of maintaining exclusive control over their firms as owner-managers; sometimes, they may not find any employment for their managerial ability but only for their wealth. The supply of managers is infinitely elastic at price zero up to the limit set by the number of individuals with managerial talent, and perfectly inelastic thereafter. However the capital they own, like everybody else's capital, has an outside option.

Each enterprise must reach a minimum size $\underline{I}$ before operation is possible. Thus entrepreneurs whose funds F are less than this must recruit investment either from managerial partners or from the public in order to set up business. F may represent the collective funds of a group of insiders who combine to set up a firm. Collective action problems limit the extent to which such pooling of funds is possible so that the minimum size requirement has considerable bite. M is the volume of managerial investment in the firm and S that of outside shareholder capital. Further, enterprises cannot function without an individual of managerial ability 1. Individuals lacking managerial talent cannot establish firms on their own: they must either recruit a manager or become outside investors.

Firms that couple a manager with an entrepreneur (a second insider) are characterized by a division of labor: all executive decisions are taken by the manager while the entrepreneur is the authority that hires and fires him. The entrepreneur can use two instruments to control the manager – the compensation contract (assumed to be perfectly verifiable and enforceable) and the threat of dismissal (where this threat is credible). If the firm mobilizes outside capital, the outside investors have no say in hiring and firing decisions, though they can observe the entrepreneur's decisions and draw their own inferences. Basically, we assume that outside investment is too widely dispersed for individual outsiders to exercise effective control.

The manager's compensation contract has the general form (Φ, A) where Φ is his bonus share in profits and A is his salary – and is common knowledge. While cheating, he

can however siphon off private gains for himself beyond this (subject to a cap that is linked to the size of the firm) which comes out of the firm. The maximum that he can steal – without his theft being provable in court (ie verifiable) – is proportional to the size of the firm: we assume that it is a fraction ε of total insider assets (F + M).[8] A larger theft would be provable in a court of law, and therefore may be ruled out by sufficiently harsh penalties. Though a theft of a fraction ε of total insider assets (F + M) is not verifiable in court, it *is* detectable (with probability q) by a public signal with a lag. This same public signal also detects direct misreporting by managers to investors of the true state of nature (as we describe more fully below).

Each enterprise lasts for one period after which outside investors have to decide whether or not to refinance the enterprise as opposed to investing their wealth in the outside option. We may think of the enterprise as undertaking fresh projects in each period.[9]

Enterprises earn a rate of profit G with probability p (the probability of "good luck"), and B otherwise, with G > B. The expected rate of profit is H = pG + (1 - p)B and exceeds R, justifying the existence of the industry. Here G and B are exogenous - we are operating in a small open economy facing fixed world prices and exogenous shocks to output. Also R > B. For economy of notation, all rates of return in this paper are gross rates (= 1 + net rates).

Outside capital S can be mobilized by the firm on the basis of a contract that promises outside investors an amount equal to $\min[SD_g, G(S + F + M)]$ if luck is good and to $\min[SD_b, B(S + F + M)]$ if it is bad. The investor's expected dividend $D = pD_g + (1 - p)D_b$ if there is no bankruptcy or cheating. This will be endogenized later. The firm's assets are not redeployable.

The investor contract is not legally enforceable because the state of firm performance (whether the firm has experienced good or bad luck) is observable only by insiders - it is not observable or legally verifiable by outsiders. Insiders can cheat by paying the outsiders their "bad luck" dues even when good luck has occurred – appropriating the excess. M, the manager's investment, F, the board's investment, S, the

[8] This assumption is similar to Shleifer and Wolfenzon (2002).
[9] For a somewhat similar setup in a two-period model see Bolton and Scharfstein (1990).

aggregate outside investment, G, B and p are all taken as exogenous by the individual outsider. Moreover, outsiders can observe the aggregate ratio of outsider to insider capital, which we denote by s (= S/(F + M))..

A publicly observable signal detects cheating with an accuracy (probability) q but only after it has occurred. The information it conveys is available to all investors at the beginning of the next period.

We also assume that cheating, once exposed, becomes common knowledge and part of collective memory, so that firms that have been dissolved due to the exposure of cheating and a consequent exodus of investors cannot be set up again. Managers who have been exposed as cheats are dismissed and never rehired.

Of our assumptions, the one that needs further discussion is that of no savings. We assume zero savings so as to focus on the distinctive consequences of cheating without our results being obscured by the changing dynamics of the accumulation and distribution of wealth. A detailed justification in the appendix shows that this assumption can be supported in terms of microfoundations with minimal restrictions. Accommodating the dynamics of accumulation would make our model intractable without sharpening the points we wish to make. Zero saving makes the distribution of wealth exogenous. It eliminates complex feedback effects such as the possibility that firms that go public may ultimately save enough out of current income to raise entrepreneurial wealth above the threshold needed to set up business without reliance on outside capital.

3. The Time Profile of the Game

The timing of moves is as follows. First, entrepreneurs announce compensation contracts and recruit from the pool of available managers.[10] Then outside investors decide whether to invest or not. The information available to them at this point relates to the managerial contract, the firm's choice of managers, the payoffs distributed by the firm

[10] We do not assume that a manager *must* work for a non-managerial entrepreneur. In fact, we will show that for some parameters, an owner-managed equilibrium obtains where firms are managed by their owners (who of course need to have managerial talent). However, we will also show that managers in our model *prefer* to work for entrepreneurs to running their own firms and adopt the former alternative when both are feasible. If only owner managed firms are feasible, the game merely involves a decision by outside investors of whether to invest, given the firm's previous payouts, and the realization of the previous period's public signal. Firms realize their outcomes, managers distribute payoffs, the public signal indicates cheating with probability q, and its realization determines whether the owner-manager can stay on in business or not and whether the firm is refinanced.

earlier and the public signal that gives a clue as to whether the insiders cheated in the previous period. Finally, firms realize their outcomes. Managers distribute payoffs to investors, having decided whether to be honest or to cheat (their outside investors and also perhaps their entrepreneurs) in the process. The public signal indicates cheating by the manager with probability q. Entrepreneurs decide whether to retain their managers or to dismiss them. Investors decide whether to reinvest in their existing firm or withdraw and invest elsewhere. This cycle is then repeated indefinitely.

4. Requirements for Equilibrium

Equilibrium is defined by

(1) an optimal investor contract that promises investors

$$\min[SD^*_g, G(S + F + M)] \text{ if luck is good,} \quad (1)$$

$$\text{and } (SD^*_b, B(S + F + M)] \text{ if it is bad} \quad (1a)$$

and enables them to insure against collusive cheating by the entrepreneur and the manager;

(2) an optimal stake s* corresponding to the maximum ratio of outsider to insider capital at which outsiders are guaranteed against such collusive cheating;

(3) an optimal managerial contract (Φ^*, A*) that eliminates the manager's incentive to steal.

Given conditions (1) – (3), one of two kinds of equilibrium may result. An *owner-managed equilibrium* is one in which

(4) all managers who are willing and able, at the current cost of outside capital, to set up firms on their own, do so while all other wealth holders are outside investors, and

(5) total demand for outside capital from all the manager-owned firms at the existing cost of capital just equals the total wealth of all other wealth holders who supply outside capital

Consider the doublet (i, j) comprised of two distinct members of our population of wealth-holders (at least one of whom has managerial ability) who could profitably set up a firm, given their combined wealth and the current cost of capital. A *professionally managed*

equilibrium is then defined by the collection T of all such pairwise disjoint doublets T = {(i, j),….} such that

(6) each pairing is mutually satisfactory; i.e. neither member of any doublet in T would prefer to be paired with some other individual in the population (whether in T or outside it) and

(7) total demand for outside capital from firms set up by all the entrepreneur-manager pairs in T at the existing cost of capital equals the total wealth of all wealth-owners outside T.

Fortunately, the first three requirements are analytically separable from the others. We can solve for the first three equilibrium conditions for a given rate of market return to capital in the first stage. In the second stage, we endogenize this rate of return in terms of the other requirements which embody market-clearing conditions.

Before presenting our main results, we discuss an issue relating to equilibrium in infinitely repeated games. It is well known that for high enough discount factors, a great multiplicity of possible equilibria can be supported in infinitely repeated games. What is then distinct about the equilibria we choose to focus on below? The answer lies in the fact that our repeated game is embedded in a general equilibrium framework linking our equilibrium to economy wide parameters like the distribution and level of wealth and the distribution of managerial talent. The equilibria that we will focus on are the only repeated game equilibria that are compatible with maintaining a balance between demand and supply forces in this wider framework. Moreover, people's beliefs are aligned with the fundamentals of the economy : so that people expect only those equilibria to be chosen that are in line with economic fundamentals. We elaborate on this assumption further in the course of the next section, arguing that it is a reasonable assumption in the absence of extraneous co-ordination devices.

5. The Outsider and the Insider.

We begin our analysis of this game by examining how different agents react to a given market rate of return D on capital. Assume that there is a managerial contract that induces honest behavior by managers and is common knowledge. When will the manager and entrepreneur have no incentive to secretly renegotiate to form an insider coalition in

order to cheat outsiders? The answer to this question requires an analysis of the optimal investor contract and the possibility it opens up for outside investors to forestall collusion between entrepreneurs and managers at the expense of outsiders.

The optimal investor contract may be defined as one that (1) eliminates any incentive for insiders collectively to cheat outside investors whether by false bankruptcy or by offering them the bad luck payment when good luck has in fact been experienced, and (2) maximizes total expected insider income subject to this constraint for any given rate of return D to outside capital and given insider investments F and M. Now, when outsiders receive D on their capital, the combined income of insiders amounts to

$$H(F + M + S) - DS = (F + M)[H + (H - D)s]. \quad (2)$$

Firms are set up only if $D < H$ since, otherwise, potential insiders would earn less on their capital than outsiders and would therefore prefer to play an outsider role. But then, collective insider income is maximized by maximizing s (if there is no cheating).

Theorem 1. For any D above a certain threshold, there exists an optimal investor contract.

Proof. The general form of the investor contract we have assumed is one that explicitly allows for the possibility of bankruptcy – and therefore raises the spectre of false bankruptcies. Bankruptcy is possible if $D_B S > B(F + M + S)$. On the other hand, if $D_B S \leq B(F + M + S)$ – implying $s \leq s_l = \frac{B}{D_B - B}$ – bankruptcies are impossible and any claim of bankruptcy will be legally barred.

However, firms could still cheat by misrepresenting the fortunes of the business and offering investors $D_B S$ instead of their rightful dues $D_G S$, risking detection by the public signal and loss of future income. This variety of cheating would be unprofitable if and only if the present value of this expected future loss is no smaller than the one-time cheating gain:

$$\frac{q\delta[H(F+M)+(H-D)S]}{1-\delta} \geq (D_G - D_B)S \quad (3)$$

$$\text{or } s \leq \frac{\delta qH}{(1-\delta)(D_G - D_B) - \delta q(H-D)}. \quad (4)$$

Bankruptcy would be impossible if the contract itself provides that, in the event of bad luck, the entire proceeds of the firm should go to the outside investor: $D^*_B S = B(F + M$

+ S). This is indeed the maximum guarantee against misfortune that a liquidity-constrained firm can credibly promise the outside investor: it maximizes D_B subject to credibility. If max $D_B = B(F + M + S)/S \leq D \leq D_G$, the implication is that it minimizes the cheating premium ($D_G - D_B$) for any given D – and thereby maximizes s. It follows that this is the optimal contract whenever $B(F + M + S)/S \leq D$. Given that investors are to receive B(F + M + S) under bad luck, the contract must provide for a good luck payout that ensures an expected return D:

$$pD^*_G S + (1 - p)B(F + M+S) = DS \quad (5)$$

$$\text{or } D^*_G S = [DS - (1 - p)B(F + M+S)]/p. \quad (6)$$

With D^*_G and D^*_B thus determined, $(D^*_G - D^*_B)S$ reduces to $\{DS - B(F + M+S)\}/p$, yielding

$$s \leq s^* = \frac{\delta pqH + (1-\delta)B}{(1-\delta)(D-B) - \delta pq(H-D)}. \quad (7)$$

Thus, the optimal contract also imposes a ceiling on s that decreases in D.

The picture is rather different if $B(F + M + S)/S > D$. With a contract that offers investors B(F + M + S) in the event of bad luck, this configuration tempts the firm to cheat the investor in the diametrically opposite way – by offering the smaller good luck payoff when in fact it has been unlucky. However, $B(F + M + S)/S > D$ is equivalent to $s < \frac{B}{D-B}$, s is a variable controlled by the firm and the firm's profits increase in s (if D < H). Since, $s < \frac{B}{D-B}$ also undermines its credibility by creating moral hazard, the firm has every incentive to increase s to the level $s \geq \frac{B}{D-B}$, at which point it will find it worthwhile to offer the optimal contract described above.

Now $s^* > 0$ if and only if

$$(1 - \delta)(D - B) > \delta pq(H - D) \quad (8)$$

$$\text{or } D > [\delta pqH + (1 - \delta)B]/(1 - \delta + \delta pq). \quad (9).$$

In that case, outsiders, by restricting the ratio of outsider to insider capital, can preempt a collusive coalition between the insiders and forestall renegotiation.

Q. E. D.

This leads to

Corollary 1. An implication is that the total wealth of entrepreneur and manager together must exceed $\underline{I}/(1 + s^*)$ if they are to set up an enterprise.

Corollary 2. A further implication is that, as long as $H > D$, so that entrepreneur and manager enjoy a combined profit of $H - D$ on each unit of outside capital, it is in their common interest to apply for outside capital till s has been driven up to the credibility ceiling s^*. Moreover, D will never exceed H as this would violate the insiders' participation constraint, since in that case being an outsider would clearly be more attractive than becoming an insider. In equilibrium therefore, $s = s^*$.

The ceiling s^* is determined by the parameters of the game, for a given D (which is endogenized in general equilibrium). We rule out equilibria which are not based on fundamentals – such as those in which every one shares a common belief about some other value of s^*, not necessarily based on fundamentals, and invests accordingly because of the conviction that every one else shares the same belief. This is easily justifiable if we assume the absence of co-ordination devices : in that case common knowledge of every one else's beliefs is ruled out, so each individual bases his or her behavior on fundamentals.

6. The Entrepreneur and the Manager

Even though outside investors can insure themselves against a coalition to cheat between entrepreneurs and managers by maintaining $s \leq s^*$, this does not guarantee that managers lack a private incentive to cheat. That would follow only if the managerial contract (Φ, A) makes honesty individually worthwhile for the manager (with $s \leq s^*$). Φ includes a share not only in the insiders' legitimate profits, but also in their one-time cheating gains – extracted by paying outsiders their "bad luck dues" even when luck has been good. The size of such gains would then be the difference between the outsiders' dues in the good and the bad states. We focus on contracts that specify non-negative Φ and A and a positive value for at least one of them**.** In addition to his salary and bonus, the manager earns profits on his stock holdings in the firm – and of course he can steal from the firm. All thefts, in turn, run the risk of being detected (with a probability q) by the public signal at a later date.

Theorem 2. (1) If $(D-B)s^* > \varepsilon p + B$ there exists a feasible managerial contract that induces managerial honesty. This contract prescribes a zero bonus share for the manager and a salary defined in terms of observable parameters. Given such a contract**,** managers prefer wealthier entrepreneurs and entrepreneurs would not object to wealthier managers.

(2) If $(D-B)s^* < \varepsilon p + B$, no credible contract exists so a firm with an entrepreneur-manager pairing cannot form.

Proof of Theorem 2: The manager's honest one-period income I_h comprises contractual salary, bonus and profits on holdings of company stock.

$$I_h = A + \Phi[(F+M+S)H - DS - A] + \frac{M}{M+F}(1-\Phi)[(F+M+S)H - DS - A]$$

$$= A\frac{F(1-\Phi)}{M+F} + [H(F+M+S) - DS]\frac{M+\Phi F}{M+F}$$

$$= A\frac{F(1-\Phi)}{M+F} + [H + (H-D)s^*](M+\Phi F) \tag{10}$$

His one-time cheating gains are

$$\varepsilon F(1-\Phi) + \frac{DS - B(F+M+S)}{p}\frac{M+\Phi F}{M+F}$$

$$= \varepsilon F(1-\Phi) + \frac{Ds^* - B(1+s^*)}{p}(M+\Phi F) \tag{11}$$

He will be honest if and only if

$$\varepsilon F(1-\Phi) + \frac{Ds^* - B(1+s^*)}{p}(M+\Phi F)$$

$$\leq \frac{\delta q}{1-\delta}[A\frac{F(1-\Phi)}{M+F} + \{H + (H-D)s^*\}(M+\Phi F)] \tag{12}$$

The entrepreneur designs the managerial contract so as to maximize his honest one-period income

$$\Pi_h = (F + M)H + S(H - D) - I_h \tag{13}$$

subject to the manager's honesty constraint and the entrepreneur's own participation constraint

$$\Pi_h \geq \text{FD}. \tag{14}$$

Assume that the manager's honesty constraint binds. Differentiating the resulting equation with respect to the contract parameters A and Φ,

$$\frac{1-\Phi}{M+F}\frac{dA}{d\Phi} = \frac{A}{M+F} - \{H+(H-D)s^*\} + \frac{1-\delta}{\delta q}\left(\frac{Ds^*-B(1+s^*)}{p} - \varepsilon\right) \tag{15}$$

Differentiate the entrepreneur's profit function with respect to the same parameters and insert the expression for $\frac{dA}{d\Phi}$. Then

$$\frac{d\Pi_h}{d\Phi} = -F\frac{1-\delta}{\delta q}\left(\frac{Ds^*-B(1+s^*)}{p} - \varepsilon\right) \tag{16}$$

Thus, if $(D-B)s^* > \varepsilon p + B$, $\frac{d\Pi_h}{d\Phi} < 0$, so that the optimal bonus of the manager is Φ* = 0. This happens when the maximum that the manager can steal from the entrepreneur is less than what insiders can steal from outsiders. If this inequality is reversed, a firm which pairs an entrepreneur and a manager cannot form – only firms run solely by managers will exist.[11] (setting Φ* = 1).

If Φ* = 0, I_h reduces to

$$A\frac{F}{M+F} + \frac{M}{M+F}\{H(M+F)+S(H-D)\} \tag{17}$$

and Π_h to

$$F\{H+s^*(H-D)-\frac{A}{F+M}\}. \tag{18}$$

If the manager's honesty constraint binds so that A = A*, the salary just sufficient to induce honesty, and Π_h* is the associated one-period profit, it can be checked that

[11] A firm which is run by the manager without any non-managerial entrepreneur would face a similar upper limit on the ratio of outsider to insider (here, managerial) capital compatible with credibility.

$$\frac{d\Pi_h^*}{dM} = 0 \qquad (19)^{12}$$

The manager who acts honestly has two sources of income, the salary A* and insider profits on his investment. Given that Φ* = 0, the honesty constraint defines A* as

$$\text{A}^* = \frac{1-\delta}{\delta q}\varepsilon(M+F) \qquad (20)$$

The manager's insider profits work out to

$$\text{P} = M[H+(H-D)s^*-\frac{A^*}{M+F}]. \qquad (21)$$

His total honest income per period adds up to

$$\frac{1-\delta}{\delta q}(\frac{\{Ds^*-B(1+s^*)\}M}{p}+\varepsilon F). \qquad (22)$$

This increases in F: the manager prefers to work for a wealthier entrepreneur. An important implication of this is that the manager's income for any positive F is higher than that for F = 0: the manager prefers working as a manager to setting up an independent enterprise even if he has enough wealth to do so.

The manager's income is also increasing in M: he prefers therefore to invest all his wealth in his firm.

Q. E. D.

Corollary. The existence condition for a feasible managerial contract $(D-B)s^* > \varepsilon p + B$ sets a lower limit to (D-B)s*(D). Since (D-B)s*(D) decreases in D, this condition imposes a cap Ď on the return to capital given by [Ď-B]s*(Ď) = εp + B: if D exceeds this limit, a managerial contract that induces honesty is infeasible. However, people with managerial ability could still set up proprietorial firms if their personal wealth exceeds the threshold I /(1 + s*).

How does one interpret the existence condition? It can be checked that for managers to be paid a salary A* that would deter them from cheating while all owners of capital, insiders as well as outsiders, receive at least the market rate of return, it is

[12] To derive this we use the definition of s* in (7).

necessary and sufficient that $(D-B)s^* > \varepsilon p + B$. The condition therefore refers to the ability of the firm to pay the manager an 'honesty wage' (comparable to the Shapiro – Stiglitz 'efficiency wage'). Ď represents the threshold value of the cost of capital that separates owner-managed equilibria from professionally managed equilibria.

Where $D < Ď$, feasible managerial contracts exist, managers prefer wealthier entrepreneurs and entrepreneurs have no objection to wealthier managers. Further, a person with managerial ability and wealth M has four options:

(A) assuming a managerial role in a partnership and receiving an income of $M[H + s^*(H – D)] + A^*N/(N + M)$ where N is the wealth of the partner (who may or may not have managerial ability);

(B) assuming a non-managerial role in such a partnership and receiving $M[H + s^*(H – D) – A^*/(M + N)]$;

(C) setting up an independent enterprise and receiving $M[H + s^*(H – D)]$;

(D) investing his capital in other firms as an outsider and earning MD.

Evidently he prefers option (A) to (C), and both (A) and (C) to (B). Substitutions for s* and A* would also indicate that option (B) is better than (D). Those with managerial ability therefore prefer managerial roles: they seek out individuals without managerial ability as partners (since those with managerial ability would not want non-managerial roles). If there are none available, they manage their own firms, when wealthy enough to do so. When they are not, they form partnerships with similar others if their combined wealth reaches the entry threshold. When this option too is exhausted, they are reduced to being outside investors.

Thus, a simple bilateral matching process with full information is set up with a stable equilibrium in which positive assortative matching (indeed segregation) in the dimension of wealth occurs: the wealthiest entrepreneur hires the wealthiest manager among those on the market, the second richest entrepreneur employs the second richest manager, and so on.[13] However, this process is subject to the constraint that the combined

[13] Matching in this context is not similar to assortative matching in the marriage market, because there is no issue of heterogeneity in "types" here or of "joint production" with transferable utility - even though an individual who lacks managerial talent cannot start a firm without the help of one with managerial ability

wealth of entrepreneur and manager should be at least as large as the investment requirement for entry:

$$F + M \geq \underline{I}/(1 + s^*). \qquad (23)$$

Accordingly, the chain of matches ends either if this threshold for aggregate wealth is reached or if the supply of either entrepreneurs or managers on the market runs out**.** If the chain ends because the supply of wealth-holders without managerial skill is exhausted, owner-managed firms could still be established by individuals with managerial skill, whose personal wealth exceeds the entry threshold**.** And when this supply too is exhausted, partnerships could be formed by those whose combined wealth exceeds this limit: one of the two partners would in this case perform the managerial function while the other's managerial talent would remain unutilized and unrewarded. Outside capital would be supplied by aspiring managers whose combined wealth, even after pairing, would not reach the floor required for entry.

The terms of agreement between managers and entrepreneurs depend on which of these terminal constraints to the matching process binds. If either combined wealth or the number of entrepreneurs sets the limit to firm formation, the managerial honesty constraint will determine the manager's salary. If however scarcity of managers binds, managers can bargain their salaries above the minimum necessary to induce honesty. Suppose there are N managers (indexed 1, 2, …..N in decreasing order of wealth). Suppose that entrepreneurs are similarly indexed and that the wealth of the (N + n)-th entrepreneur, together with that of the N-th manager, just fulfils the criterion $F_{N+n} + M_N \geq \underline{I}/(1 + s^*)$ where the subscripts of F and M indicate the rank (in order of wealth) of the relevant entrepreneur or manager. The N-th manager can choose to link up with the N-th entrepreneur or with the (N + 1)-th or with entrepreneurs even lower in the hierarchy down to the (N + n)-th. The maximum he can extract from the N-th board is what he would get if the entrepreneur is reduced to its reservation rate of return on capital, D. This amounts to $HM_N + (H - D)\{F_N + s^*(F_N + M_N)\}$. However, the manager's own reservation payoff in this bargain is the maximum he could have extracted from the (N + 1)-th entrepreneur: $HM_N + (H - D)\{F_{N+1} + s^*(F_{N+1} + M_N)\}$. The bargaining outcome should lie somewhere in this interval: we assume for simplicity that it will correspond to the entrepreneur's

participation constraint, but we can readily accommodate other bargaining processes and outcomes. Likewise, for any i < N, the i-th entrepreneur and the i-th manager team up under a contract that guarantees the manager the entire surplus while leaving the entrepreneur with a return of D on his capital.

7. A General Equilibrium

Having worked out the responses of different agents to a specific market rate of return on capital, we now embed our analysis in a general equilibrium model to endogenize D. A given market level of D implies a specific value of s*(D) and a fixed investment requirement $\underline{I}/\{1 + s^*(D)\}$. However, the implications are different according to whether firms are owner-managed or set up by manager-entrepreneur pairs. If they are owner-managed, only those with managerial ability can be insiders. D can never exceed H as this would violate insiders' participation constraint and no firms would be set up. The demand curve for outside capital thus has a horizontal intercept at D = H. As D drops below H, s* increases, and the wealth requirement for entry $\frac{\underline{I}}{1+s^*(D)}$ falls, more and more members of this class can set up firms and demand more outside capital. Members of this class who cannot enter at the current level of D contribute to outside capital supply. The entire wealth of those lacking managerial ability is also a component of outside capital supply, regardless of the value of D. The resulting demand and supply curves for outside capital are depicted as the dashed curves in Fig. 1.

If however firms are entrepreneur-manager combines, they cannot exist either if D > H or if D > Ď. But if Ď > D and H > D, manager-entrepreneur partnerships are feasible and will in fact be the preferred form of enterprise. Even the owner-managed firms that were the only feasible enterprises when H > D > Ď would now reinvent themselves and pair off with non-managerial wealth-holders. As one reads down the list of potential entrepreneur-manager matches, the last match with a combined wealth of at least $\underline{I}/\{1 + s^*(D)\}$ represents the last firm that is just viable at this D. No more matches may be feasible for one of three reasons: (1) though there are other potential entrepreneur – manager pairings, their combined wealth is less than the minimum investment requirement;

(2) there are no more entrepreneurs to match the potential managers; (3) there are no more managers to match the potential entrepreneurs.. The first two of these reasons imply that the binding constraint on the optimal contract decision is the managerial honesty requirement, the third corresponds to the case where the entrepreneur's participation constraint binds.

As D declines, s* rises, so that the investment requirement falls and, in Case (1) above, more manager-entrepreneur pairs can enter and set up firms. Further, each firm can credibly apply for more outsider capital. The demand for outsider capital X_d rises on both counts. In Case (2), despite the fall in investment requirement, there is no change in the number of partnerships due to scarcity of entrepreneurs. However, aspiring managers without non-managerial partners may now set up proprietorial firms if their personal wealth exceeds $\underline{I}/\{1 + s^*(D)\}$. And less wealthy people with managerial skill could pair off to form firms if their combined wealth reached this limit. As D drops, more and more of such individuals (or pairs) will switch away from the ranks of outsiders to set up business on their own. In Case (3), however, there can be no additions to the number of incumbents since we have reached the limit to firm formation set by the essential input, managerial skill. However, in all three cases, incumbent firms will demand more outside investment as the credibility ceiling rises with the decline in D. In any event, therefore, the demand for outside capital will continuously decrease in D.

As D drops to $[\{\delta pqH+(1- \delta)B\}/(1–\delta+ \delta pq)\}$, s* tends to infinity, so that the demand curve for outside capital is asymptotic to this level of D, whether firms are owner-managed or run by entrepreneur-manager pairs.

The supply of outside capital X_s comprises the wealth of all those who cannot set up firms, whether because they, singly or along with their partners, do not command the minimum necessary funds to do so, or because they cannot find managers. As D falls, as long as the supply of managers is unexhausted, more people can set up firms and the supply of outside capital diminishes in steps as more wealth is diverted by new entrants to the industry. Eventually, however, the supply of managers runs out and no more firms can be set up; further fall in D does not reduce outside capital supply until D drops to R, the

opportunity cost of outside capital. For D below R, the supply of outsider capital falls to zero.

The demand and supply curves for outside capital generated by pair-wise associations of insiders are the solid curves in Fig. 1. Since such associations survive only when $D \leq \check{D}$, the composite demand and supply curves will comprise the solid curves at or below this level and the dashed curves above it. At $D = \check{D}$, there is a quantum leap in the demand for outside capital as many more wealth-owners qualify as insiders than at higher levels of D. Given the configurations actually depicted in Fig. 1, equilibrium will occur at the intersection of the solid curves with $D < \check{D}$, implying that all firms are entrepreneur-manager pairs.

What parameter values make it more likely to have an equilibrium value of D in excess of $\check{D}$? It is straightforward to prove that $\check{D} < H$. Holding other parameters fixed, a small ε ensures a high $\check{D}$ so that $D < \check{D}$ is likelier. If the manager can steal a large fraction of assets from the firm without legal reprisal he must be paid a high "honesty wage" to prevent this, which is more likely to rule out feasible managerial contracts so that only owner-managed firms are feasible. A high q or δ, holding ε fixed, increases s^* and hence increases the threshold value $\check{D}$ that can support a professionally managed equilibrium, making professionally managed firms likely to emerge as the prevalent form of organization.

The demand-supply equilibrium is illustrated in Fig. 2. Depending on the relative positions of the demand and supply curves and the corresponding intersections, a variety of outcomes is possible, of which we focus on five:

1. An equilibrium above the flat segment of the demand curve at $D = \check{D}$ where the honesty wage cannot be paid and only owner-managed firms can exist**.**

2. An interior equilibrium (the one actually depicted in the figure) in which the managerial honesty constraint binds.

3. An equilibrium on the vertical segment of the supply curve furthest to the left, where firm formation is restricted by the scarcity of managers.

4. An equilibrium on the lowest horizontal stretch of the supply curve where the return to capital has fallen to its opportunity cost. In this event, as in the previous one, an excess supply of capital (owned by the class that is in surplus) emerges and takes shelter in its outside option.

5. Non-existence of equilibrium when the maximum return to capital that the system can generate is below its opportunity cost so that industrialization is impossible.

We elaborate briefly on the interior equilibrium referred to above. Consider the two separate wealth distributions, one for individuals with managerial ability and another for those without. Consecutively pair off an individual in each group with one in the other in descending order of wealth to generate a composite wealth distribution: after one group is exhausted, the composite wealth distribution will be identical with the distribution of wealth among the remaining members of the other group. Suppose K is the aggregate wealth of the economy and P(W) the fraction of total wealth owned by pairs or, where pairing is impossible, by individuals with composite wealth below W. Then the total demand for outside capital generated by the entrepreneurs who can enter is

$$X_d = K[1 - P(\frac{\underline{I}}{1+s^*})]s^* \tag{24}$$

Here, the term in square brackets represents the ratio of managerial and entrepreneurial capital to the total wealth of the economy. The RHS, therefore, represents the amount of outside capital that firms can apply for without compromising their credibility.

The total supply of outside capital is the total wealth of pairs and relevant individuals below the minimum threshold required for entry:

$$X_s = K\,P(\frac{\underline{I}}{1+s^*}) \tag{25}$$

We need not consider the constraints on firm formation imposed by the number of managers or entrepreneurs, since these constraints do not bind here. The interior equilibrium is then defined by

$$s^* = \frac{P(\frac{\underline{I}}{1+s^*})}{1 - P(\frac{\underline{I}}{1+s^*})} \tag{26}$$

The optimal ratio of insider to outsider capital just matches the ratio of total wealth owned by pairs above the minimum wealth requirement for entry to that owned by pairs and individuals below it: it is uniquely determined by the composite wealth distribution (which in turn is uniquely determined by the wealth distributions for our two classes).

8. Discussion

We model two kinds of credibility concerns. Given asymmetric information (with regard to firm performance), outside investors realize that if they provide more than a certain amount of financing to any one firm, that firm's temptations to cheat them may be too strong. However, even if outsiders limit their stake in the firm to a level that implies that insiders collectively gain nothing from cheating, this does not suffice to ensure honesty except where there is only one insider (the owner-manager). Where there are two, the manager individually must have no incentive to cheat, which requires a contract that pays him an "honesty wage" but no bonus share in profits. However, even if the law mandated or competition compelled public observability and transparency of managerial contracts, this would not render the credibility ceiling on the outsiders' stake redundant: the possibility of false disclosure and secret renegotiation between manager and entrepreneur would persist unless outsiders impose this ceiling.

The ceiling, s*, is a decreasing function of the discount rate and of D, the cost of outside capital and an increasing function of q, the probability of detection. Depending on these parameters, it sets limits to outside participation in a firm, and, given a minimum size of enterprise, determines the wealth requirement for insiders to enter. Two people would find it easier to fulfil this requirement with their combined wealth than would one person. However, the association of two people, an entrepreneur and a manager, creates a new credibility concern: how does the entrepreneur deter the manager from cheating? We have shown that a contract exists that could accomplish this, but that this contract is feasible only for $D < \check{D}$. Above $\check{D}$, only owner-managed firms can survive, that too only if the owner-manager's wealth, singly, exceeds the entry requirement. This is outcome 1 in the previous section. It is likely to occur if a few individuals with managerial ability own a large fraction of total wealth, so that the segment of the demand curve above $\check{D}$ is wide and the supply curve (which reflects the wealth of all the others, who would be outsiders at these levels of D) far enough to the left for an intersection here. For a given distribution

of wealth, the greater the fraction of insider assets a manager may feasibly steal without legal repercussions, the more the likelihood of a situation where only owner-managed firms are feasible.

We now turn to some developmental implications of our model[14]. In poor countries, industrialization is hampered not just by an aggregate scarcity of wealth but by difficulties in mobilizing and concentrating it to support large-scale industry if it is too thinly spread. This is due in part to the well-known constraints on borrowing. Our model demonstrates that raising share-capital is also subject to a credibility ceiling, a limit on the ratio of outsider to insider capital set by concerns over cheating. This is one reason why share markets are underdeveloped in most poor countries and why firms in early modern Japan, Korea and India and within the Chinese Diaspora relied so heavily on extended family groups within which credibility was less of a concern than in an anonymous share market. This is also perhaps the reason why governments like the Korean deliberately skewed income distribution towards the chaebol, enabling the accumulation of personal fortunes that could help in building up credible large-scale industries[15].

If a market exists, if, for instance, we have a regular interior equilibrium, the return to outside capital D will decrease as the distribution of a given aggregate wealth becomes more equitable: if P( ) is higher for any W, the equilibrium ratio of outsider to insider capital s* will be higher, the demand curve for outside capital $X_d(D)$ will shift leftward, the supply curve $X_s(D)$ will shift rightward, so that D falls. With increasing equity, the equilibrium level of D may fall below R, so that the market disappears.

This view of equity as inimical to industrialization contrasts strongly with received doctrine. Murphy, Shleifer and Vishny (1989), for instance, see equity as the basis of a homogeneous mass market for manufactures that fosters industrialization. This, however, is a demand-side phenomenon. It affects output only if the production pattern reflects the consumption pattern, as it must in a closed economy. In a small open economy – as in our model - the two are independent.

Evidence on the effect of initial inequality on growth is mixed. While earlier cross-sectional studies tended to suggest a negative relationship between inequality and growth,

[14] A related paper, in which however the agency problem within the firm is assumed away, is Guha (2005).
[15] Lal and Myint (1996) provide a good discussion of this.

(for example, Persson and Tabellini (1994)), recent work seems to indicate otherwise. Forbes (2000) and Li and Zou (1998) discover a positive relationship. They use fixed effects and trace the negative relationship in earlier studies essentially to omitted variables. Deininger and Squire (1998) and Barro (2000) find mixed results for panels while Banerjee and Duflo (2003) find that inequality as such is neutral in its impact on growth, though changes, both positive and negative, in inequality tend to erode growth. Given traditional theoretical arguments in favor of a negative impact of inequality on growth[16], why has the evidence been so mixed? Our model suggests a possible factor. Whether or not large indivisibilities are present in the form of minimum enterprise size requirements, the credibility problem we have modeled means that it will be difficult to mobilize external funds for industry. In a poor society equality beyond a point may thus hurt industrial takeoff prospects via the mobilization problem, because individuals lack sufficient personal wealth to start an enterprise – a problem which some degree of inequality might have solved. This factor may serve to offset potential negative effects of inequality.[17]

Given the same Lorenz curve, a higher aggregate wealth facilitates industrialization. P(W) is smaller for a given level of P, so that, other things being equal, outside investors will enjoy a higher expected income D. A wealthier economy finds it easier to sustain a credible capital market. We have yet another factor that tends to make industrialization a cumulative process and yet another vicious circle of poverty.

Finally, if the minimum-size constraint binds, an increase in minimum firm-size $\underline{I}$ with the same level and distribution of wealth will increase P for any given s*: the demand curve for outside capital will fall and the supply curve rise, reducing D and increasing s* in equilibrium. Technological indivisibilities make for missing markets.

These conclusions are valid if there is no agency structure within the firm. They also hold if there is – but in this case, the mobilization of capital is facilitated by the association of two wealthy insiders. Such an association occurs if and only if $D < \check{D}$. If $D > \check{D}$, we are back in the more difficult case of the owner-manager who has to meet the minimum capital requirement for entry all on his own. This emphasizes the significance of

[16] Apart from the Murphy et al view, which as we have mentioned applies to a closed economy, there are political economy arguments that inequality leads to redistributive policies which hamper growth (variants of which are presented in Alesina and Rodrik (1994) and Persson and Tabellini (1994)) – though Benabou (2000) has argued that neither of these premises holds true in the data.

[17] Admittedly, our problem is considerably simplified because of the static nature of the wealth distribution.

D = Ď as a threshold. At and below Ď, the number of firms rises sharply as partnerships become credible. The jump is larger in an economy with a substantial middle class. Thus, if wealth is not so intensely polarized as to raise equilibrium D above Ď and create a regime of owner-managed firms only, a large middle class would facilitate the proliferation of entrepreneur-manager pairings; the large number of people setting up firms would imply relatively few outside investors, limited supply of outside capital and a consequently high return to it (though not of course higher than Ď). Thus, building up a middle class is an alternative to Korea's polarizing strategy for facilitating industrialization – here through many relatively widely held firms instead of a few family enterprises.

If the aggregate ratio of outsider to insider capital can be concealed (for instance by secret selling of insider stake) cheating can occur, as the actual ratio might well be raised beyond the safe limit. Evidence suggests (1) that a high ratio of outsider to insider capital intensifies moral hazard (Joh [2003], Lemmon and Lin [2003]),(2) that cheating is negatively associated with the salary component of executive pay (Peng and Roell [2004]), (3) that long term shareholder returns, presumably negatively correlated to executive cheating, are also negatively related to 'incentive payments' (share-based pay) to executives (Crystal [1991]) and (4) that separation of managers from compensation committees has not lowered executive pay (Anderson and Bizjak [2003]). All these findings bear out our conclusion that paying the manager enough – even when he has no say in the matter – may be a condition for credibility, provided this compensation does not include a bonus share in profits.

Other empirically testable implications of our model include a discontinuous jump in the number of firms when the cost of external capital goes below a threshold, with professionally managed firms as the preferred organizational form below this threshold, and owner-managed firms being the dominant organizational form above it. This could potentially be tested using time series data covering periods over which ease of access to external capital, and its cost, have varied significantly. We could also test whether the incidence of professionally managed firms, as compared to owner-managed ones, becomes more likely with an increase in the size of the middle class, or with an improvement in the legal framework. A third testable implication is a positive correlation between firm size and the personal wealth of managers at the time of appointment (this is an implication of the

positive assortative matching by wealth between entrepreneurs and managers in our model). Actually testing these implications is part of our future research agenda.

9. Conclusion

We embed a repeated game with imperfect information and stochastic market outcomes between holders of wealth (with and without managerial ability) in a general equilibrium setting. We endogenize their choice of roles – as owner-managers, managers, non-managerial entrepreneurs or outside shareholders and show that managers will invest their wealth in their own firms. We define the optimal managerial contract (the feasibility of which determines whether the manager owns the firm or is a hired employee) and the optimal outsider stake that deters cheating. We then show how the distribution of wealth determines the equilibrium where it exists and its absence where it does not. We show that an individual with managerial ability prefers to work for an entrepreneur rather than set up his own firm, provided the cost of capital is low enough to make entrepreneur-managerial pairings credible. He also prefers running his own firm to playing a non-managerial role and hiring a second individual as a manager. At a critical level of external capital cost there is a discontinuous jump in the number of firms accompanying a switch from owner-managed firms to professionally managed firms as the prevalent mode of firm organization.

Our model helps explain the proliferation of family firms in relatively poor countries, moral hazard induced vicious circles retarding industrialization in poorer economies relative to richer ones with the same degree of inequality, and points to the effects on industrial takeoff of creating wealth inequality in a poor but open economy. It also provides a rationale for paying managers substantially more than their opportunity cost – but not in the form of profit-sharing bonuses.

Appendix : The No Saving Assumption

One possible justification for the no-savings assumption in our model is as follows. In models like ours, risk-neutrality is a standard postulate. With a constant rate of time-preference, the intertemporal utility function can then be written as

$$U = \sum \delta^t c_t$$

where c_t is consumption in the t-th period. The net gain in utility from a one-period postponement of a unit of t-th period consumption is then

$$\delta^t[-1 + \delta(1 + r_t)]$$

where r_t is the rate of return to capital in the t-th period. With risk-neutrality, savings are no longer needed to perform a consumption-smoothing function. They now reflect only the discrepancy, if any, between the rate of time-preference and the rate of return on capital. When these are independent of the level of consumption, savings will have a bang-bang character. If there are no constraints on the consumption of capital and time preference exceeds the rate of return, all wealth will be dissipated in the first period. On the other hand, if the rate of return is higher, all income will be saved and consumption postponed for ever. Savings will be precisely zero if (1) capital is not consumable (again a standard assumption, see Bernanke and Gertler, [1989]) and (2) time preference is higher than the rate of return.[18] In our model, the highest rate of return is H: a sufficient condition for zero savings therefore is $H < (1 - \delta)/\delta$. It can be readily checked that such a restriction is not inconsistent with any of our results.

One could of course question the origin of what wealth there is. Where did it come from if there are no savings? Here, we must resort to 'manna from heaven' assumptions. All wealth could be land, as in some banana republic where the consumption good is too perishable to be stored. Alternatively, in an industrial economy, wealth could be machinery, that the country has received through foreign aid or as war reparations. Both these forms of wealth can be invested in industry and are useful and indeed necessary ingredients for production. Our essential purpose of course is a focus on the problem of cheating independently of the level or distribution of wealth; and all we need for this purpose is that the zero-savings assumption should be self-consistent, not that it should be realistic.

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[18.] No individual can dissave by trading capital for output, since, if one wishes to dissave, so will everyone else – so that the potential dissaver cannot find anyone to trade with.

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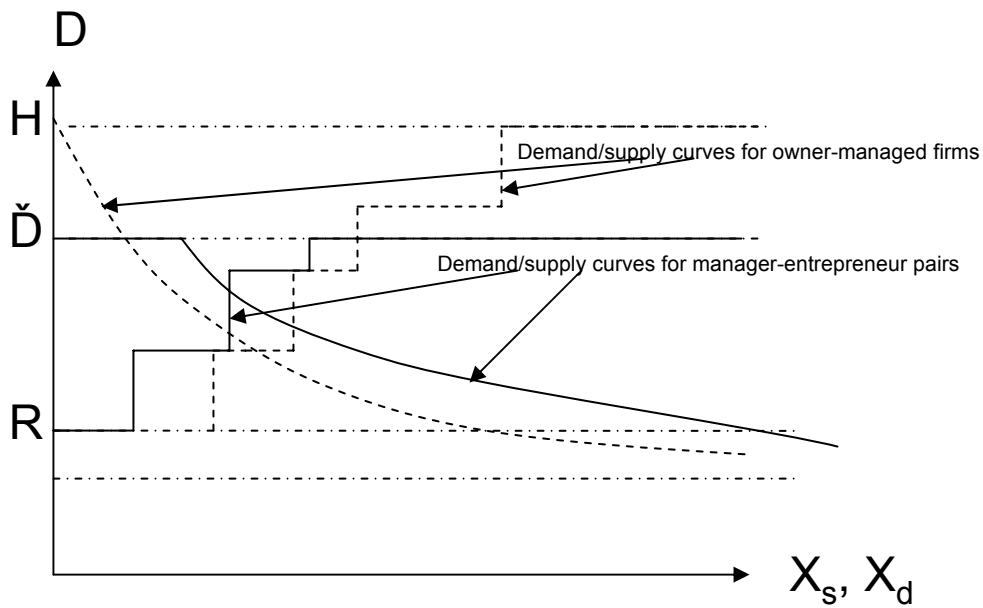
Fig. 1


D
H
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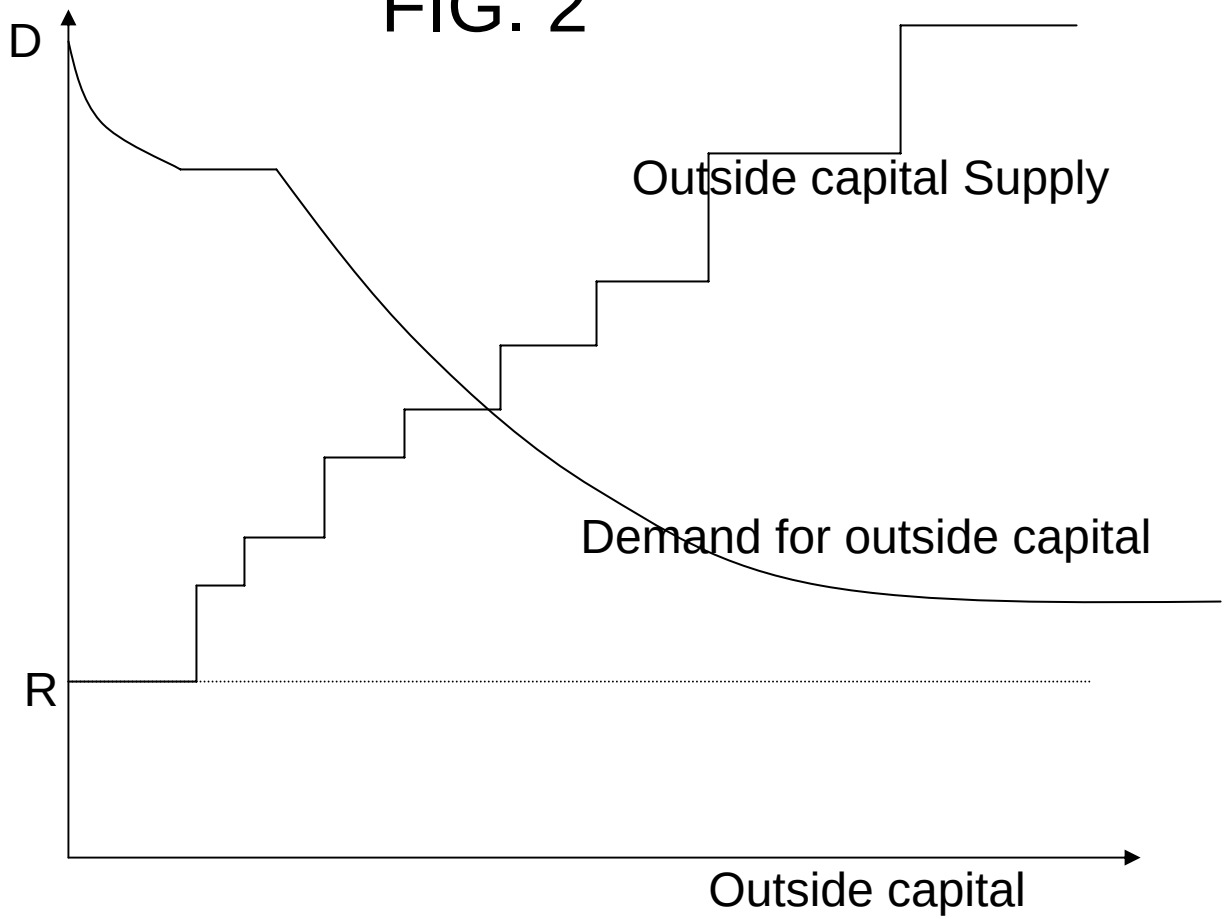
Demand/supply curves for owner-managed firms
Demand/supply curves for manager-entrepreneur pairs
X_s, X_d

FIG. 2


D
Outside capital Supply
Demand for outside capital
R
Outside capital