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The Market for Corporate Control and the Agency Paradigm*

NORVALD INSTEFJORD
Department of Economics, Birkbeck College, University of London, 7–15 Gresse Street, London W1P 2LL
Tel.: +44 (0)171 631 6407; Fax: +44 (0)171 631 6416; E-mail: ninstefjord@econ.bbk.ac.uk

Abstract. The paper analyzes the role of agency driven takeover activity. The analysis shows that takeovers can play an important role in reducing agency costs even though the gains from the corporate restructuring that follows the takeovers are zero, which counters existing models of agency driven takeover activity. The model can therefore form the basis for deriving empirical predictions which discriminate between the "agency paradigm" and the "corporate restructuring paradigm" of takeover activity. Negative post-merger performance (Agrawal et al., 1992), which is inconsistent with corporate restructuring is consistent with this model, and that takeover targets' investment levels are below or at the average (Servaes 1994), which is inconsistent with the free cash flow theory is also consistent with this model.

Keywords: Agency paradigm, market for corporate control, mergers and acquisitions, takeovers.

JEL numbers: G14, G31, G32, G34.

1. Introduction

Broadly speaking, there are two paradigms explaining takeover activity. The first is the "corporate restructuring paradigm", in which the market for corporate control is viewed as a mechanism for restructuring corporations or reaping synergy gains which otherwise are left unexploited. Manne (1965) is perhaps the first to recognize this role of the takeover market. In contrast, the "agency paradigm" argues that takeover activity is driven by agency conflicts which has two types of effects; "disciplining effects" and "hubris effects". On the one hand, a threat of a takeover may induce wealth creation, see for instance Grossman and Hart (1980) and Scharfstein (1988). Managers, who otherwise may be pursuing their own objectives rather than their shareholders, are disciplined into behaviour corresponding closer to shareholders' wishes by the takeover market. On the other hand, acquisitions may be driven by managers who do not necessarily have the welfare of their shareholders in mind when taking over other firms, see Roll's (1986) "hubris hypothesis". Whereas the welfare implications of corporate restructuring are unambiguously positive,

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the same cannot obviously be said about agency driven takeover activity which motivates better theoretical understanding of the role of the agency paradigm in the market for corporate control.

The disadvantage of existing models of managerial disciplining such as Grossman and Hart (1980) and Scharfstein (1988) is that the disciplining argument cannot work independently of the assumption that corporate restructuring generates strictly positive value. If it is false that takeovers create value through the corporate restructuring that follows, it is false that there can be a disciplining effect on current management also. Empirically, it is therefore difficult to discriminate between the corporate restructuring role of takeovers and the disciplining role of takeovers.

The "hubris hypothesis" of Roll (1986) must also work in conjunction with the corporate restructuring paradigm. There must be some likelihood that a proposed merger is a positive net present value project, since otherwise no merger would ever be sanctioned by the shareholders. Therefore, also in this case the empirical predictions following the agency argument are interlinked with the empirical predictions consistent with the corporate restructuring idea. Therefore, if we are looking for empirical evidence to discriminate between the corporate restructuring paradigm and the agency paradigm it is difficult to derive these on the basis of existing models. The need for separation motivates further an analysis which aims at modelling agency driven takeover activity independently of corporate restructuring.

The model in this paper refines the agency argument to an extent where takeover activity is generated independently of the assumption that corporate restructuring is valuable. The model can therefore potentially form a basis for models aimed at deriving empirical predictions which separate the corporate restructuring argument from the agency argument. Many will probably not find it surprising that the agency paradigm can explain takeover activity, since so called "hostile takeovers" would never take place without some reference to an agency problem. However, "hostile takeovers" are often both hard to identify for certain and relatively rare (Jensen 1988 asserts that of over 3000 takeover transactions in the US in 1986, only 40 were "hostile takeovers"). Therefore, it appears important to analyze the forces which drive takeover activity and to make attempts at isolate their specific empirical characteristics in a broader context. This would enable us to better evaluate the welfare implications that the takeover market brings about. Indeed, the analysis suggests, somewhat surprisingly, that the takeover mechanism is capable of generating value to shareholders with no underlying corporate restructuring gain. This counters the argument that a merger should document hard evidence of efficiency gains which appears to be the yardstick many opponents to takeover activity uses to measure the usefulness of mergers.

The dynamics driving the takeover market are simple even though the equilibrium outcome may have surprising characteristics. Essentially, the private gains that managers derive from controlling real assets drive both overinvestment and takeover activity. This makes the market for corporate control a venue for predatory corporate games where the management team in charge of the most efficient

firm stands the greatest chance of survival. The fight for survival may itself be without economic value, but investing efficiently increases the likelihood of survival. Therefore, managers who may otherwise pursue their own objectives enhance the probability of corporate survival. Thus, the agency problem arising from overinvestment is cancelled out by the equilibrium in the takeover market.

This mechanism is however far from perfect. Sometimes chance dominates efficiency in that a firm gains an advantage over other firms simply by being in a better performing industry rather than as a result of investing more efficiently. If this is the case the manager is more worried about sacrificing private benefits and hence less likely to be disciplined by the takeover threat. Expansion within the same industry, therefore, leads to a greater reduction of agency costs than expansion into unrelated businesses.

In the paper I also investigate the unique empirical characteristics of agency driven takeover activity. Under the corporate restructuring paradigm, the welfare effect is conditional on a corporate restructuring actually taking place. Firms which create value through a merger will tend to have above average stock price performance in the period before and on the day of the merger announcement. However, the efficient market hypothesis predicts that in the period after the merger announcement the stock price performance is normal relative to an appropriate benchmark. In contrast, under the agency model the stock price performance following a merger is likely to be negative.

This prediction is also consistent with Jensen's (1986) free cash flow theory. Whereas the free cash flow theory implies that firms which overinvest free cash flow are likely takeover targets, the agency model predicts that takeover targets sometimes invest more than the average non-merging firms, and sometimes less. In aggregate the effect is ambiguous. There are therefore two empirical predictions which appear to be unique to the model presented here. The first is evidence of negative stock price performance for the acquiring firm after the merger, which contradicts the corporate restructuring argument, and the second is evidence of average or underinvestment among acquired firms, which contradicts Jensen's free cash flow theory. Both have been documented (Agrawal et al. 1992 and Servaes 1994).

The related theory is vast. We have already mentioned Grossman and Hart (1980), Scharfstein (1988), and Roll (1986) as examples of agency driven models of takeover activity. The model here differs from these in that we assume that takeover activity is driven purely by agency conflicts. Another important paper is Jensen's (1986) article on the "free cash flow theory" of corporations. Jensen's theory relies on the argument that managers are reluctant to distribute "free cash flow" to the equity holders of the firm, instead preferring to take on negative net present value projects. The misallocation of free cash flow has two implications for takeover activity; one the one hand the firm may embark on an acquisition programme which is not economically justified, and on the other hand the excess investment levels in these firms provide an opportunity for valuable corporate re-

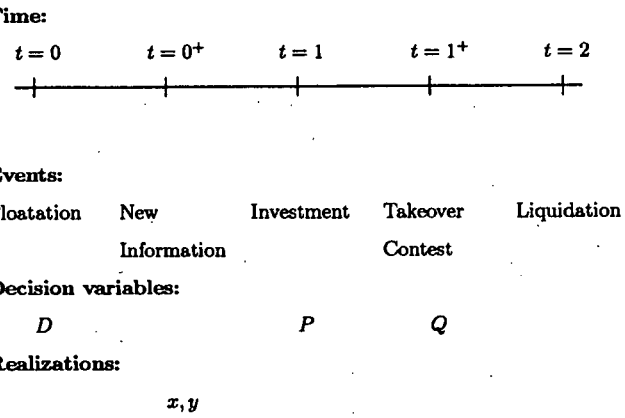

Figure 1. Overview of the model. There are three decision variables; D, which indicates the leverage decision made by a value maximizing entrepreneur immediately prior to floatation; P, which indicates the investment decision by the incumbent manager; and Q, which indicates the acquisition decision of the incumbent manager. There are two random variables which are realized during the time frame. Immediately after floatation, the market learns about the realization of x, the value of the assets in place, and y, the value of the investment opportunity.

structuring, either in the form of a takeover or a leveraged buyout. Whereas our model shares the idea that agency conflicts may drive takeover activity, we do not assume that this agency conflict in itself induces an opportunity for corporate restructuring.

The paper proceeds as follows. Section 2 presents the basic framework, Section 3 solves the equilibrium with only one firm and no activity in the market for corporate control. Section 4 sets up and describes the main results concerning the market for corporate control, and the empirical content of the theory is discussed in Section 5. The paper is concluded in Section 6.

2. The Model

2.1. OVERVIEW

The model which we describe in this section is stripped down to what we believe is the simplest form to illustrate our point. We consider the smallest economy with a takeover market possible, where there are two firms, denoted A and B. Each firm owns a real asset and an investment opportunity, and they meet in a takeover contest. A merger is in this paper interpreted as a "horizontal merger," i.e., we exclude mergers between "upstream" and "downstream" firms. The basic structure of the model is illustrated in Figure 1.

The model can be considered as an extended Hart and Moore (1995) model with the inclusion of a takeover contest. There are three periods which denote various stages in a firm's life. In the first period, a value maximizing entrepreneur chooses a debt structure D and subsequently floats the firm ($t = 0$). Immediately after

floatation, new information concerning the assets of the firm becomes common knowledge (x, the value of existing assets, and y, the value of the investment opportunity become known at time $t = 0^+$).

In the second period, the manager of the firm decides the internal investment policy of the firm (P, a binary variable denoting whether investment is undertaken, is decided at time $t = 1$) before entering into a takeover contest (Q, a binary variable denoting whether the firm bids for the other firm, is decided at time $t = 1^+$). The takeover contest is described in detail below.

Finally, in the third period ($t = 2$) the firm is liquidated. In the full model, therefore, there are three pairs of decision variables, (D_A, D_B) denoting the joint capital structure decision, (P_A, P_B) denoting the joint investment policy, and (Q_A, Q_B) denoting the joint takeover decision. There are also two pairs of exogenous variables, (x_A, x_B) denoting the values of the firms' existing assets, and (y_A, y_B) denoting the values of the firms' investment opportunities. A crucial assumption is that x_i and y_i, although observable, are not verifiable and can hence not be included in an incentive contract for the manager.

2.2. INVESTMENT AND PREFERENCES

The investment cost of the firms is a fixed constant I where $0 < I < 1$. The payoffs of the assets in place, $\tilde{x}$, and the growth opportunity, $\tilde{y}$, are *a priori* independent and identical random variables of the form

$$\tilde{x}, \tilde{y} = \begin{cases} 1 & \text{with probability } \frac{1}{2} \\ 0 & \text{with probability } \frac{1}{2} \end{cases} \tag{1}$$

Real investment is desirable if $y - I \geq 0$. The total value of the firm is therefore $\tilde{x} + P(\tilde{y} - I)$ where P is an indicator function denoting real investment. The value of the firm does not depend on Q as long as all transactions in the market for corporate control are zero net present value projects.

The firms are run by a manager which may be optimally incentivized, but who nonetheless has some residual discretion with which she can pursue own objectives (this assumption rests on the incomplete contracting idea of Hart and Moore (1988)). The assumption in this paper is that the manager is an "empire builder" who, given the option, always prefer to control more real assets over less. The model gives the manager two avenues to pursue this objective; internal expansion and the takeover market. These avenues are similar in all but one respect; expansion through takeovers gives the corporate governance mechanisms more power than internal expansion. Thus, whereas internal investment projects can be blocked only by means of blocking the firm's borrowing opportunities, a takeover can be blocked simply by voting against it. In practice, takeovers are almost always sanctioned by the shareholders whereas most investment projects are not. The following subsection outlines the details of the takeover contest.

To implement these assumptions we assume that an asset has a cash flow element which accrue privately to the manager and can be denoted the private benefits of control. The total cash flow element of $\tilde{x}$ and $\tilde{y}$ can therefore be written as

$$\tilde{X} = \tilde{x} + z_X, \quad \tilde{Y} = \tilde{y} + z_Y \tag{2}$$

where z_X and z_Y are non-stochastic cash flows which represent the net present value of private benefits to the manager of controlling asset $\tilde{x}$ and $\tilde{y}$, respectively. This formulation is similar to Grossman and Hart (1988). Also, the formulation may represent the empirical fact that managers of larger corporations tend to earn larger pay packages.

In the takeover market, control over real assets can be transferred through acquisition of the firm which owns them. We denote the transfer of control by an indicator function Q. If $Q_i = 1 = 1 - Q_j$ we say that control of firm j's assets has been transferred to firm i's manager. If $Q_i = Q_j = 1$, then control of the two separate firm's assets is merged into the hands of a management team consisting of either the two managers together, or of one of the managers where the other is compensated fully for the loss of control.

On the basis of these assumptions, the preferences of the manager of firm i can be written as the utility function

$$u_i(P_i, P_j, Q_i, Q_j) = (z_X + P_i z_Y)(1 - Q_j\gamma) + Q_i\gamma(z_X + P_j z_Y) \tag{3}$$

where $i \neq j = A, B$, and where $1 > \gamma > 0$. The parameter γ measures the managerial gain of control over an investment through a takeover which effectively truncates the private cash flow to the incumbent manager. The table in Table I gives us a map of the outcomes of (P_i, P_j, Q_i, Q_j) and the associated utility levels of the manager, under the assumption that $\frac{1}{\gamma} > \frac{z_X}{z_Y} > \frac{1-\gamma}{\gamma}$. We adopt this assumption for the rest of the paper.

From the table, we see that the manager in general prefers corporate growth irrespective of the economic value attached to it. Thus, faced with the opportunity to carry out an investment project the manager seeks to raise financing to expand, either internally through a real investment project or externally through an acquisition of another firm. That managers are indeed driven by growth preferences in the takeover market is not a novel idea. Jensen (1986), Roll (1986) and Morck, Shleifer, and Vishny (1990), for instance, all argue along these lines. Treynor (1993) even goes as far as stating: "Although often cited as the motive for hostile takeovers, synergy is rarely demonstrated. The real motive is to transfer control [...]".

The owners of the firm obviously do not prefer growth at any cost. To them, the issue of growth is an issue of trading off costs against benefits, and growth is desirable only if the benefits outweigh the costs. In Section 3 we investigate how this conflict is optimally resolved.

Table I. The manager's utility. The table shows a map of the utility of the manager as a function of the investment decision and the acquisition decisions of the firms. On the basis of the utility function for the manager and the assumption that $\frac{1}{\gamma} > \frac{z_X}{z_Y} > \frac{1-\gamma}{\gamma}$, we obtain the following ranking of the outcomes of (P_i, Q_i, Q_j). Given $P_j = 0$, it is true that

$$(1, 1, 0) \succ (1, 0, 0) \succ (0, 1, 0) \succ (1, 1, 1) \succ (0, 1, 1) \sim (0, 0, 0) \succ (1, 0, 1) \succ (0, 0, 1)$$

and given $P_j = 1$, it is true that

$$(1, 1, 0) \succ (0, 1, 0) \succ (1, 0, 0) \sim (1, 1, 1) \succ (0, 1, 1) \succ (0, 0, 0) \succ (1, 0, 1) \succ (0, 0, 1)$$

where '$\succ$' denotes strict preference and '$\sim$' indifference.

(P_i, Q_i, Q_j)	$u(P_i, 0, Q_i, Q_j)$	$u(P_i, 1, Q_i, Q_j)$
(1,1,0):	$z_X(1+\gamma)+z_Y$	$z_X(1+\gamma)+z_Y(1+\gamma)$
(0,1,0):	$z_X(1+\gamma)$	$z_X(1+\gamma)+z_Y\gamma$
(1,0,0):	z_X+z_Y	z_X+z_Y
(1,1,1):	$z_X+z_Y(1-\gamma)$	z_X+z_Y
(0,1,1):	z_X	$z_X+z_Y\gamma$
(0,0,0):	z_X	z_X
(1,0,1):	$z_X(1-\gamma)+z_Y(1-\gamma)$	$z_X(1-\gamma)+z_Y(1-\gamma)$
(0,0,1):	$z_X(1-\gamma)$	$z_X(1-\gamma)$

2.3. THE TAKEOVER CONTEST

The details of the takeover contest can be illustrated as an extensive form game. Consider the game in Figure 2 between the managers of the two firms A and B.

In Figure 2, the decision to bid for another company is assumed to imply the lowest bid which is successful with probability 1. In this paper we assume that this bid is always equal to the post-takeover value of the target firm's equity plus an infinitesimal markup which is large enough to induce all shareholders to tender but at the same time small enough to be ignored in all algebra.

As we can see, there are four distinct outcomes: First, the two firms merge because they simultaneously submit bids that are accepted. The two managers share the post-merger benefit of control. This outcome, although not supported by a micro model here, is jointly dominating a lengthy and resource consuming war of attrition. Thus, it is reasonable that even empire building managers sometimes agree to a friendly merger. Second, firm A's manager makes a bid and firm B does not. In this case firm A takes over firm B and firm A's manager appropriates all benefits of control. Third, firm B's manager makes a bid and firm A does not. In this case firm B takes over firm A and firm B's manager appropriates all benefits of control. Finally, there is no bid and consequently no takeover. The payoffs to the two managers are illustrated for every outcome. Note that before the takeover battle

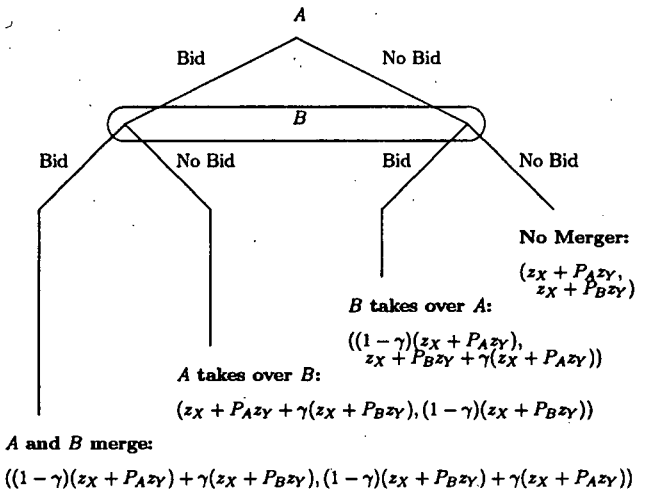

Figure 2. The takeover contest. The figure illustrates the takeover contest as an extensive form game. "A" is the player representing firm A's manager, and "B" is the player representing firm B's manager. The branch marked "Bid" indicates that the manager makes a competitive bid for the other firm which will succeed, and the branch market "No Bid" indicates that no bid is made. The brackets associated with the various outcomes indicate the payoff to player A and B, respectively.

starts, the capital structure decision and the investment policy are both common knowledge, as well as the exogenous variables which determine the value of the assets in place and the investment opportunities.

The market for corporate control works under the following key assumptions:

- A merger implies no debt forgiveness. The merged firm has therefore total debt equal to $D_A + D_B$ after the merger.
- An acquisition is always a zero net present value project (minus the infinitesimal markup which is necessary to induce all the target firm's shareholders to tender).
- It is impossible to fund a takeover borrowing against assets not currently under the firm's control.

The first assumption is aimed at preventing takeovers as means of transferring wealth from the merging firms' debtholders to their shareholders or managers, and the second is aimed at preventing takeovers as means of transferring wealth form the bidding firm's shareholders to its manager. These restrictions will normally be binding in an agency model of the kind presented here. If mergers are a way of forcing debt restructuring in a firm which benefits the shareholders then this fact will be priced into the debt claim ex ante. The shareholders will be better off by incorporating protective debt covenants which preventing such appropriation. Also, since the takeover market is no avenue for pursuing strictly positive net present

value projects (Grossman and Hart 1980), the bidding firm's shareholders will never benefit from takeover activity. They may however lose, however, since corporate bids normally are subject to shareholder approval this is unlikely. Therefore, it is natural to assume that corporate governance mechanisms are sufficiently strong to prevent value decreasing bids (in fact, empirical evidence seems to confirm that the bidding firms' shareholders on average makes close to zero profits over the announcement period of a bid, see Jarrel et al. 1988).

The two first assumptions imply, taken together, that a merger between an insolvent firm and another firm never takes place. If the bidding firm is insolvent the new capital raised to fund the takeover needs to bail out the bidding firm's existing debt as well as paying for the target firm's equity. Without restructuring gains this is infeasible. Similarly, if the target firm is insolvent the bidding firm's equityholders need to bail out the target firm's debt which also is infeasible. In practice, such transactions take place, nonetheless they are almost always associated with restructuring gains in the form of savings in liquidation costs.

The third assumption is included as a device to curb takeover activity that is not funded by the firm's own assets. Recalling that a manager who manages a firm whose assets generates a high cash flow has greater discretion in the investment process than a manager who manages a firm which does not. This enables the first manager to invest in a negative net present value project. Since all transactions in the takeover market are zero net present value projects by assumption, all transactions are technically feasible simply by borrowing against the target firm's assets. This is of course unrealistic, and could result in a small firm taking over other much larger firms. To avoid this – and to extend the idea of the role of fixed claims constraining management – we make assumption number three. Whilst there is clear empirical support for the notion that mergers are funded by the firm's own "deep pockets" nonetheless some takeovers appear motivated by the search for other firm's cash holdings (see Jensen 1986). In practice, however, this is often done in the form of issuing additional equity to increase the bidding firm's own equitybase first. When the existing equityholders face dilution costs in the process of selling new equity (Myers and Maljuf 1984) this strategy is loss making unless the takeover that follows delivers positive restructuring gains. Therefore, this assumption appears sensible here where the restructuring gains of takeover activity are fixed at zero.

To summarize, a takeover implies no restructuring gains nor any financial gains to the shareholders, as the restructuring of the ownership of the assets does not affect the cash flow and as the debt liability remains fixed. In addition, a firm with a lower equity value cannot take over a firm with a larger equity value by the assumption that funds cannot be borrowed against assets not currently under the firm's control. Whilst there exist arguments that can provide a microfoundation for this assumption, no formal micromodel is provided here.

In the analysis that follows in the subsequent sections I allow for the possibility that two firms end up with exactly equal equity values which prevents either firm

taking over the other straight out. This is caused by the fact that the underlying uncertainty in the model is of a simple, discrete structure. In practice we may well expect that this event has zero probability. In any case, it does not matter for the analysis whether we allow for equal equity values or not, since the incentive implications of the takeover activity are the same regardless.

3. Equilibrium with a Single Firm

The firm should invest when $y \geq I$. Therefore, under the first best scenario, the expected net value of the firm is equal to

$$\text{Expected Firm Value} = \frac{1}{2} + \frac{1}{2}(1 - I)$$

Before we proceed, we classify the firm as a "high growth firm" if $I < \frac{1}{2}$ and a "low growth firm" if $I \geq \frac{1}{2}$. We find that in equilibrium, the value of the firm is strictly less than the first best, and the optimal capital structure depends on the firm being a high growth firm or a low growth firm. The preferences of the manager are given by (3) under the constraint that $Q_i = Q_j = 0$.

PROPOSITION 1. In equilibrium with a single firm, the total ex ante firm value is $\frac{1}{4} + \frac{3}{4}(1 - I)$ if the firm is a high growth firm, and $\frac{1}{2} + \frac{1}{4}(1 - I)$ if the firm is a low growth firm. High growth firms have low leverage $D \leq 1 - I$, and low growth firms have high leverage $1 - I < D \leq 2 - I$.

Proof: The manager will invest if investment is feasible, that is, if $x + y - D \geq I$. If $D \leq 1 - I$, this condition reduces to $x + y \geq 1$. If $D > 1 - I$, this condition reduces to $x + y = 2$. Therefore, $D \leq 1 - I$ implies overinvestment when $y = 0$ and $x = 1$, and $D > 1 - I$ implies underinvestment when $y = 1$ and $x = 0$. The debt and equity payoffs are given in the table below under the two scenarios, respectively. The first column under each scenario contains the state contingent payoff to the debt, and the second column contains the payoff to the equity (in brackets). No investor receives any of the manager's private benefit of control.

	$D \leq 1 - I$		$1 - I < D \leq 2 - I$	
$x = 1, y = 1$:	D	$(2 - I - D)$	D	$(2 - I - D)$
$x = 1, y = 0$:	D	$(1 - I - D)$	$\min(D, 1)$	$(1 - \min(D, 1))$
$x = 0, y = 1$:	D	$(1 - I - D)$	0	(0)
$x = 0, y = 0$:	0	(0)	0	(0)

From the table, we find that the expected value of the firm, F, is equal to

$$\text{Expected Firm Value} = \begin{cases} \frac{1}{4} + \frac{3}{4}(1 - I) & \text{if } D < 1 - I \\ \frac{1}{2} + \frac{1}{4}(1 - I) & \text{if } D \geq 1 - I \end{cases}$$

The incentive problem for the entrepreneur is to maximize the expected value of the firm. Hence, it is optimal for the entrepreneur to choose the low level debt financing ($D \leq 1 - I$) when $-\frac{1}{4} + \frac{1}{2}(1 - I) > 0$, or $I < \frac{1}{2}$, and high level debt financing ($1 - I < D \leq 2 - I$) otherwise. □

We make the observation that the equilibrium is essentially the Hart and Moore (1995) equilibrium, and as such can be interpreted as a theory for optimal capital structure. The debt contract plays the role of an optimal implicit incentive contract for the manager.

4. The Market for Corporate Control

In this section I will compute the full equilibrium in the model under the assumptions outlined in Section 2. Before I proceed, I introduce a parameter ρ which measures the "closeness" in industry terms of the two firms. Basically, $\rho = \rho(\tilde{x}_A, \tilde{x}_B) = \rho(\tilde{y}_A, \tilde{y}_B)$, the correlation coefficients between $\tilde{x}_A$ and $\tilde{x}_B$, and $\tilde{y}_A$ and $\tilde{y}_B$, respectively. If $\rho = 0$ the firms operate in completely unrelated industries, and if $\rho = 1$ the firms operate in identical industries. The joint probability distribution of $(\tilde{x}_A, \tilde{y}_A)$ and $(\tilde{x}_B, \tilde{y}_B)$ is given by the matrix in Table II.

The underlying assumption is that the managers of the two firms are identical in terms of skill. Faced with the same underlying demand shock, both managers benefit or lose equally. In practice, managerial skill differences may cause one firm to benefit more than the other if it employs a manager with superior ability, which implies that firms in the same industry may not have perfectly correlated returns even though they face perfectly correlated demand shock. In a world where the job market for managers is relatively frictionless, however, we would expect the skill differences between managers to be small. Moreover, since we have already assumed that corporate restructuring is value neutral, consistency arguments makes it natural to assume that managers are not different in terms of skill.

The value of the equity of firm i, $i = A, B$, just prior to the takeover contest is a function of P_i,

$$E_i(P_i) = x_i + P_i(y_i - I) - D_i \tag{4}$$

where the new investment is financed by a junior debt contract with face value I. The takeover contest takes place under four possible scenarios; either $E_i > E_j > 0$; $E_i > E_j = 0$; $E_i = E_j > 0$; or $E_i = E_j = 0$. If $E_i = 0$ for some i there is no merger because at least one firm has defaulted. Therefore, we are left with two scenarios of interest; either $E_i > E_j > 0$ or $E_i = E_j > 0$.

From (4), we know that $E_i \geq E_j$ is equivalent to

$$(x_i - x_j) + (P_i y_i - P_j y_j) - (P_i - P_j)I \geq D_i - D_j \tag{5}$$

Table II. Probability matrix. The matrix contains the joint probabilities of $\tilde{x}_A$, $\tilde{y}_A$) and ($\tilde{x}_B$, $\tilde{y}_B$). The diagonal elements are derived as;

$$\begin{aligned}\Pr[(x, y) \text{ and } (x, y)] &= \Pr[(x, y)|(x, y)]\Pr[(x, y)] \\ &= \left(\tfrac{1+\rho}{2}\right)^2\left(\tfrac{1}{4}\right) = \tfrac{(1+\rho)^2}{16}.\end{aligned}$$

The off-diagonal elements where one pair of random variables coincides are derived as (x denotes "x" and $\bar{x}$ denotes "not x");

$$\begin{aligned}\Pr[(x, y) \text{ and } (x, \bar{y})] &= \Pr[(x, y) \text{ and } (\bar{x}, y)] \\ &= \Pr[(x, y)|(x, \bar{y})]\Pr[(x, \bar{y})] \\ &= \left(\tfrac{1+\rho}{2}\right)\left(\tfrac{1-\rho}{2}\right)\left(\tfrac{1}{4}\right) = \tfrac{1-\rho^2}{16}.\end{aligned}$$

Finally, the off-diagonal elements where no pair of random variables coincides are derives as;

$$\begin{aligned}\Pr[(x, y) \text{ and } (\bar{x}, \bar{y})] &= \Pr[(x, y)|(\bar{x}, \bar{y})]\Pr[(\bar{x}, \bar{y})] \\ &= \left(\tfrac{1-\rho}{2}\right)^2\left(\tfrac{1}{4}\right) = \tfrac{(1-\rho)^2}{16}.\end{aligned}$$

$(\tilde{x}_i, \tilde{y}_i)$	(1, 1)	(1, 0)	(0, 1)	(0, 0)
(1, 1)	$\frac{(1+\rho)^2}{16}$	$\frac{1-\rho^2}{16}$	$\frac{1-\rho^2}{16}$	$\frac{(1-\rho)^2}{16}$
(1, 0)	$\frac{1-\rho^2}{16}$	$\frac{(1+\rho)^2}{16}$	$\frac{(1-\rho)^2}{16}$	$\frac{1-\rho^2}{16}$
(0, 1)	$\frac{1-\rho^2}{16}$	$\frac{(1-\rho)^2}{16}$	$\frac{(1+\rho)^2}{16}$	$\frac{1-\rho^2}{16}$
(0, 0)	$\frac{(1-\rho)^2}{16}$	$\frac{1-\rho^2}{16}$	$\frac{1-\rho^2}{16}$	$\frac{(1+\rho)^2}{16}$

Assuming $\rho = 1$ (all off-diagonal elements of the matrix in Table II disappear) we can write $x_i = x_j = x$ and $y_i = y_j = y$, such that (5) reduces to

$$(P_i - P_j)(y - I) \geq D_i - D_j \tag{6}$$

We use Table I to derive the optimal investment policy (P_A^*, P_B^*), and takeover policy (Q_A^*, Q_B^*) as a function of the debt levels D_A, D_B. The analysis, which is somewhat tedious but straightforward, appears in the Appendix. In sum, the analysis shows that for two non-failing firms A and B the following applies. If we assume that $|D_A - D_B| \leq \min\{1 - I, I\}$ or that $1 - I < |D_A - D_B| \leq I$, the following investment profile is consistent with equilibrium,

$$(P_A^*, P_B^*) = \begin{cases} (1, 1) & \text{if } y = 1 \\ (0, 0) & \text{if } y = 0 \end{cases} \tag{7}$$

Otherwise, if $I < |D_A - D_B| \leq 1 - I$ or $|D_A - D_B| > \max\{1 - I, I\}$, the following investment profile is consistent with equilibrium,

$$(P_A^*, P_B^*) = (1, 1). \tag{8}$$

The takeover policy consistent with equilibrium for non-failing firms is given by $Q_i^* = 1$ if and only if $D_i \leq D_j$.

It remains to analyze the equilibrium debt levels (D_A^*, D_B^*). The following result summarizes the full equilibrium for firms in identical industries.

PROPOSITION 2. For firms in identical industries ($\rho = 1$), there always exist equilibria where the ex ante firm value is equal to the first best value. If the firms are high growth firms, this is the only class of equilibria in the model. If the firms are low growth firms, there exist a second class of equilibria where the ex ante firm value is equal to the single firm equilibrium value given in Proposition 1.

Proof: Assume first that $D_j \leq 1 - I$ is given. The optimal policy for firm i's entrepreneur in period 0 is to set $D_i \leq 1 - I$ (which implies $|D_i - D_j| \leq 1 - I$), since by the derivation in the Appendix this implies the investment policy $P_i^* = 1$ if and only if $y_i = 1$. Hence, for firm j, $D_j^* \leq 1 - I$ is optimal by the same argument. Therefore, $D_i^*, D_j^* \leq 1 - I$ and $|D_i^* - D_j^*| \leq 1 - I$ is an equilibrium which implements the first best investment policy for both firms.

Assume that $1-I < D_j \leq 2-I$. By the same argument as above, if $|D_i - D_j| \leq \min\{1 - I, I\}$, the investment policy of firm i is efficient over the range where the firm does not default. If there exists a $D_i \leq 1 - I$ which satisfies this requirement, therefore, firm i's investment policy is efficient. In this case, however, it is not consistent with equilibrium that $D_j > 1 - I$, since the entrepreneur is charge of firm j can do strictly better by putting $D_j \leq 1 - I$ and $|D_j - D_i| \leq \min\{1 - I, I\}$.

If there does not exist a $D_i \leq 1 - I$ such that $|D_i - D_j| \leq \min\{1 - I, I\}$, the choice is as follows. If $D_i \leq 1 - I$, the investment policy is $P_i^* = 1$ if $x_i = 1$ or if $x_i = 0$ and $y_i = 1$, and zero otherwise. If $D_i > 1 - I$, the investment policy is $P_i^* = 1$ if and only if $x_i = y_i = 1$. Therefore, if $1 - I \geq I$, or $I \leq \frac{1}{2}$, the optimal strategy is $D_i^* \leq 1 - I$, in which case $D_j^* \leq 1 - I$ in equilibrium also and both firms implement the first best. If $I > \frac{1}{2}$, there exists equilibria where D_i^*, $D_j^* > 1 - I + \max\{1 - I, I\}$ and where both firms implement the same investment policy as in the single firm case. □

Merger activity is the outcome of a predatory game played by firms in the same industry where each merger *per se* is welfare neutral. A firm that loses the game becomes a takeover target by rival firms, which implies managerial loss of control. Managers, therefore, are willing to sacrifice the private benefit of investing in a negative net present value project since such an investment may jeopardize the survival prospects of the firm in the takeover contest. When firms' current and future profits are perfectly correlated this mechanism is efficient enough to implement the first best solution.

The effect of managerial disciplining dominates the effect of "managerial hubris" advocated in Roll (1986). The mechanism does work also when the firms operate in unrelated industries, however, in this case "managerial hubris" becomes stronger.

An interesting prediction of Proposition 2 is that firms in the same industry will have correlated leverage. There is evidence of "industry-specific" leverage levels, see Bowen et al. (1982), Bradley et al. (1984), Long and Malitz (1985), and Kester (1986), however this effect may also be caused by other factors. A possible discriminating prediction is that our model implies that the effect of similar leverage should be stronger in periods of high takeover activity, which appears untested.

Now assume $\rho = 0$, which implies that all elements in the matrix in Table II become identical. In this case we need to consider all of the left hand side of Equation (5). The analysis is carried out in the second part of the Appendix.

The following result summarizes the result for the firms in unrelated industries.

PROPOSITION 3. For firms in unrelated industries ($\rho = 0$), there exists an equilibrium where D_i^*, $D_j^* \leq 1 - I$, and the ex ante equity value is $1 - \frac{11}{16}I$, provided $I \leq \frac{4}{7}$. This equilibrium always dominates the single firm solution. In addition, there exists an equilibrium where D_i^*, $D_j^* > 1 - I$ if the firms are high growth firms which implements the single firm solution.

Proof: Assume $D_j \leq 1 - I$. The expected efficiency loss of firm i by choosing $D_i \leq 1 - I$ (which implies $|D_i - D_j| \leq 1 - I$) can be worked out in the following way. Firm i invests efficiently for $y_i = 1$ always, and efficiently for $y_i = 0$ unless $y_i \leq y_j$ and $x_i \geq x_j$ with at least one inequality satisfied. Therefore, the expected efficiency loss by firm i is $-\frac{3}{16}I$. If $D_i > 1 - I$, firm i invests efficiently for $y_i = 0$, and efficiently for $y_i = 1$ unless $x_i = 0$. Therefore, the expected efficiency loss by firm i is $-\frac{1}{4}(1 - I)$. Therefore, $D_i \leq 1 - I$ is optimal provided $I \leq \frac{4}{7}$.

Assume $D_j > 1 - I$. If $D_i > 1 - I$ also, there is no disciplining effect originating from the takeover market, hence, the efficiency loss in both firms is $-\frac{1}{4}(1 - I)$. If $D_i \leq 1 - I$ and $|D_i - D_j| \leq 1 - I$, the efficiency loss is equal to $-\frac{3}{16}I$ for firm i. If $D_i \leq 1 - I$ but $|D_i - D_j| > 1 - I$, the efficiency loss is equal to $-\frac{1}{4}I$ due to overinvestment in firm i.

If the firms are low high growth firms, there is only one class of equilibria in the model, where both firms have low borrowing D_i^*, $D_j^* \leq 1 - I$. If the firms are high growth firms but $I \leq \frac{4}{7}$, there exist two types of equilibria, one where firms have low borrowing and one where firms have high borrowing. Finally, if the firms are high growth firms where $I > \frac{4}{7}$, there exists only one equilibrium where both firms have high borrowing. □

The market for corporate control loses some of its efficiency to remedy the agency conflict when the firms use it for diversification rather than for expansion within the same line of business. If the firms are low growth firms, then this problem may become sufficiently severe to warrant high leverage as a protection against unprofitable acquisition programmes. Empirically, "diversification" programmes seem less profitable than expansion within the same industry, see Scherer's (1988) discussion of the conglomerate merger activity in the US in the 1960s.

5. The Empirical Content of the Model

Theory development aims primarily at generating testable hypotheses which may discriminate between rival theories. In this section I assess the empirical content of the theory, with the aim of discriminating between the "agency paradigm" and the "corporate restructuring paradigm" of takeover activity.

An important methodology in this area is the event study methodology which measures stock price performance in response to merger announcements, see Thompson (1985) for a theoretical discussion of this methodology. The efficient market hypothesis dictates that, on average, the stock price performance around a merger announcement should be related to its value implication. Under a pure corporate restructuring model, the merger announcement induces a stock price effect which is related to the value of the implied corporate restructuring. Under a pure agency driven model, the stock price response to a merger announcement reflects the "signal effect" of the merger announcement regarding the level of corporate rivalry in the industry. A merger announcement sends a signal that a predatory game is being played, which has implications for the level of agency costs for the firms involved. Mergers which imply corporate restructuring programmes are good news, since such programmes are positive net present value projects. Similarly, mergers which signals increased corporate rivalry are also good news, since a reduction of agency costs is likely to follow. Both models, therefore, have in general the same implication about stock price performance of merging firms in response to the merger announcement.

Similarly, in the period before the merger announcement, it is likely that informed speculation causes stock returns effects bringing the stock price closer to the anticipated level after the announcement has been made. The role of informed speculation is the same in the two models, which implies that analyzing stock return before and during merger announcements does not discriminate between the agency paradigm and the corporate restructuring paradigm. We look therefore to the period after the merger announcement to find discriminating empirical predictions.

Using the efficient market hypothesis, in a corporate restructuring model of takeovers the stock price performance of merging firms should be average to non-merging firms in the period following the merger announcement, since all relevant information regarding the restructuring is now available. In contrast, in a pure agency model the stock returns effect following a merger announcement is linked to characteristics of the merging firms, particularly the likely evolution of earnings in acquiring firms. Acquiring firms tend to be firms that have gained corporate strength through efficient investment strategy or through high current earnings. Therefore, firms with unanticipated high current earnings are likely to become acquiring firms. We expect, therefore, on average that an acquiring firm has a downwards trend in future earnings which reverts to the long term mean.

It is possible for high value firms to take over any firm, but it is not possible for firms with medium earnings to take over firms with high earnings, or firms with low earnings to take over firms with medium or high earnings. In the set of acquiring firms with high earnings are likely to be overrepresented, whereas in the set of acquired firms no type is overrepresented. Conditional on the information that the firm is an acquiring firm, we expect to see a decline in the stock price because of mean reversion in the earnings stream. It will be true also, however, that we expect a higher distribution of dividends among acquiring firms. The negative stock price performance is compensated for by higher than average distribution to shareholders.

Moreover, the effect becomes stronger the less related the merging firms are industrywise. Firms in related industries tend to have correlated earnings streams, which implies that the set of acquiring firms has a similar composition to the set of acquired firms. Therefore, the negative post merger performance should be stronger in "conglomerate mergers" than in "non-conglomerate mergers." Agraval et al. (1992) find empirical evidence to support both negative stock price performance after mergers, and a more negative performance in conglomerate mergers than in mergers within the same industry. The question whether merging firms have higher dividend payments which revert to a long term mean after mergers appears untested.

Franks et al. (1991) construct benchmark portfolios which correct for dividend policy, however, as long as these portfolios do not contain firms which are likely to have a decrease in dividend distribution, the bias is still going to be present. The benchmark portfolio, if constructed randomly, contains firms with earnings close to the long term mean, whereas the sample of bidding firms is likely to contain firms with earnings above the long term mean.

Whereas predictions of post merger performance discriminate between the agency driven model and the corporate restructuring model, they do not necessarily discriminate between the pure agency model and the "free cash flow theory" of Jensen (1986). Jensen's model predicts that firms with high current earnings are overrepresented in the set of acquiring firms simply because some of these firms spend free cash flow on corporate acquisitions.

Jensen's theory also predicts, however, that firms with excess free cash flow will be overrepresented among takeover targets. Therefore, capital expenditure tends to be higher in takeover targets than in an "average" non-merging firm. In our model, the market for corporate control in general implies a disciplining effect on the merging firms' managers. The investment process in merging firms is therefore in general more efficient than in non-merging firms.

This implies that in a sample of high growth firms who have access to highly profitable investment projects, merging firms invest on average less than non-merging firms. For low growth firms, merging firms invest on average more than non-merging firms. Across a wide sample of firms there is no conclusive prediction. Servaes (1994) investigates a sample of 700 US firms who either were taken

over by another firm or were subject to a leveraged buyout, and find no evidence of systematic overinvestment, which contradicts Jensen's (1986) "free cash flow theory". Servaes finds, however, some evidence of overinvestment in a subsample of oil and gas firms and large firms.

Hendershott (1996) finds, however, evidence of target overinvestment in a sample of firms engaged in defensive highly leveraged transactions. This result suggests that free cash flow may play a role in increasing the takeover threat but that a highly leveraged transaction such as a management buyout can be a defensive mechanism which helps reducing the threat. This piece of evidence is inconsistent with our model when we fix the value of corporate restructuring at zero.

6. Conclusions

I derive a pure agency driven model of takeover activity which assumes that corporate restructuring is worthless. This should not be taken to mean that we should believe that corporate restructuring is empirically implausible. Purification of the agency argument leads to a set of empirical predictions which are independent of the corporate restructuring role of takeovers, and hence provide predictions which discriminate between agency motivated models and corporate restructuring motivated models. It is therefore possible to empirically evaluate the validity of the agency argument linked to mergers.

The corporate restructuring model of takeovers implies that the stock price performance of merging firms on average is zero in the period following a merger. The pure agency model, in contrast, implies that the stock price performance of merging firms on average is negative in the period following a merger. This effect is driven by mean reversion in the earnings stream.

Existing empirical findings suggest that merging firms have significant negative stock price performance in a period of up to 5 years after the merger, see Agrawal et al. (1992). There is also evidence which suggests that takeover targets do not overinvest, see Servaes (1994). These findings support our theory.

Whereas it may not be surprising for many that the agency paradigm is capable of driving takeover activity, I believe that it is important to do an exercise of this kind since it highlights certain dynamics of the agency argument which may not be entirely obvious. This key lesson is that wealth enhancement can be achieved by means of the takeover market even if there are no underlying corporate restructuring gains to be made. The wealth creation, which takes the form of reduced agency costs, can even be stronger in the context of a takeover market than with incentive contracts only. Therefore, the argument that one should be suspicious to merger activity because synergy gains are not documented, which appears to be one of Treynor's (1993) points, is not necessarily valid. However, when firms merge across unrelated industries the welfare gains may be lower than if the firms rely on incentive contracts. In these circumstances it may be important that efficiency gains can be present to justify the merger.

Appendix

6.1. DERIVATION OF THE OPTIMAL INVESTMENT AND MERGER POLICY WHEN $\rho = 1$

Let $D_i = D_j$, which enables us to manipulate Equation (6) such that

$$E_i \geq E_j \Leftrightarrow \begin{cases} P_I \geq P_j & \text{if } y = 1 \\ P_i \leq P_j & \text{if } y = 0 \end{cases}$$

From Table I we know that $Q_i = 1$ is optimal independent of P_i, P_j, and Q_j, so firm i chooses P_i such that the likelihood of $E_i \geq E_j$ is maximized.

Case i: $D_i = D_j \geq 2 - I$. In this case both firms default with probability 1.

Case ii: $2 - I > D_i = D_j \geq 1 - I$. In this case the firms do not default if $x + y = 2$. Assuming no default, we find that given any P_j, the optimal P_i, $P_i^* = 1$.

Case iii: $1 - I > D_i = D_j \geq 0$. In this case the firms do not default if $x + y \geq 1$. We assume that the firms do not default. If $P_j = 0$, $P_i^* = 1$ if $y = 1$ and $P_i^* = 0$ if $y = 0$. If $P_j = 1$, $P_i^* = 1$ if $y = 1$, and $P_i^* = 0$ if $y = 0$, since $z_X(1 + \gamma) > z_X + z_Y(1 - \gamma)$.

In summary, therefore, if $D_i = D_j$ we find that

$$(P_i^*, P_j^*) = \begin{cases} (1, 1) & \text{if } y = 1 \\ (0, 0) & \text{if } y = 0 \end{cases}$$

and the optimal Q_i and Q_j, denoted Q_i^* and Q_j^*, are given by

$$(Q_i^*, Q_j^*) = (1, 1)$$

provided the firms do not default on their debt liability.

Now consider $D_i \neq D_j$. From Equation (6) we deduce that

$$E_i \geq E_j \Leftrightarrow \begin{cases} (P_i - P_j)(1 - I) \geq D_i - D_j & \text{if } y = 1 \\ -(P_i - P_j)I \geq D_i - D_j & \text{if } y = 0 \end{cases}$$

As before, firm i seeks to maximize the likelihood that $E_i \geq E_j$

Case i: $|D_i - D_j| \leq \min\{1 - I, I\}$. Assume first that $P_j = 1$ and $y = 1$. Firm i loses the takeover contest for sure if $D_i > D_j$, therefore the best firm i can do is $P_i^* = 1$. Firm i can win for sure if $D_i < D_j$, however, by playing $P_i = 1$. Next, assume $P_j = 1$ and $y = 0$. In this case, firm i can win the takeover contest for sure by playing $P_i = 0$, regardless of the sign of $D_i - D_j$. Therefore, the best response to $P_j = 1$ is $P_i^* = 1$.

Assume that $P_j = 0$ and $y = 0$. Firm i loses the takeover contest for sure if $D_i > D_j$, therefore, the best firm i can do is $P_i = 1$. Firm i can win the takeover contest if $D_i < D_j$, however, by playing $P_i = 0$. Next, assume $P_j = 0$ and $y = 1$. In this case firm i can win the takeover contest for sure by playing $P_i = 1$.

In sum, therefore, the equilibrium profiles of case i is given by

$$(P_i^*, P_j^*) = \begin{cases} (1,1) & \text{if } y = 1 \\ (0,0) & \text{if } y = 0 \end{cases}$$

and

$$(Q_i^*, Q_j^*) = \begin{cases} (1,0) & \text{if } D_i < D_j \\ (0,1) & \text{if } D_i > D_j \end{cases}$$

provided neither of the firms defaults on their debt liability.

Case ii: $|D_i - D_j| > \min\{1-I, I\}$. First, if $I < \frac{1}{2}$ and $|D_i - D_j| \leq 1-I$, the only change from the analysis in Case i is that the firm with least debt outstanding can invest without fear of being taken over when $y = 0$. Therefore, both firms invest unless they default on the debt liability. The firm with the most debt outstanding is always taken over.

If $I \geq \frac{1}{2}$ and $|D_i - D_j| \leq I$, the analysis in Case i still applies, since the firm with the least debt in theory can abstain from investment when $y = 1$ without fear of being taken over, but will obviously not choose to do so. Therefore, both firms invest when $y = 1$ unless there is a default, and both firms do not invest when $y = 0$. The firm with the most debt outstanding is always taken over.

We need to check the remaining possibility that $|D_i - D_j| > \max\{1 - I, I\}$. This turns out to be very simple. The firm with the least debt outstanding will never face a takeover threat, hence will choose an investment policy as in the single firm scenario in Section 3. The firm with the most debt outstanding will always be taken over, and will therefore adopt the same investment policy. Both firms therefore invest whenever they can, and the firm with the least debt outstanding always takes over the firm with the most debt outstanding.

DERIVATION OF THE OPTIMAL INVESTMENT AND MERGER POLICY WHEN $\rho = 0$

Let $D_i = D_j$ and consider non-failing firms only. From Equation (5) we find that $E_i \geq E_j$ is equivalent to

$$P_i(y_i - I) + x_i \geq P_j(y_j - I) + x_j$$

First assume that $x_i = x_j$, in which case the inequality reduces to

$$P_i(y_i - I) \geq P_j(y_j - I)$$

There are four cases; (i) $y_i = 1$ and $y_j = 1$; (ii) $y_i = 1$ and $y_j = 0$; (iii) $y_i = 0$ and $y_j = 1$; and (iv) $y_i = 0$ and $y_j = 0$. In cases (i)–(iii), the optimal strategy that $P_i^* = 1$, so consider case (iii). Since $y_j = 1$, $P_j = 1$. Since $\max_{P_i} P_i(-I) < 1 - I$, firm i never wins the takeover contest. Hence, firm i invests if possible, $P_i^* = 1$.

Now consider case (iv). Given $P_j = 0$, the inequality becomes

$$\begin{aligned} -I &\geq 0 \text{ if } P_i = 1 \\ 0 &\geq 0 \text{ if } P_i = 0 \end{aligned}$$

which is satisfied for $P_i = 0$ with equality. Given $P_j = 1$, the inequality becomes

$$\begin{aligned} -I &\geq -I \text{ if } P_i = 1 \\ 0 &\geq -I \text{ if } P_i = 0 \end{aligned}$$

which is satisfied always and strict if $P_i = 0$. Therefore, $P_i^* = 0$. Because of symmetry, also $P_j^* = 0$.

Assume $1 = x_i > x_j = 0$. Since for $y_j = 0$ firm j defaults, we can consider without loss of generality the case that $y_j = 1$. There are therefore two cases to consider; (i) $y_i = 1$; and (ii) $y_i = 0$. In case (i) $P_i^* = 1$ since $y_i^* = 1$, and $P_j^* = 1$ since $y_j = 1$. Therefore, consider case (ii). The inequality becomes

$$\begin{aligned} -I &\geq 1 - I \text{ if } P_i = 1 \\ 0 &\geq 1 - I \text{ if } P_i = 0 \end{aligned}$$

which is satisfied in neither case. Therefore, the best firm i can do is to put $P_i^* = 1$.

In sum, therefore, for $D_i = D_j$, $P_i^* = 1$ and $P_j^* = 1$ always whenever feasible except for the case that $y_i = y_j = 0$.

Now consider $D_i \neq D_j$. From Equation (5) we find that $E_i \geq E_j$ is equivalent to

$$P_i(y_i - I) + x_i \geq P_j(y_j - I) + x_j + (D_i - D_j)$$

Case i: $|D_i - D_j| \leq \min\{1 - I, I\}$. As for the case that $\rho = 1$, the analysis for $D_i = D_j$ still applies, since it is impossible for any firm to protect itself from the takeover threat due to differences in debt levels alone.

Case ii: $|D_i - D_j| > \min\{1 - I, I\}$. If $I < \frac{1}{2}$ and $|D_i - D_j| \leq 1 - I$, the firm with the least debt can invest without fear of being taken over if $y_i, y_j = 0$ and $x_i, x_j = 1$. Therefore, also the firm with the highest debt level invests. The optimal investment policy for firm i is therefore $P_i^* = 1$ whenever firm i does not default.

If $I \geq \frac{1}{2}$ and $|D_i - D_j| \leq I$, the analysis in Case i still applies. The firm with the least debt can in theory abstain from investing when $y = 1$ without fear of being taken over as a result of differences in outstanding debt, but will never choose to do so.

Case iii: $|D_i - D_j| > \max\{1 - I, I\}$. As for the case that $\rho = 1$, differences in debt levels give full protection from takeover threats, hence there is no disciplining effect of the takeover market. Both firms invest whenever they can.

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