Fall September, 2009

Mergers and CEO Power

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by
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In this paper I propose a model of mergers in which synergies and CEO power play a crucial role. A merger is modeled as a bargaining game between the acquiring and target board of directors with the gains from a merger divided according to the generalized Nash-bargaining solution. The model's implications are consistent with the available empirical evidence on stock returns, and yield some new untested implications that are mainly related to the relationship between CEO power, corporate governance and mergers. Finally, the model sheds light on the relationship between aggregate merger activity, synergies and CEO power. (JEL: G34, D86, L21, D21)

1 Introduction

Over the past two decades, the U.S. and many other world economies have experienced a large wave of mergers and acquisitions. In the U.S. alone firms have spent more than $3.4 trillion on over 12,000 mergers during this period. While the combined value of mergers on acquirer and target value is positive in most cases, many mergers have failed to increase acquiring shareholders' value. In fact, between 1980 and 2001 acquiring shareholders lost over $220 billion at the announcement of merger bids Moeller and Stulz [2005].

At the same time, corporate governance has come under a great deal of scrutiny in the United States and several other countries. Criticism of corporate governance in the U.S. led to the introduction of Sarbanes-Oxley legislation, though CEOs are still routinely criticized for being overpaid and engaging in value-decreasing mergers, and boards of directors are frequently criticized as being cronies of those overpaid and powerful CEOs. In fact, Grinstein and Hribar [2004] find that CEOs who have more power to influence board decisions receive significantly larger bonuses and tend to engage in larger acquisitions relative to the size of their firms. Furthermore, they find that the market responds more negatively to their acquisition announcements. Byrd and Hickman [1992] found that firms in which at least 50 percent of board members are independent exhibit a very small stock price drop of 0.07 percent, while firms containing a minority of independent board members show a larger stock price fall of 1.86 percent.

*I would like to express my gratitude to two anonymous referees and the editor whose comments help me improve several parts of the paper. The author acknowledges the support of Fondecyt Project 1060207

This suggests that the market perceives firms with independent boards as making better acquisitions (or at least fewer bad ones). Hartzell and Yermack [2004] find evidence that CEOs negotiate in their own interests during merger negotiations.

In this paper, I propose a model of mergers based on synergies and CEO power understood as the CEO's ability to influence board decisions. The model borrows from both agency and neoclassical theory since at the time a merging decision is made, each board of directors takes into account its CEO's interest as well as the efficiency gains from merging. In particular, CEO power biases board's decisions toward those that favor him, yet boards fully internalize the efficiency gains due to synergies. This last feature distinguishes my model from the standard agency conflicts model of mergers, since in them the driving force behind mergers is the benefits that they create for the merging CEO, and it is different from neoclassical theory in that incorporate agency conflicts. Incentive contracting is also important, but only to the extent that it is combined with CEO power, otherwise it plays a minor role. In short, the model here combines known theories with the idea of CEO power in a novel fashion that is able to explain several facts surrounding the performance of merging firms.

The model's results: (1) explain the existence of friendly mergers that do not increase acquiring shareholders' value and yet, they have a positive combined value; (2) square well with several other empirical regularities regarding mergers; and (3) yield some new empirical implications that have not been *directly* tested such as: (i) acquiring shareholders' return falls as the acquiring and target CEO power rise; (ii) the increase in the target firms' stock after the announcement is greater when target CEOs are more powerful, and the decrease in acquiring firms' stock is greater when acquiring CEOs are more powerful; (iii) the increase in the combined value is smaller when acquiring CEOs are more powerful, and target CEOs are less powerful; (iv) the increase in CEO compensation due to acquisitions should be smaller in environments in which corporate governance is better and CEO power is lower; and (v) more powerful CEOs are more likely to be acquirers in order to avoid personal losses resulting from the job loss due to mergers.

The model considers two firms or units (assets) that can be operated as stand-alone firms or as an integrated firm. Each firm is run by a risk-neutral CEO and a board of directors composed of risk-neutral members. Within each firm there is a project that can either succeed or fail. When units are non-integrated, the probability of success depends on the corresponding CEO's behavior. Specifically, when the CEO behaves, the probability of success is high, and when he misbehaves it is low. When units are integrated, the probability of success depends not only on the CEO's behavior, but also on the implementation strategy. For simplicity's sake, only two implementation strategies are considered: the status-quo strategy and the coordination strategy. The probability of success is high when the CEO behaves and selects the coordination strategy and is low otherwise.

The timing of the model is as follows: The board and CEO bargain over the CEO's compensation. This is determined following a generalized Nash bargaining procedure; that is, the board and the CEO agree on an incentive contract that maximizes the product of their surpluses from trade. Then an organizational form is selected by the

board of directors. Specifically, board members decide whether the units should remain as stand-alone units (non-integration; i.e., there are two CEOs) or merge into one firm (integration; i.e., there is one CEO).[1] At this stage, the board of the acquiring firm and that of the target firm bargain over the price of the target. This is also done utilizing a generalized Nash bargaining procedure; that is, boards agree on a price that maximizes the product of their surpluses from trade.[2] If a merger occurs, the board of the acquiring firm and its CEO negotiate a new compensation contract. When firms remain independent, each CEO decides whether or not to behave, while when they integrate, the CEO not only chooses whether or not to behave, but also selects the implementation strategy. Finally, payoffs are realized and compensation takes place.

Board members' preferences are crucial to the outcome. I assume that the board of directors is composed of both inside as well as outside members. Inside members are different from outside members in that the former are not only concerned about firm value, but also with CEO compensation. This assumption is based on the empirical evidence and casual observation showing that managers of large corporations influence boards' decisions and boards do not consider negative stock market reactions to those decisions (e.g., acquisition announcements) to be definitive indicators of long-run value losses.

The share of inside members is interpreted as the level of CEO power. Furthermore, following Hermalin and Weisbach [1998], I assume that the preferences of individual members can be aggregated in such a way that the board acts as if it has a single utility function that corresponds to the weighted sum of members' utility functions, where the weights are given by the share of the board that each type of member represents. Thus, CEO power rises as the share of inside members increases.

The main results of the model are: (i) a merger occurs when synergies are greater than a positive threshold that depends on the level of CEO power, and (ii) acquiring firms share the gains from synergies with target firms in a way that is also determined by CEO power. The reason for this is that bargaining takes place with perfect and complete information and therefore no party can get less than its inside option (i.e., the value as a stand-alone firm). Furthermore, the gains from a merger are shared between the negotiating parties in such a way that the acquiring board overpays for the target firm. As a result, excessive CEO power on the acquirer side leads to too many value-decreasing mergers, while excessive CEO power on the target side leads to too few value-increasing mergers.

Existing theories of mergers can be split into three categories: (i) neoclassical theories that explain mergers in terms of technological, economic, and regulatory shocks; (ii) behavioral theories that are based on market misvaluation of firms;[3] and (iii) agency

[1]This means that I am focusing on one of many possible takeover mechanisms. In particular, I consider a merger instead of a tender offer since the latter does not require target management to be sympathetic to the acquisition. Mainly tender offers are made directly to target shareholders who decide the outcome by either tendering the required number of shares or rejecting the offer by not tendering.

[2]Exactly the same result obtains if Rubinstein's alternating offers bargaining game is adopted.

[3]This more recent theories arise from recent studies on merger waves (e.g., Maksimovic and Phillips [2001] and Jovanovic and Rousseau [2002]) establishing that high merger activity is cor-

theory that sees mergers as primarily motivated by the self-interest of the acquirer management. Neoclassical theories (Mitchell and Mulherin [1996] and Jovanovic and Rousseau [2002]) see mergers as efficiency-improving responses to industry shocks such as antitrust policies, technological innovations or deregulation. Behavioral theories based on market misvaluation (Shleifer and Vishny [2003] and Rhodes-Kropf and Viswanathan [2004]) assume that financial markets are inefficient/irrational and that some firms are therefore valued/priced incorrectly, while bidder managers are completely rational individuals who understand market misvaluation and time the market to take advantage of it.[4] In contrast, the hubris hypothesis (Roll [1986]) assumes that financial markets are efficient/rational and that corporate managers are not. Agency theories posit that acquisitions result in a transfer of value (private benefits) from acquiring shareholders to acquiring management. Several reasons have been provided for this behavior. For example, managers derive private benefits of control from managing more diversified firms (Jensen [1986]; Stulz [1990]). Reasons for this range from prestige coming from managing larger firms and entrenchment through specific human capital investments (Shleifer and Vishny [1992]) to the idea that larger firms provide more pay, power, and prestige (Jensen and Murphy [1990]).

This paper is different from the undervaluation models developed by Shleifer and Vishny [2003] and Rhodes-Kropf and Viswanathan [2004] in that it does not need to assume inefficient capital markets and it is different from the hubris hypothesis of corporate takeovers in that it does not need to assume that corporate managers and directors are irrational. Thus, in this paper rational managers and directors respond to rational capital markets. This paper is also different from agency theory in that synergy gains are the main motive for mergers in here, not managerial gains. In fact regardless of the size of private managerial gains, a merger will occur only if there are positive synergies. What managerial gains do in my model is to distort the negotiated price at which a merge occurs and therefore how the gains from merging are distributed among the acquiring and target shareholders.

This paper is related to the following contributions. Berkovitch and Khanna [1991] also model a merger as a bargaining process between an acquiring and target firm. However, their model sets aside agency problems and focuses on the choice of takeover mechanism. Basically, they argue that when the gains from a takeover are small, a merger mechanism is used since it does not reveal any information to the market. When large gains are involved, a tender offer method is used. Harris [1994] also models mergers as a bargaining game, though he focuses on the manager of the acquiring firm and shareholders of the target firm. His model is intended to determine which firm is the acquirer and which is the target in a merger that is always value-increasing. Firms with CEOs who have higher costs associated with a job loss are more likely to become acquirers in order to retain their jobs, and in so doing, give up gains to target shareholders at the expense of acquiring shareholders. Harris' model cannot explain the evidence on

related with high stock-market valuations.

[4]Their models differ in that in the latter target managers rationally accept overvalued equity because of imperfect information about the degree of synergies, while in the former the result are driven by differences in time horizons.

announcement returns and makes no predictions about the relationship between CEO power, governance and mergers.

Rhodes-Kropf and Robinson [2008] develop a search model with matching and asset complementarity that links the property rights theory of the firm to the fact there is a positive relationship between the value of the acquiring and target firm (that is, high buys high and low buys low). They also model a merger as bargaining process where the inside option is determined by the expected gains from a potential merging partner. Therefore, the share of the merging surplus that each party receives depends on each firms ability to locate another merger partner. Since both firms are necessary for the merger, the firm with relatively more scarce assets will more easily locate another merger partner, and therefore will get a larger share of the merger gains. Thus, higher relative scarcity causes a firm to have a higher ex ante market-to-book ratio, regardless of whether it is the bidder or the target in a particular transaction. Asset scarcity in their model and CEO power in mine have a similar effect on how the merging gains are split between trading partners. Yet, asset scarcity is intended to capture technological differences that are embedded in the type of asset that each firm owns, while CEO power is intended to capture the role of internal corporate governance problems. In addition, a priori there are no reasons to believe that internal corporate governance problems differ across different types of assets. This is why there are issues that my model addresses that are of different nature than some of the issues that Rhodes-Kropf and Robinson's model addresses such as the relationship between CEO pay and mergers.

Finally, Brusco, Giuseppe, and Viswanathan [2007] develop a model to study whether an efficient mechanism for mergers and acquisitions exists. Their model is based on the idea that acquirers have private information about the synergies that they may bring to a merger as well as about their value as stand-alone entities. Specifically, they show that the presence of asymmetric information not only causes too few mergers to occur, but also leads to mergers in which the acquirer is not the one that produces the greatest synergies. This inefficiency is different from the one in this paper since in Brusco et al. [2007] value-destroying mergers do not take place. More importantly , however, is the fact that the inefficiency in their model is based on a different rationale than the one in this paper. Mainly, in their model the inefficiency arises because of the acquiring firm's private information about its value as a stand-alone firm. Mainly as in most models of incomplete information, an information rent is required for a merger to take place. Because the information rent rises with the private stand-alone value, a merge with the partner that brings the higher synergies require these to be great enough to compensate for the information rent. In my model the inefficiency arises because powerful CEOs may gain too much by merging and, synergies, while positive, may not be large enough to compensate for the managerial compensation gains due to CEO power. Thus, I see my model as complementary to that of Brusco et al. [2007] since mine assumes perfect information, moral hazard problems and deals with mergers structured as bilateral negotiations, while theirs assumes incomplete information, no agency problems and deals with mergers structured as auctions.

The organization of the rest of the article is as follows: Section 2 offers a description of the model. Section 3 presents preliminary results with regard to the optimal incen-

tive contracts under each organizational form and the outcome of the bargaining game between the board of the acquiring firm and that of the target firm. Sections 4 and 5 set out the conditions under which mergers take place when CEOs are powerless (i.e., boards are fully independent) and when they are powerful, respectively. In Section 6, the empirical implications of the model are derived and discussed. This is followed by closing remarks.

2 The Model

I consider a simple model in which two firms or units (assets), denoted by i and j, can be operated either as stand-alone firms or as an integrated firm. Each firm is run by a board directors composed of risk-neutral members and a risk-neutral CEO. A crucial assumption is that the CEO is protected by limited liability; specifically, the compensation in any state must be non-negative.

Within each firm there is a project that can either succeed or fail.[5] When units are non-integrated, the project in unit i yields π_i when successful and yields nothing otherwise. The probability of success (r) in unit i depends on the action taken by the corresponding CEO; if he behaves, then $r = r_1$, while if he misbehaves, the probability of success is $r = r_0 < r_1$, but he takes an observable, though non-verifiable, expected private benefit $B(p)$ (private benefits are measured in money), where p is a parameter that captures the quality of external corporate governance.

When the two units merge, the CEO faces a multi-tasking problem. He must choose between behaving and misbehaving and between two non-contractible implementation strategies. One strategy (called coordination) allows the firm to reap the benefits of merging as outlined below and the other (called status-quo) does not allow this, but it provides the CEO with expected private benefits equal to $2B(p)$ (equivalent to $B(p)$ per unit). Basically, the coordination strategy can be thought of as the solution to problems arising from internal interdependence among organizational units, where these refer situation in which total organization is jeopardized unless each unit performs adequately.

Private Benefits as a Function of Corporate Governance. Following Shleifer and Wolfenzon [2002], I assume that private benefits become verifiable in court when external monitoring is successful. When this is the case, as occurs with probability p, the courts force the CEO to return the diverted resources. When monitoring fails, which occurs with probability $1-p$, the CEO can enjoy the diverted resources in full.[6] Thus, the probability of successful monitoring is interpreted as a corporate governance mechanism exogenous to the firm and common across all firms. In this interpretation, governance is dictated by country-wide regulations in the spirit of La Porta, Lopez-de Silanes, Shleifer, and Vishny [1998]. Let total private benefits be b of which a portion α

[5]The fact that there are two outcomes only is without loss of generality since one can show, under the monotone likelihood ratio property, that the principal will compensate the agent with a positive wage only when the highest outcome is realized (see, Laux.C. [2001]).

[6]I could assume also that courts apply a fine to the diverting CEO, yet this immaterial for the model results.

comes from shareholders' pockets and the rest does not. The portion that does not come from shareholders' pockets could be job-satisfaction, reputational benefits, and/or on-the-job training, and the portion that comes from them has the usual interpretation. As such, expected private benefits $B(p)$ are given by $\alpha(1-p)b + (1-\alpha)b$. Thus, as corporate governance improves, private benefits fall.[7]

When the CEO behaves and selects the coordination strategy, the probability of success is given by r_1, while any other combination of strategy and CEO's behavior results in a probability of success equal to r_0. This implies that the quality of the signal that serves as the basis of an incentive contract when the two units merge is the same as that when the units remain as stand-alone firms. This is meant to isolate the effect of CEO power on the integration decision, and to distinguish its consequences from other potential effects of mergers that have been studied in the literature such as the diversification effect of integration on optimal incentive contracts.[8] The project yields a return S when successful and nothing otherwise. There is positive synergies when $S > \pi_i + \pi_j$ and there are negative synergies otherwise. Thus, synergies affect the CEO's marginal productivity but cannot substitute for his or her behavior. In fact, the behavior and the coordination strategy are strategic complements.

It is important to note that the structure of project returns assumes incomplete contracts in the following sense. When the two units interact through the market, they cannot contract on the provision and division of the surplus created by combining the units (assets). The only way to capture synergies is by merging the units (that is, by placing the assets under common control). As such, Coasian bargaining will not ensure the creation of synergies in independently owned firms, and the benefits of integration cannot materialize through the market.[9]

The timing of the model is as follows. At the beginning, the board and CEO bargain over the CEO's compensation. The CEO's compensation is determined following a generalized Nash bargaining procedure; that is, the board and the CEO agree on an incentive contract that maximizes the product of their surpluses from trade. The board of directors then selects an organizational form–specifically, whether the units should remain as stand-alone units (non-integration; i.e., there are two CEOs) or merge into one firm (integration; i.e., there is one CEO). At this stage, the board of the acquiring firm and that of the target firm bargain over the price of the target also according to a generalized Nash bargaining price determination procedure; that is, the board of the acquiring firm and that of the target firm agree on a price that maximizes the product of their surpluses from trade. If a merger occurs, the board of the acquiring firm and its CEO negotiate a new compensation contract. In a stand-alone firm each CEO decides whether to behave. In an integrated firm, the CEO not only chooses whether to behave, but also he selects the implementation strategy. Finally, the payoffs are realized and compensation takes place.

[7]See, Albuquerque and Jianjun [2008] for a similar modeling assumption about private benefits.

[8]See, Hermalin and Weisbach [2003] for a detailed study of how mergers can change the quality of the information on which incentive contracts can be conditioned.

[9]In the absence of this assumption, coordination through the market by mean of side-payments might be possible, and thus integration would not be needed (ceteris-paribus) to reap its benefits.

Given that the board determines CEO compensation and the organizational form, its objective function is at the crux of the model. I assume that the board of directors is composed of inside as well as outside members. Inside members are different from outside members because the former are not only concerned with shareholder's value (Π), but also with the CEO's compensation (C). The share of inside directors is δ and the share of outside directors is $1-\delta$. Thus, the share of inside directors (δ) is interpreted as the level of CEO power.[10] This is intended to capture in a reduced form the evidence indicating that the more independent the board, the less likely it is to make decisions that favor the current CEO. The size of the parameter δ would, for instance, be expected to vary inversely with the quality of corporate governance, board members' monitoring capability, board size, board members' incentives to rock the boat, and proportionally with free-rider problems arising from diluted ownership, social ties between board members and the CEO, and the CEO's formal titles. The fact that CEOs influence board's decisions is also consistent with the institutional literature on boards, which suggests that CEOs, both in the United States and abroad, have a great deal of influence on who is nominated for board positions. In fact Boone, Field, Karpoff, and Raheja [2007] find that the proportion of outside directors is negatively related to measures of CEOs' influence–including CEOs' shares, age and job tenure–and positively related to limits on such influence, including the ownership of outside members, the presence of a venture capitalist, and the reputation of the firm's investment bank at the time of its IPO.[11]

Following Hermalin and Weisbach [1998],[12] I assume that individual directors' preferences can be aggregated in such a way that the board acts as it has a single utility function. I assume that outside members' utility is

$$U_o = \Pi, \tag{1}$$

while inside members' utility is

$$U_I = \Pi + C. \tag{2}$$

This plus the aggregation assumption result in that the board's utility is the weighted sum (by the corresponding shares) of members' utilities; that is, the board's utility is

$$U_{B(p)} = \Pi + \delta C.$$

In the absence of moral hazard with regard to CEOs' choices, it is socially efficient to ask the CEO of an integrated firm to behave and to select the coordination strategy whenever

$$r_1 S > \max\left\{r_0 S + 2B(p) - 4\alpha b, r_0 S + 4B(p) - 4\alpha b\right\}, \tag{3}$$

[10]See, Bebchuk and Walker [2002] for a compelling argument about the pervasive influence of management, particularly the CEO, on most board-made decisions.

[11]Furthermore, they provide evidence indicating a significant degree of persistence in the bargaining outcome, as CEO power at the time of the IPO helps explain board composition even several years after the IPO. This supports Hermalin and Weisbach [1998] view that corporate boards reflect the outcome of a negotiation between the CEO and outside board members.

[12]See, also Graziano and Luporini [2003] for a similar assumption in a different context.

and it is socially optimal to ask the CEO of a stand-alone firm to behave whenever

$$r_1\pi^i > r_0\pi^i + B(p) - \alpha b. \tag{4}$$

If these two conditions hold, integration is socially efficient when synergies are positive; that is,

$$S > \pi^i + \pi^j. \tag{5}$$

For the rest of the paper, it is assumed that when CEOs are powerless, it is optimal for shareholders' point of view: (i) to induce the CEO of stand-alone firm to behave, and (ii) to induce the CEO of an integrated firm to behave and to select the coordination strategy. This requires the following:

- (A1) (i) $\triangle r\pi^i \geq B(p)$ and $\triangle r\pi^j \geq B(p)$, where $\triangle r \equiv r_1 - r_0$; and (ii) $\triangle rS \geq 4B(p)$.

Finally, I assume that

- (A2): Each CEO's reservation utility is zero.

3 Preliminaries

3.1 Stand-Alone Firms

In this sub-section, I consider a stand-alone or focused firm. Here each board and its corresponding CEO bargain over the compensation contract. Let define the contract $w^F \equiv (w_s, w_f)$, where w_s is the wage payment when the project succeeds, w_f is the wage payment when the project fails, and F stands for focused. Then contract w^F induces the CEO to behave if and only if

$$r_1 w_s + (1 - r_1) w_f \geq r_0 w_s + (1 - r_0) w_f + B(p). \tag{6}$$

It is easy to show that the incentive constraint (6) can be written as follows

$$w_s - w_f \geq \frac{B(p)}{\triangle r}.$$

It is a well-known result that the least expensive way to satisfy the agent's incentive compatibility constraint under limited liability is to set $w_f = 0$ and $w_s = \frac{B(p)}{\triangle r}$.[13] This entails a positive incentive cost equal to $\frac{r_1}{\triangle r} B(p)$, due to limited liability. The literature refers to this as the agent's limited-liability rent.

Board members and the CEO bargain to determine the CEO's compensation contract (w^F) in order to maximize the product of their surpluses from trade subject to the incentive compatibility constraint. The players' surplus is the difference between what

[13] See Laffont and Martimort [2002].

they expect to receive if an agreement is reached, and what they expect to receive if no agreement is reached. If no agreement is reached, the CEO leaves the firm and gets his outside option, which is zero. [14] The CEO's surplus is, therefore, his total compensation when an agreement is reached and he behaves, denoted by C_i^F, minus what he gets when he lives the firm. If no agreement is reached, the board hires a new CEO with no power (since from the new CEO's viewpoint there are no inside board members) and bargains with him or her in an arm's length fashion. This implies that the newly hired CEO is paid the limited-liability rent, which is the lowest rent needed to induce him or her to behave.[15]

The board's surplus is, therefore,

$$r_1\pi^i - C_i^F + \delta C_i^F - \left(r_1\pi^i - r_1\frac{B(p)}{\triangle r}\right).$$

Thus, using Nash bargain, the board and the CEO choose w^F to solve the following problem

$$\max_{w^F\geq 0}\left\{\left[r_1\frac{B(p)}{\triangle r} - (1-\delta)\,C_i^F\right]C_i^F \text{ s.t. } (6)\right\}.$$

This is a relaxed program since it ignores the CEO's participation constraint. However, the participation constraint is trivially satisfied since $w_f \geq 0$, by the limited-liability constraint.

The solution to the bargaining problem when the board wants to induce the CEO to behave is therefore as follows:

Lemma 1 *(i) If $\delta \leq \frac{1}{2}$, then the optimal compensation contract in a stand-alone firm is given by: $w_s^F = \frac{B(p)}{\triangle r}$ and $w_f^F = 0$, and entails compensation costs: $r_1\frac{B(p)}{\triangle r}$, while if $\delta > \frac{1}{2}$, the optimal compensation contract in a stand-alone firm is given by: $w_s^F = \frac{B(p)}{\triangle r} + \frac{2\delta-1}{2(1-\delta)}r_1\frac{B(p)}{\triangle r}$ and $w_f^F = \frac{2\delta-1}{2(1-\delta)}r_1\frac{B(p)}{\triangle r}$, and entails compensation costs: $\frac{1}{2(1-\delta)}r_1\frac{B(p)}{\triangle r}$; and (ii) the board induces the CEO to behave more often than it is optimal from shareholders' viewpoint, but less often than first-best efficiency requires.*

This lemma says that the board and CEO agree on a contingent incentive contract ex-ante in order to align the interests of the latter with those of the former. When CEO power is small ($\delta \leq \frac{1}{2}$), the CEO cannot extract a rent greater than the limited-liability rent, which is the lowest rent that induces him to behave and participate. This rent arises because of the limited-liability constraint. In contrast, when CEO power is large ($\delta > \frac{1}{2}$), the CEO and the board agree on a compensation contract that yields a

[14] The model results do not change if, after the CEO leaves the firm, the CEO can get a job with a positive wage.

[15] It is easy to show that the solution to the bargain problem between the new CEO and the board has as a solution to pay the new CEO the limited-liability rent. In fact, this corresponds to the solution to the problem of the old CEO when $\delta = 0$ and therefore for the sake of brevity the proof is omitted. Furthermore, one can show that the paper's results hold when the assumption that the new CEO is powerless is loosen, and it is assumed that the new CEO has less power than the old CEO.

rent greater than the limited-liability rent. Specifically, the principal offers the agent a positive wage payment when the project fails. This means that the wage payment after a success is greater than that when CEO power is small. In fact, the greater the CEO power, the greater the wage payment after success and failure.

This is consistent with a considerable body of empirical literature that shows that CEOs in many corporations are able to extract rents greater than those obtained under arm's length bargaining. Bebchuk and Walker [2002] carefully review the literature that studies the relationship between CEO power and compensation, and concludes that the evidence support the idea that rent extraction takes places in most companies. Basically, the evidence shows that CEO compensation is higher when the board is larger (and thus less cohesive), when more of the outside directors have been appointed by the CEO, when outside directors are older, when outsiders serve on five or more boards, when the CEO is the chairman of the board, and when board members' share of ownership is small.

Bertrand and Mullainathan [2001] and Bertrand and Mullainathan [2000] present two interesting studies providing evidence indicating that the absence of shareholders who own more than 5 percent of the shares is associated with a significant deviation from optimal contracting. This evidence is consistent with the result here if I assume that there is, as the evidence suggests, a positive correlation between the ownership share of the largest shareholder and the share of outside board members.

It readily follows from lemma (1) that total compensation costs are

$$C_i^F(\delta) = \begin{cases} \frac{1}{2(1-\delta)} \frac{r_1}{\triangle r} B(p) & \text{if } \delta > \frac{1}{2}, \\ \frac{r_1}{\triangle r} B(p) & \text{if } \delta \leq \frac{1}{2}. \end{cases} \tag{7}$$

Thus, the CEO's utility in a stand-alone firm is given by:

$$U_i^F(\delta) = C_i^F(\delta), \tag{8}$$

firm value is given by:

$$\Pi_i^F(\delta) = r_1 \pi^i - C_i^F(\delta), \tag{9}$$

and the board's utility is as follows:

$$V_i^F(\delta) = r_1 \pi^i - (1-\delta) C_i^F(\delta). \tag{10}$$

It is interesting to note that the board's utility increases as the share of inside directors increases until half of the members are independent and then remains constant from there onwards. This is due to risk neutrality and the fact that inside directors see the CEO's rent as fully transferable between the board and the CEO. In contrast, firm value is independent of CEO power up to the point where half of the members are independent and then falls with CEO power from there onwards.

3.2 Merged Firms

In this sub-section, I consider the case in which the two units merge and a new integrated firm arises. Here the board and the acquiring CEO bargain over the compensation contract. Let define the contract $\mathbf{w}^M \equiv (w_s, w_f)$, where w_s is the wage payment when the project succeeds, w_f is the wage payment when the project fails, and M stands for merged. Then, contract $\mathbf{w}^M$ induces the CEO to behave and to select the coordination strategy if and only if

$$r_1 w_s + (1 - r_1) w_f \geq r_0 w_s + (1 - r_0) w_f + 4B(p), \tag{11}$$

and

$$r_1 w_s + (1 - r_1) w_f \geq r_0 w_s + (1 - r_0) w_f + 2B(p). \tag{12}$$

Incentive constraint (11), also known as the global incentive constraint, ensures that the CEO prefers to behave and to select the coordination strategy than misbehaving and selecting the status-quo strategy. Furthermore, incentive constraint (12), also known as the local incentive constraint, guarantees that the CEO prefers to behave and to select the coordination strategy than misbehaving and selecting the coordination strategy and than behaving and selecting the status-quo strategy. It is easy to verify that the global incentive constraint (11) is more stringent that the local incentive constraint (12).[16] Due to limited liability, the optimal incentive contract in the absence of CEO power is one in which the wage payment after a success is $w_s = \frac{4B(p)}{\triangle r}$ and that after a failure is $w_f = 0$. This contract entails a limited-liability rent equal to $r_1 \frac{4B(p)}{\triangle r}$.

Board members and the CEO bargain to determine the CEO's compensation contract w^M to maximize the generalized Nash product of their respective surplus from trade subject to the global incentive compatibility constraint. If no agreement is reached, the CEO leaves the firm and he gets his outside option, which is zero. The CEO's surplus is therefore his total compensation (C^M) when an agreement is reached and he behaves and selects the coordination strategy minus his outside option. If no agreement is reached, the board hires a new CEO with no power, and pays him the limited-liability rent, which is the lowest rent needed to induce him to behave and to select the coordination strategy. The board's surplus is, therefore,

$$r_1 S - C^M + \delta C^M - \left(r_1 S - r_1 \frac{4B(p)}{\triangle r} \right).$$

Thus, the board's problem is as follows:

$$\max_{\mathbf{w}^M \geq 0} \left\{ \left[r_1 \frac{4B(p)}{\triangle r} - (1 - \delta) C^M \right] C^M \text{ s.t. (11) and (12)).} \right\}$$

This is a relaxed program since it ignores the CEO's participation constraint. However, this is trivially satisfied since $w_f \geq 0$, by the limited-liability constraint.

[16] This is true in any multi-task model with complementary tasks and risk-neutral agents with limited liability.

LEMMA 2 *(i) If $\delta \leq \frac{1}{2}$, then the optimal compensation contract in an integrated firm is given by: $w_s^M = \frac{4B(p)}{\triangle r}$ and $w_f^M = 0$, and entails compensation costs: $r_1 \frac{4B(p)}{\triangle r}$; and if $\delta > \frac{1}{2}$, the optimal compensation contract in an integrated firm is given by: $w_s^M = \frac{4B(p)}{\triangle r} + \frac{2\delta-1}{2(1-\delta)} \frac{r_1 4B(p)}{\triangle r}$ and $w_f^M = \frac{2\delta-1}{2(1-\delta)} \frac{r_1 4B(p)}{\triangle r}$, and entails compensation costs: $\frac{1}{2(1-\delta)} r_1 \frac{4B(p)}{\triangle r}$; and (ii) the board induces the CEO to behave more often than it is optimal from shareholders' viewpoint, but less often than first-best efficiency requires.*

The intuition here is exactly the same as the one provided in the case of a stand-alone firm, and the relationship between CEO power and wage payments is also the same. The only difference is that the limited-liability rent is greater due to the multi-task nature of the incentive problem faced by the CEO of an integrated firm. In particular, this is due to the fact that the CEO has to give up more private benefits in an integrated firm than in a stand-alone firm.

It readily follows from lemma (2) that compensation costs under the optimal contract are

$$C^M(\delta) = \begin{cases} \frac{1}{2(1-\delta)} r_1 \frac{4B(p)}{\triangle r} & \text{if } \delta > \frac{1}{2}, \\ r_1 \frac{4B(p)}{\triangle r} & \text{if } \delta \leq \frac{1}{2}. \end{cases} \tag{13}$$

Thus, the CEO's utility when units merge is given by:

$$U^M(\delta) = C^M(\delta), \tag{14}$$

firm value is given by:

$$\Pi^M(\delta) = r_1 S - C^M(\delta). \tag{15}$$

and the board's utility is as follows:

$$V^M(\delta) = r_1 S - (1-\delta) C^M(\delta). \tag{16}$$

Note that the board's utility is increasing with the share of inside directors up to the point where half of the members are independent and then remains constant from there onwards. This is due to the fact that the CEO fully captures the benefits of inside directors when the share is beyond the minimum share needed for the CEO to be able to extract a rent greater than the limited-liability rent. In contrast, firm value is independent of CEO power up to the point where half of the members are independent and then falls with CEO power from there onwards. Furthermore, firm value and the board's utility rise with synergies at the same rate. Thus, the board fully internalizes the return to synergies.

3.3 Integration Decision

In this subsection I find the general conditions under which the units integrate and determine the price that the acquiring board (firm i in what follows) pays for the target firm (firm j from here onwards) when a merger takes place.

The board of the acquiring firm and that of the target firm bargain to determine the price at which the target firm is acquired so as to maximize the product of their surpluses from trade.[17]

The surplus of the acquiring board is the difference between what it expects to receive if an agreement is reached and what it expects to receive if no agreement is reached. If no agreement is reached, the acquiring firm and the target firm remain as stand-alone units and thus the board of unit i gets $V_i^F(\delta_i)$. If an agreement is reached, the acquiring board's surplus is the utility from integration minus both the price paid and the utility from remaining as a stand-alone firm (its inside option); that is, $V_i^M(\delta_i) - P_i - V_i^F(\delta_i)$. The target board's surplus is the price at which the firm is sold minus the utility from remaining as a stand-alone unit (its inside option).[18] Thus, under Nash bargaining the board of the acquiring firm and that of the target firm choose P_i to maximize

$$\left[V_i^M(\delta_i) - P_i - V_i^F(\delta_i)\right]\left[P_i - V_j^F(\delta_j)\right]. \tag{17}$$

It follows from this that a merger will occur if the expected joint surplus when an agreement is reached exceeds that when no agreement is reached; that is,

$$V_i^M(\delta_i) \geq V_i^F(\delta_i) + V_j^F(\delta_j), \tag{18}$$

and conditional on a merger occurring, the equilibrium price is given by:

$$P_i(\delta) = \frac{1}{2}\left[V_i^M(\delta_i) - V_i^F(\delta_i) - V_j^F(\delta_j)\right] + V_j^F(\delta_j), \tag{19}$$

for $i, j = 1, 2$ and $i \neq j$, where $\delta = (\delta_i, \delta_j)$.

Given that boards bargain over the rents from merging with complete information, a merger occurs when the acquiring board's post-merger utility is greater than the sum of the boards' pre-merger utilities. Furthermore, the trading price corresponds to what the board of the target firm gets when no agreement is reached plus half of the surplus from merging.

Notice that

$$\frac{\partial V_i^M(\delta_i)}{\partial S} = r_1 > 0,$$

and therefore the board's utility rises with the synergy level at the same rate as shareholders' value does. In other words, board members fully internalize shareholders' return to synergies. Thus, one can define a synergy cutoff S_δ^* as the minimum synergy level above which a merger occurs. This leads to the following result.

[17] I could also model this as a sequential bargaining game in which the target board can either accept or reject a merger offer made by the acquiring firm. If the target board rejects the offer, it may submit the next period a counter-offer of its own merger terms. The acquirer can either reject or accept this counter-offer. If it rejects, it can submit next period a new merger offer, and so on and so forth. Thus, rejecting a merger offer causes a delay of one period during which each Board gets its inside option given by the payoff from remaining focused, which is $V_i^F(\delta_i)$. Thus, by well-known results about Rubinstein's alternating offers game, the equilibrium is unique, an agreement is reached immediately and this coincide with the solution to the generalized Nash bargaining with inside options.

[18] I am assuming, consistent with the evidence, that the board members of the target firm are fired after the merger.

Proposition 1 *A merger takes place if and only if the synergy level S is greater than or equal to S_δ^*, and the equilibrium price rises with the synergy level.*

In the next two sections I will study this result in great detail to show that despite of its simplicity, it can provide a rationale for several empirical facts surrounding mergers.

4 Mergers with Powerless CEOs ($\delta = \mathbf{0}$).

In this section, I assume that CEOs are powerless in the sense that all board members are outsiders; that is, $\delta = \mathbf{0}$. In this case, equation (18) becomes

$$\Pi^M(0) \geq \Pi_i^F(0) + \Pi_j^F(0), \tag{20}$$

and equation (19) becomes:

$$P_i(0) = \frac{1}{2}\left[\Pi^M(0) - \Pi_i^F(0) - \Pi_j^F(0)\right] + \Pi_j^F(0). \tag{21}$$

for $i, j = 1, 2$ and $i \neq j$.

When CEOs are powerless, the CEO of a stand-alone firm is paid the limited-liability rent $C_i^F(0) = r_1 \frac{B(p)}{\triangle r}$ and the CEO of an integrated firm is paid the limited-liability rent $C^M(0) = r_1 \frac{4B(p)}{\triangle r}$. Plugging these values into equation (20) produces the following result.

Proposition 2 *Suppose CEOs are powerless, then a merger takes place for all synergy levels $S \geq S_0^*$, with $S_0^* = \pi^i + \pi^j + \frac{2B(p)}{\triangle r}$.*

When CEOs are powerless, board members' interests are fully aligned with those of shareholders and CEOs are paid their limited-liability rent. Since the limited-liability rent that induces the CEO of an integrated firm to behave and to select the coordination strategy is greater than the sum of the limited-liability rents needed to induce the CEOs of two stand-alone firms to behave, compensation costs are higher in a integrated firm. This implies that a merger occurs only when synergies compensate for the difference in limited-liability rents.

The fact that boards bargain over the price under complete information and boards' interests are fully aligned with those of shareholders implies that rents from merging are shared according to each board's bargaining power, which is basically determined by the value of the firm as stand-alone unit. In this case the acquiring and target shareholders always get a share of the synergistic gains and thus the target firm is paid more than the firm value as a stand-alone unit and the acquiring firm gets more than the value as a stand-alone unit. Thus, the following result obtains.

Proposition 3 *Suppose CEOs are powerless. Then (i) only value-enhancing mergers take place and no value-increasing mergers go unrealized; (ii) the acquiring board overpays for the target (that is, $P_i(0) > \Pi_j^F(0)$); and (iii) the acquiring and target firm's stock price increases after the announcement and therefore the combined value also increases after the announcement.*

Given that only value-enhancing mergers take place and no value-enhancing mergers go unrealized in the absence of CEO power, the existence of moral hazard by itself is not sufficient to explain the empirical regularities that this paper attempts to explain.

5 Mergers with Powerful CEOs.

In this section, I consider boards' decision to integrate when CEOs are powerful. It is useful to have in mind that it is being assumed that board composition is exogenously determined. Thus, this analysis assumes that the post-merger board's independence is the same as the acquiring board's independence.

In this case equation (18) can be written as follows:

$$\Pi^M(\delta_i) \geq \Pi_i^F(\delta_i) + \Pi_j^F(\delta_j) + \delta_i\left[C_i^F(\delta_i) - C^M(\delta_i)\right] + \delta_j C_j^F(\delta_j). \tag{22}$$

and equation (19) becomes

$$P_i(\delta) = \frac{1}{2}\left[\Pi^M(\delta_i) - \Pi_i^F(\delta_i) - \Pi_j^F(\delta_j)\right] + \frac{1}{2}\left[\delta_i\left(C_i^F(\delta_i) - C^M(\delta_i)\right) - \delta_j C_j^F(\delta_j)\right] - \Pi_j^F(\delta_j) - \delta_j C_j^F(\delta_j) \tag{23}$$

Equation (22) shows that the consequences of CEO power for the integration decision stem from two things. First, when units merge, target firm's board members and the target CEO lose their jobs. Outside board members get back more than what they lose since the price at which the transaction takes place is greater than the target firm's stand-alone value. However, inside directors may not be compensated for the loss due to the fact that the CEO is also fired; that is $\delta_j C_j^F(\delta_j)$. Second, outside board members of the acquiring firm lose $\Pi_i^F(\delta_i)$ and get back $\Pi^M(\delta_i) - P_i(\delta)$, while inside board members lose $\Pi_i^F(\delta_i) + \delta_i C_i^F(\delta_i)$ and get back $\Pi^M(\delta_i) - P_i(\delta) + \delta_i C^M(\delta_i)$. Given that $C^M(\delta_i) > C_i^F(\delta_i)$, acquiring inside board members gets an extra benefit from seeing the acquiring CEO's compensation grow. Thus, whether CEO power makes mergers more likely to take place depends on the loss suffered by target inside board members relative to the gains obtained by acquiring inside board members, both of which rise with the corresponding CEO pay. This trade-off is captured in the next proposition.

Proposition 4 *Suppose CEOs are powerful. Then (i) a merger takes place for all synergy levels $S \geq S_\delta^*$, with $S_\delta^* = \pi^i + \pi^j + \frac{2B(p)}{\triangle r} + \frac{B(p)}{\triangle r}\triangle(\delta) > \pi^i + \pi^j$, with $\triangle(\delta) < 0$ for all $\delta_i > d(\delta_j)$; and (ii) $d(\delta_j) \leq \frac{1}{6}$ and $d(\delta_j)$ rises with δ_j.*

This result shows that mergers may occur either more or less often than when CEOs are powerless. When CEO power is small (that is, insiders represent less than half of the board), a rise in CEO power does not increase compensation costs but does decrease the importance of compensation costs on the merging decision, which in turn results in a greater utility for the board. When CEO power is large, both effects are present but cancel each other out due the linearity of board's preferences. Thus, when the acquiring

CEO power is small relative to the target CEO power, captured boards requires greater synergies to merge than fully independent boards, while the opposite occurs when the acquiring CEO power is large relative to the target CEO power.

6 Implications

In this section, I discuss the empirical implications of the analysis. The discussion is divided in three parts. First, I discuss the theory in light of the available empirical evidence on stock returns. Second, I present implications of the model that have not been *directly* testes. Mostly, these are related to the relationship between CEO power, corporate governance and mergers. Third, I look at the relationship between the aggregate merger activity, synergies and CEO power.

Before doing so it is worthwhile to point out that this theory cannot explain a number of empirical findings that appear in the literature. For example, the model cannot explain finding related to market mis- or over-valuation of stocks since the model assumes efficient markets and rational agents. Nor can it explain why some mergers are in cash and some others are in stock beyond the obvious fact that some firms could face credit constraints because in the model the difference between paying in cash or stock is irrelevant. In order for that aspect to be important, some kind of error on valuations is needed. These findings are often related to details regarding how the deal is structured, and this theory was not designed to address such matters (as is the case with many other theories).

6.1 Cross-section implications

The evidence on long- and short-run stock returns around the issuing of acquisition announcements is carefully reviewed by Agrawal and Jaffe [2000], Andrade, Mitchell, and Stafford [2001], and Shleifer and Vishny [1997].

Andrade et al. [2001] look at a three-day period around the announcement and find that the combined announcement returns over that period are economically and statistically significant and positive. The combined value of the acquirer and target increases by 2% of the total initial value of the acquirer and target in the window beginning 20 days before the acquisition announcement and ending on the close. Target firms gain 23.8% and acquiring firms lose 3.8% over the same period. In addition, they show that the acquirer's Q exceeded the target's Q in 66% of mergers between 1973 and 1998. This result is consistent across all three decades (the 1970s, 1980s and 1990s). Bruner [2002] and Holmstrom and Kaplan [2001] survey a number of papers and reach a similar conclusion. Returns to target firms are clearly positive, returns to acquirers are mixed, and the combined returns are positive in every study. They conclude that if one were to judge acquisition success only by the acquirer return, one would conclude mistakenly that acquisitions did not create value on average.[19]Shleifer and Vishny

[19]The evidence on accounting-based studies are all over the map. Andrade et al. [2001] and Healy and Ruback [1992] find positive results, i.e., accounting performance improves. Maksimovic and Phillips [2001], Kaplan and Weisbach [1992], McGuckin and Nguyen [1995], and Schoar

[1997] argue that if the stock price falls when firms announce a particular action, this action must to certain extent serve the interests of managers rather than those of shareholders. Based on this argument and the evidence, they conclude that bad acquisitions are driven mainly by managerial objectives.

Let the synergy cutoff S_δ^{**} be the minimum synergy level above which a merger is value-enhancing; that is, the lowest synergy that ensures that $\Pi^M(\delta_M) \geq \Pi_i^F(\delta_i) + \Pi_j^F(\delta_j)$. Then the following obtains.

Prediction 1 *Suppose CEOs are powerful ($\delta > \mathbf{0}$). Then, value-destroying mergers take place if and only if the acquiring CEO power is large (that is, $\delta_i > e(\delta_j)$) and $S_\delta^* \leq S < S_\delta^{**}$, and value-enhancing mergers do not take place if and only if acquiring CEO power is small ($\delta_i \leq e(\delta_j)$) and $S_\delta^{**} \leq S < S_\delta^*$.*

This result establishes three things: first, value-destroying mergers take place with positive probability, and mergers that are value increasing sometimes do not take place; second, these two value-decreasing strategies occur when synergies are not too large; and third, value-destroying mergers takes place when acquiring CEO power is large, while some value-increasing mergers do not take place when acquiring CEO power is low.

The next result speaks to the equilibrium price. Equation (24) implies the following: First, prices P_i^* and P_j^* are generally not the same since $V_i^F(\delta_i)$ is different from $V_j^F(\delta_i)$. Second, the greater the utility the target board gets, the lower the expected utility that the acquiring board earns. Furthermore, the greater the expected utility that the acquiring board receives, the higher the price. This follows from the fact that bargaining parties share the total surplus generated by merging and no bargaining party gets less than its inside option. This leads to the following.

Prediction 2 *(i) The acquiring firm overpays for the target firm; (ii) the price falls with the efficiency of the acquiring firm (π^i) and rises with the efficiency of the target firm (π^j); and (iii) the price rises with the synergy level (S).*

The next prediction is related to acquiring and target shareholders' value and it is consistent with the evidence summarized at the beginning of this section.

Prediction 3 *Target firm's stock increases after the announcement, while acquiring firm's stock and the combined value may either increase or decrease. Specifically, if $S < S_\delta^* + 6\delta_i \frac{B(p)}{\triangle r} \max\left\{1, \frac{1}{2(1-\delta_i)}\right\}$ acquiring firm's stock value decreases after the announcement, but the combined value increases only if $S > S_\delta^* + \xi(\delta)$, with $\xi(\delta) < 6\delta_i \frac{B(p)}{\triangle r} \max\left\{1, \frac{1}{2(1-\delta_i)}\right\}$.*

This establishes that target shareholders are always better-off, but acquiring shareholders may be better- or worse-off. In fact, it says that in some cases acquiring shareholders are worse-off despite the fact that the combined value is positive. This occurs

[2002] find neutral or mixed results, while Ravenscraft and Scherer [1987b] find negative results. In other words, in contrast to the announcement return results, there is not clear-cut evidence that acquisitions lead on average to accounting-based or productivity-based improvements.

when synergies are small. Thus, the presence of positive synergies guarantees neither a positive combined value nor that acquiring shareholders are better-off.

The next implication relates to the existence of a negative relationship between the acquiring shareholders' return and acquiring and target firm size (measured as firm value as a stand-alone unit). Moeller and Stulz [2004] find that very large acquirers have a negative announcement return, while small acquiring firms have positive announcement returns.

Prediction 4 *The acquiring firm's stock value decreases more or increases less after the announcement in relation to the size of the acquiring and target firm.*

The size effect of the target firm is trivial. The size effect of the acquiring firm follows from the following facts: first, an increase in the acquiring firm value rises the acquiring board's inside option $V_i^F(\delta_i)$ and, second, the acquiring firm shares the return to integration with the target firm.

The next implication is related to total compensation before and after the merger for the acquiring CEO. Lambert and Larcker [1987] report that CEO compensation increases only when mergers create wealth for investors. Avery and Schaefer [1998] find that CEO compensation growth at firms that merge does not outpace that of firms that do not merge. They also find that compensation growth at merging firms does not depend on whether acquisitions increase shareholder wealth. Rose and Shepard [1997] and Berry, Lemmnon, and Naveen [2002] find that salaries of CEOs of diversified firms are larger than those of similarly-sized but less-diversified firms (approximately 13% and 11%, respectively, higher for diversified than focused firms). Based on additional evidence, they infer that this is not due to managerial entrenchment but to greater task complexity and higher managerial product for diversified firms. Bliss and Rosen [2001] report that CEO compensation increases with changes in asset size due to internal growth or mergers for 32 billion-dollar banks from 1986-1995.

Harford and Li [2007] explore how compensation policies following mergers affect a CEO's incentives to pursue a merger. They find that even in mergers where bidding shareholders are worse off, bidding CEOs are better off three quarters of the time. Following a merger, a CEO's pay and overall wealth become less sensitive to negative stock performance, but a CEO's wealth rises in step with positive stock performance.

Bebchuk and Grinstein [2007], examining the full universe of firm-expansion decisions, find a positive correlation between any type of firm expansion including large acquisitions under a given CEO and the CEO's subsequent pay. In fact, after excluding firms making significant acquisitions during the relevant period, a significant and economically meaningful association remains between firm expansion under the CEO and growth in the CEO's compensation.[20] This evidence provides support for the following prediction.

[20]The existence of an economically meaningful correlation between expansion and subsequent pay increases does not indicate that compensation practices are suboptimal and therefore does not provide direct evidence on the effect of CEO power on compensation. But it does indicate that, overall, compensation practices provide managers with excessive incentives to expand firm size.

Prediction 5 *Post-merger total compensation is greater than pre-merger total compensation.*

As found by Rose and Shepard [1997], this result is due to the multi-task nature of the CEO job in an integrated firm, and that compensation is more sensitive to CEO power in an integrated firm.

The last prediction concerns the relationship between the price at which the deal is struck and CEO power.

Prediction 6 *Ceteris-paribus, acquiring firms pay more as the acquiring and target CEO power rises.*

This is due to the fact that as the acquiring CEO's power rises, he extracts greater rents from an integrated firm than from a stand-alone unit due to the multi-task incentive problem that he faces in an integrated firm. As a result, the acquiring board is willing to pay more for a target firm since inside board members place a positive weight on CEO compensation and this weight rises as CEO power increases.

When the target firm has a powerful CEO, the price must be higher since the target CEO loses his job and the target board is willing to accept a merger if and only if the price it extracts during negotiation more than compensates for the loss suffered by the target CEO. This effect is more important as CEO power rises since this leads the target board to place a greater weight on the CEO's compensation. This also suggests that if the target CEO is retained, the board will be willing to agree to a lower price.

This prediction has three main corollaries. First, acquiring shareholders' return falls as the acquiring and target CEO power rises. Second, the increase in the target firm's stock after the announcement is greater when the target CEO is more powerful, and the decrease in the acquiring firm's stock is greater when the acquiring CEO is more powerful. Third, the increase in the combined value is smaller when the acquiring CEO is more powerful and the target CEO is less powerful.

There is some indirect evidence that is related to this prediction. There is evidence that the prevalence of inefficient mergers is at least partially determined by the ability of firms' corporate governance structures to curb agency problems. For instance, Palia [1999] finds that the diversification discount increases with the board size and decreases with the shares and options in the management compensation package. Grinstein and Hribar [2004] find that more powerful CEOs tend to engage in larger deals relative to the size of their own firms and the market responds more negatively to their acquisition announcements. In addition, they find that CEO power is the main driver of merger and acquisitions bonuses. While studying a sample of mergers of equals, Wulf [2004] finds that target CEOs trade premium in exchange for a position in the post-merger firm. Harford [2003] shows independent outside target board members face both severe financial and non-financial repercussions subsequent to merger, while Hartzell and Yermack [2004] find evidence that CEOs negotiate in their own interests during merger negotiations. Furthermore, target board members and executives are unlikely to be offered similar positions in the successor firm, which results in a loss of future compensation (Agrawal and Walkling [1994]; Brickley and Linck [1999]; Cotter

and Zenner [1997]; and Harford [2003]).

Beacher and Campbell [2005] examine a sample of bank mergers and find that merger premiums are significantly lower when the target CEO is retained on the post-merger board. They also find that some target bank board members accept personal benefits at the expense of lower premiums for their shareholders. Specifically, they find that few target board members remain on the successor board, but the target's merger premium is inversely related to the number of target board members retained. The average merger premium is roughly double in mergers in which two or more target board members are retained on the post-merger board compared to those in which no or one board member is retained. Premiums are also lower when multiple outside or inside board members are retained when compared to the sample of firms retaining no target board members. Similarly, for CEO retention Malmendier and Tate [2007] find that CEOs' press coverage, which I interpret as increasing their power, helps explain merger decisions. They find that CEOs with more press coverage overpay for target companies and undertake value-destroying mergers. The effects are strongest if they have access to internal financing.

6.2 Untested predictions

In this section I point to some distinctive predictions of the model that have not been directly tested but are testable.

First, the model predicts that, ceteris-paribus, acquiring firms pay less for the target firm as external corporate governance improves.

Corporate governance feeds into the model through the size of private benefits; as corporate governance improves, the ability of a CEO to extract private benefits by misbehaving or taking the inadequate strategy lowers. This implies that pre- and post-merger compensation fall as corporate governance improves, yet the drop in post-merger compensation is greater since the limited liability rent is greater. Thus, the target board is willing to accept a lower price since the target CEO loses less when he loses his job, while the acquiring board is willing to pay less since the increase in total CEO compensation from integration is now smaller.

This prediction has several corollaries. First, acquiring shareholders' return rises as corporate governance improves. Second, the increase in the target firm's stock after the announcement and the decrease in the acquiring firm's stock are both smaller as corporate governance improves. Third, the increased in the combined value is greater when corporate governance improves. Fourth, merger activity should rise as corporate governance improves.

Second, the model predicts that there is a relationship between CEO pay, power and corporate governance. It is easy to see that CEO compensation rises as CEO power increases and falls as corporate governance improves. Furthermore, the increase in CEO compensation due to acquisitions should be smaller in environments in which corporate governance is better and CEO power is lower.

This prediction sheds some light on the existence of large differences in CEO pay across countries. For instance, CEO pay is much higher in the U.S. than in Japan and,

according to Bebchuk and Fried [2004], the greater dispersion of outside shareholders in the U.S. leads to more CEO power. Malmendier and Tate [2007]find that CEOs that receive prestigious awards in the business press, which I interpret as increasing their power, have their compensation increased as the incidence of earnings management increases.

Third, the model also predicts that as the CEO has more to lose; that is, the more powerful the CEO, the more likely that the acquirer will avoid losses from the job loss. This prediction is different from the arguments commonly made in favor of unfettered takeover activity that suggest that takeovers result in more efficient management teams (Jensen and Ruback [1983]). Furthermore, it is easy to show that if golden parachutes are in place, the premium obtained by target shareholders rises as the size of the parachute rises. If there is a premium for acquiring shareholders, this falls and if there is a discount, this increases; these effects are lower when the target CEO power is larger.[21]

Hartzell and Yermack [2004] find that some CEOs negotiate large cash payments in the form of special bonuses or increases in golden parachutes. They report that these negotiated cash payments are positively associated with the CEO's prior excess compensation and negatively associated with the likelihood that the CEO will become an executive of the acquiring company.[22] Their results, as predicted by my model, show that target shareholders receive lower acquisition premiums in transactions that involve extraordinary personal treatment of the target CEO, suggesting that trade-offs exist between the financial and career-related benefits they extract.

The last prediction concerns merger activity and corporate governance. In the U.S., the recent wave of corporate scandals has triggered a stronger regulatory response. Firms listed on the major stock exchanges are now required to hire independent board members. Academic research has found boards to be efficient tools of corporate governance. Independent boards members seem to pay more attention to corporate performance when it comes to CEO turnover or compensation (Weisbach [1998] and Dahya, Mc Connel, and Travlos [2002]). The stock market hails the appointment of independent directors with abnormal returns (Rosen and Rosenfield [1997]). According to the model, this new regulation will result in a decrease in CEO power and therefore, ceteris-paribus, the model predicts a decrease in the merger activity in the near future.

6.3 Merger Waves

The U.S. economy has experienced three large mergers waves. The 1990s merger wave occurred during periods of very high stock valuations (e.g., Maksimovic and Phillips [2001]; and Jovanovic and Rousseau [2002]). Most of the transactions were for stock, and the acquirers were typically in the same industry as the targets (Andrade,

[21]Let G be the golden parachute, then the target board surplus from merging is given by: $P - G + \delta_j G - V_j^F(\delta_j)$. Replacing this surplus in equation (17) and solving for the optimal price the result obtains.

[22]They find that executives obtain wealth increases with a median of \$4 to \$5 million and a mean of \$8 to \$11 million, roughly in line with the permanent income streams that they sacrifice. .

Mitchell, and Stafford [2001]). In the bust-up takeovers of the 1980s, many acquirers were financiers, and the mean of payment was often cash rather than stock. Raiders financed by bank debt and junk bonds acquired and split up the conglomerates that had been assembled in the 1960s because the conglomerate organization was no longer efficient (Jensen [1986], Blair [1993], Bhagat, Vishny, Jarrel, and Summers [1990]). In the conglomerate mergers of the 1960s, well-managed bidders built up diversified groups by adding capital and know-how to the acquired firms (Goert [1962], Rumelt [1974], Meeks [1977] and Steiner [1975]).

The main theories explaining merger waves can be divided into two groups: those that are based on managerial timing of market overvaluation of their firms and those that are based on more neoclassical arguments dating back at least to Goert [1962] which argue that merger waves result from shocks to an industry's economic, technological or regulatory environment. There is evidence consistent with both explanations. Rhodes-Kropf and Viswanathan [2004] look at the different firm characteristics of bidders and targets within waves. They offer empirical data that shows that aggregate merger waves occur when market valuations, measured as book-to-market ratios, are high relative to various estimates of true valuations based on accounting models or industry multiples. They note however that their results are also consistent with both behavioral mispricing stories and with the interpretation that merger activity spikes when growth opportunities are high or when firm-specific discount rates are low. Harford [2005], however, uses a common data set and methodology to run a horse race between these two theories and finds that the data is much better explained by a neoclassical explanation in which capital liquidity is taken into account. In particular, he finds that merger waves occur in response to specific industry shocks that require large scale reallocation of assets when there is sufficient overall capital liquidity. Harford [2005] argues that because higher market valuations relax financing constraints, market valuations are an important component of capital liquidity. In addition, Mitchell and Mulherin [1996] and Boone and Mulherin [2000] find that merger activity is mainly a result of industry clustering.[23] They document a clear pattern of clustering of waves within industries, and link that clustering to various technological, economic or regulatory shocks to those industries. They argue that their findings are consistent with a synergistic explanation for both acquisitions and divestitures, and are inconsistent with non-synergistic models based on entrenchment, empire building and hubris.

While the model in this paper was not designed to explain merger waves, it can shed some light on why these might occur. First, it is worthwhile to keep in mind that the model predicts that mergers occur only when there are positive synergies, regardless of CEO power and the quality of corporate governance. It also affirms that mergers are value-enhancing when synergies are sufficiently large. This, in turn, implies that to the extent that synergy gains are more likely to be realized in related acquisitions,[24] that is, mergers of firms that are in the same industry, the model predicts that merger activity should cluster in industries that receive positive technological or regulatory shocks that

[23]See, also, Andrade et al. [2001] and Harford [2005].

[24]The evidence on this is vast. See for instance, Andrade et al. [2001].

give rise to synergies. Second, the model predicts that in the presence of capital liquidity, high-valuation firms are more likely to acquire lower-valuation firms. This follows simply from the fact that the price that the acquiring firm must pay for a target firm rises with the value of the target firm and falls with the value of the acquiring firm. Thus, in a world in which there are capital liquidity constraints, due to, for instance, adverse selection or limited pledgability restrictions, high-value firms should acquire lower-value firms and merger activity should rise when capital liquidity constraints are softened. Thus, even if industry shocks do not cluster in time, merger activity, as a reaction to shocks, will cluster in time to create aggregate merger waves when capital liquidity constraints are loosened.

The main criticism of the neoclassical theories about merger waves is that the theory cannot explain why value-decreasing mergers from the acquiring shareholders' point of view take place and much less why mergers with negative combined value occur. The advantage of the CEO power story here is that it can provide an explanation for that evidence in a model where mergers are mostly synergy driven in the sense that only mergers that create positive synergies occur. In fact, the model predicts that very few mergers result in a negative combined value, but there are many mergers that destroy acquiring shareholders' value while resulting in a positive combined value.

Stock-market driven acquisition theories argue that the only reason for mergers is to pay with overvalued stocks and that most mergers should be paid by stocks and not by cash. Neoclassical theories and the CEO power story here show that paying with cash or stock makes no difference. Harford [2005] uses this as another test for the validity of each model, finding a strong time-series correlation between the proportion of an industry involved in firm-level mergers and the proportion involved in partial-firm acquisition for cash.

In broad terms, the analysis of this section suggests that an explanation based on an increase in CEO power and technological and regulatory shocks that creates potential synergies squares well with the empirical evidence on merger waves. Nonetheless, pushing these insights into a full-blown model that yields more specific predictions regarding merger waves is beyond the scope of this paper. In particular, I do not model a market for mergers and the precise transmission mechanism of different kinds of shocks or liquidity constraints.

7 Conclusions

In this paper I have presented a model of CEO power driven acquisitions. This paper forms part of a rapidly growing body of literature on the relationship between corporate governance and corporate performance that studies issues such as managerial compensation, entrenchment and corporate investment behavior. A good deal of empirical evidence appears to be consistent with this view and several new testable predictions are proposed.

As it stands, the model takes the composition of the board as given. The next natural step is to derive the board's structure from primitives so as to have a full blown model of CEO power driven mergers. This natural extension will allow us say more about

which firms are more likely to be acquirers and which are more likely to be targets. The other extension that is required in order to have a more complete understanding of the empirical evidence is to model liquidity constraints. This is based on the evidence suggesting that credit constraints are crucial determinant of merger waves in the U.S (Harford [2005]) .

Appendix

Proof of Lemma (1). The first-order conditions for the Board's problem are as follows:

$$w_s : -\frac{(1-\delta)\, r_1}{r_1 \frac{B(p)}{\triangle r} - (1-\delta)\, C_i^F} + \frac{r_1}{C_i^F} + \mu \triangle r = 0, \tag{A1}$$

and

$$w_f : -\frac{(1-\delta)\,(1-r_1)}{r_1 \frac{B(p)}{\triangle r} - (1-\delta)\, C_i^F} + \frac{(1-r_1)}{C_i^F} - \mu \triangle r + \xi = 0, \tag{A2}$$

where μ is the Lagrange multiplier for the incentive-compatibility constraint and ξ is the Lagrange multiplier for the limited-liability constraint for w_f.[25]

First, suppose that $\mu > 0$. Then it readily follows from the first-order conditions in equations (A1), (A2) and equation (6) that $\xi > 0$ and therefore $w_s^F = \frac{B(p)}{\triangle r}$ and $w_f^F = 0$.

Next, suppose that $\mu = 0$. Then it readily follows from the first-order conditions in equation (A1), (A2) and equation (6) that $\xi = 0$ and

$$\frac{(1-\delta)}{r_1 \frac{B(p)}{\triangle r} - (1-\delta)\, C_i^F} - \frac{1}{C_i^F} = 0,$$

which after a few steps of simple algebra it can be shown results in $C_i^F = \frac{r_1 B(p)}{2(1-\delta)\triangle r}$.

This is the solution to the bargaining problem when $\frac{r_1 B(p)}{2(1-\delta)\triangle r} > r_1 \frac{B(p)}{\triangle r}$; that is, when $\delta > \frac{1}{2}$. In this case there are many contracts that are optimal. In particular, I will focus without loss of generality on the contract with a wage payment after a success equal to

$$w_s^F = \frac{1}{2\,(1-\delta)} \frac{B\,(p)}{\triangle r},$$

and a payment after a failure equal to

$$w_f^F = \frac{2\delta - 1}{2\,(1-\delta)} \frac{r_1 B\,(p)}{\triangle r}.$$

The board will induce the CEO to behave whenever

$$\triangle r \pi^i \geq \delta B + (1-\delta)\, C_i^F - \alpha b,$$

with $C_i^F > B\,(p) - \alpha b$, while from shareholder's viewpoint inducing the CEO to behave it is optimal whenever $\triangle r \pi^i \geq C_i^F - \alpha b$ and it is socially efficient to induce the CEO to behave when $\triangle r \pi^i \geq B\,(p) - \alpha b$. Thus, in the presence of CEO power, the board induces the CEO to behave more often than it is optimal from shareholders' viewpoint, but less often than social efficiency requires. *Q.E.D.*

[25] The limited-liability constraint for w_s is implied by the incentive-compatibility constraint and the limited-liability constraint for w_f.

Proof of Lemma (2). The first-order conditions for the Board's problem are as follows

$$w_s : -\frac{(1-\delta)\, r_1}{-(1-\delta)\, C^M + r_1 \frac{4B(p)}{\triangle r}} + \frac{r_1}{C^M} + \mu \triangle r = 0, \tag{A3}$$

and

$$w_f : -\frac{(1-\delta)\,(1-r_1)}{-(1-\delta)\, C^M + r_1 \frac{4B(p)}{\triangle r}} + \frac{(1-r_1)}{C^M} - \mu \triangle r + \xi = 0, \tag{A4}$$

where μ is the Lagrange multiplier for the incentive compatibility constraint (11) and ξ is the Lagrange multiplier for the limited liability constraint for w_f.

First, suppose that $\mu > 0$. Then it readily follows from the first-order conditions in equations (A3) and (A4) and equation (11) that $\xi > 0$ and therefore the contract entails $w_s^M = \frac{4B}{\triangle r}$ and $w_f^M = 0$.

Next, suppose that $\mu = 0$. Then it readily follows from the first-order conditions in equations ,(A3) and (A4) and equation (11) that $\xi = 0$ and therefore

$$\frac{(1-\delta)}{-(1-\delta)\, C^M + r_1 \frac{4B(p)}{\triangle r}} - \frac{1}{C^M} = 0,$$

which after a few steps of simple algebra one can show that entails $C^M = \frac{r_1 4B(p)}{2(1-\delta)\triangle r}$.

This is the solution to the bargaining problem when $\frac{r_1 4B(p)}{2(1-\delta)\triangle r} > r_1 \frac{4B(p)}{\triangle r}$; that is, when $\delta > \frac{1}{2}$. In this case there are many contracts that are optimal. In particular, I will focus without loss of generality on the contract with a wage payment after a success equal to

$$w_s^F = \frac{4B\,(p)}{\triangle r} + \frac{2\delta - 1}{2\,(1-\delta)} \frac{r_1 4B\,(p)}{\triangle r}$$

and a wage payment after a failure equal to

$$w_f^F = \frac{2\delta - 1}{2\,(1-\delta)} \frac{r_1 4B\,(p)}{\triangle r}.$$

The board induces the CEO to behave and to select the coordination strategy whenever

$$\triangle r S \geq \delta 4B\,(p) + (1-\delta)\, C^M - 4\alpha b,$$

with $C^M > 4B$, while from shareholder's viewpoint inducing the CEO to behave it is optimal whenever $\triangle r S \geq C^M - 4\alpha b$ and first-best efficiency requires this to be the case when $\triangle r S \geq 4B\,(p) - 4\alpha b$. *Q.E.D.*

Proof of Proposition (2). From the Board's point of view, a merger is value-maximizing if and only if the benefits of merging are positive; that is,

$$r_1 S - C^M(0) \geq r_1\left(\pi^i + \pi^j\right) - C_i^F(0) - C_j^F(0).$$

Then, it readily follows from lemmas (1) and (2) this and equation (20) that a merger takes place if and only if

$$S \geq \pi^i + \pi^j + \frac{2B(p)}{\triangle r}.$$

Q.E.D.

Proof of Proposition (4). Plugging compensation costs in equation (18), one obtains that a merger takes place if and only if

$$S \geq \pi^i + \pi^j + \tfrac{2B(p)}{\triangle r} + \tfrac{B(p)}{\triangle r}\left[4\max\left\{\tfrac{1}{2}, 1-\delta_i\right\} - \max\left\{\tfrac{1}{2}, 1-\delta_i\right\} - \max\left\{\tfrac{1}{2}, 1-\delta_j\right\} - 2\right].$$

Let define the function

$$\triangle(\delta) = \left[3\max\left\{\frac{1}{2}, 1-\delta_i\right\} - \max\left\{\frac{1}{2}, 1-\delta_j\right\} - 2\right].$$

Observe that the term in square brackets is decreasing in δ_i for all $\delta_i \leq \frac{1}{2}$ and constant otherwise. In addition, for all $\delta_i > \frac{1}{2}$,

$$\triangle(\delta) = -\frac{1}{2} - \max\left\{\frac{1}{2}, 1-\delta_j\right\} < 0.$$

At $\delta_i = 0$,

$$\triangle(\delta) = 1 - \max\left\{\frac{1}{2}, 1-\delta_j\right\} \geq 0.$$

Thus, there exists a cutoff for the post-merger CEO power, denoted by $d(\delta_j)$, such $\triangle(\delta) < 0$ for all δ_i greater than $d(\delta_j)$ and $\triangle(\delta) \geq 0$ otherwise, where

$$d(\delta_j) \equiv \frac{1}{3} - \frac{1}{3}\max\left\{\frac{1}{2}, 1-\delta_j\right\}.$$

Because $\max\left\{\frac{1}{2}, 1-\delta_j\right\}$ falls as CEO power rises, $d(\delta_j)$ rises with δ_j for all $\delta_j \leq \frac{1}{6}$ and and it is independent of δ_j otherwise. *Q.E.D.*

Proof of Prediction (1). The first to notice is that the combined value is positive when $\Pi^M(\delta_i) \geq \Pi_i^F(\delta_i) + \Pi_j^F(\delta_j)$, which entails the following

$$S \geq \pi^i + \pi^j + C^M(\delta_i) - C_i^F(\delta_i) - C_j^F(\delta_j).$$

Let define $\Delta C(\delta)$ as

$$3\max\left\{\frac{1}{2(1-\delta_i)}, 1\right\} - \max\left\{\frac{1}{2(1-\delta_j)}, 1\right\} - 2.$$

Then the combined value is positive when

$$S \geq \pi^i + \pi^j + \frac{2B(p)}{\triangle r} + \frac{B(p)}{\triangle r}\Delta C(\delta).$$

Observe that $\Delta C(\delta)$ is increasing in δ_i and at $\delta_i = 1$,

$$\Delta C(\delta) = \infty - \max\left\{\frac{1}{2(1-\delta_j)}, 1\right\} - 2 > 0,$$

while at $\delta_i = 0$,

$$\triangle(\delta) = 1 - \max\left\{\frac{1}{2(1-\delta_j)}, 1\right\} \leq 0.$$

Observe that $\triangle C(\delta) \geq \triangle(\delta)$ if and only if

$$\max\left\{\frac{1}{2(1-\delta_i)}, 1\right\} - \max\left\{\frac{1}{2}, 1-\delta_i\right\} \geq \frac{1}{3}\left[\max\left\{\frac{1}{2(1-\delta_j)}, 1\right\} - \max\left\{\frac{1}{2}, 1-\delta_j\right\}\right]$$

Notice that the LHS rises without bound with δ_i and that the RHS is positive for all δ_j. Thus, for any $\delta_j < 1$, there exists a level of acquiring CEO power, denoted by $e(\delta_j)$, such that $\triangle C(\delta) \geq \triangle(\delta)$ for all $\delta_i \geq e(\delta_j)$. This implies that $S_\delta^* \leq S_\delta^{**}$ for all $\delta_i \geq e(\delta_j)$ and $S_\delta^* > S_\delta^{**}$ otherwise.

Notice that for all $\delta_i \leq \frac{1}{2}$, the LHS is equal to δ_i, while for all $\delta_i > \frac{1}{2}$, the LHS side is $\frac{\delta_i}{2(1-\delta_i)}$.

$$\text{(A5)} \qquad e(\delta_j) = \begin{cases} \frac{1}{3}\left[\max\left\{\frac{1}{2(1-\delta_j)}, 1\right\} - \max\left\{\frac{1}{2}, 1-\delta_j\right\}\right] & \text{if } \delta_i \leq \frac{1}{2} \\ \dfrac{\frac{2}{3}\left[\max\left\{\frac{1}{2\left(1-\delta_j\right)}, 1\right\} - \max\left\{\frac{1}{2}, 1-\delta_j\right\}\right]}{1+\frac{2}{3}\left[\max\left\{\frac{1}{2\left(1-\delta_j\right)}, 1\right\} - \max\left\{\frac{1}{2}, 1-\delta_j\right\}\right]} & \text{if } \delta_i > \frac{1}{2}. \end{cases}$$

Q.E.D.

Proof of Prediction (2). Observe that

$$P_i(\delta) = \frac{1}{2}\left[V_i^M(\delta_i) - V_i^F(\delta_i) - V_j^F(\delta_j)\right] + \Pi_j^F(\delta_j) + \delta_j C_j^F(\delta_j) > \Pi_j^F(\delta_j),$$

since $V_i^M(\delta_i) \geq V_i^F(\delta_i) + V_j^F(\delta_j)$. *Q.E.D.*

Proof of Prediction (3). Post-merger acquiring shareholders' value minus their pre-merger value is given by:

$$\text{(A6)} \quad \Pi^M(\delta_i) - \Pi_i^F(\delta_i) - \frac{1}{2}\left[\Pi^M(\delta_i) - \Pi_i^F(\delta_i) - \Pi_j^F(\delta_j) + \delta_i C^M(\delta_M) - \delta_i C_i^F(\delta_i) - \delta_j C_j^F(\delta_j)\right] - \Pi_j^F(\delta_j) - \delta_j C_j^F(\delta_j),$$

which after a few steps of simple algebra can be written as follows

$$\frac{1}{2}\left[V^M(\delta_i) - V_i^F(\delta_i) - V_j^F(\delta_j) - 2\delta_i C^M(\delta_i) + 2\delta_i C_i^F(\delta_i)\right].$$

It readily follows from this an the proof of proposition (4) that acquiring shareholders' post-merger value is negative if and only if

$$S < S_\delta^* + 2\delta_i\left[C^M(\delta_i) - C_i^F(\delta_i)\right] = S_\delta^* + 6\delta_i \frac{B(p)}{\triangle r}\max\left\{1, \frac{1}{2(1-\delta_i)}\right\}.$$

Because $C^M(\delta_M) > C_i^F(\delta_i)$, the term in square brackets is positive and thus mergers for which synergies are small result in negative acquiring shareholders' post-merger value.

Let define $\xi(\delta)$ as $[\Delta C(\delta) - \triangle(\delta)]$. Then, observe that

$$S_\delta^* + 2\delta_i\left[C^M(\delta_i) - C_i^F(\delta_i)\right] > S_\delta^* + \frac{B(p)}{\triangle r}\left[\Delta C(\delta) - \triangle(\delta)\right]$$

if and only if

$$\text{(A7)} \quad \left(\delta_i - \frac{1}{2}\right)\max\left\{\frac{1}{2(1-\delta_i)}, 1\right\} + \frac{1}{2}\max\left\{\frac{1}{2}, 1-\delta_i\right\} > -\frac{1}{6}\left[\max\left\{\frac{1}{2(1-\delta_j)}, 1\right\} - \max\left\{\frac{1}{2}, 1-\delta_j\right\}\right],$$

which holds true always. *Q.E.D.*

Proof of Prediction (4). Note that the acquiring firm's return is given by

$$\frac{1}{2}\left[V^M(\delta_i) - V_i^F(\delta_i) - V_j^F(\delta_j) - 2\delta_i C^M(\delta_i) + 2\delta_i C_i^F(\delta_i)\right],$$

and this falls in π_i and π_j. *Q.E.D.*

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