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FINANCIAL VS. STRATEGIC BUYERS

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ABSTRACT

This paper introduces the impact of debt misvaluation on merger and acquisition activity. Debt misvaluation helps explain the shifting dominance of financial acquirers (private equity firms) relative to strategic acquirers (operating companies). The effects of overvalued debt might seem limited since both acquirer types and target firms can access the debt markets. However, fundamental differences in governance and project co-insurance between the two types of acquirer interact with debt misvaluation, resulting in variation in how assets are owned that depends on debt market conditions. We find support for our theory in merger data using a novel measure of debt misvaluation.

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Mergers and Acquisitions (M&A) occur in waves of activity with recent troughs, for example, of only a few thousand deals in 2003 and peaks of over ten thousand deals in 1999 and 2006.[1] Within this oscillation of activity there is another shifting pattern: the percentage of so called financial sponsors (private equity firms) vs. strategic buyers (operating companies) seems to ebb and flow.

Figure 1 examines the financial sponsor vs. strategic proportion of M&A activity of all public targets with values less than $1 billion recorded in the SDC Platinum data base from 1984-2010.[2] It is immediately clear that the fraction of total deal value acquired by financial sponsors has varied dramatically over the last 25 years. This same pattern is true across many industries.

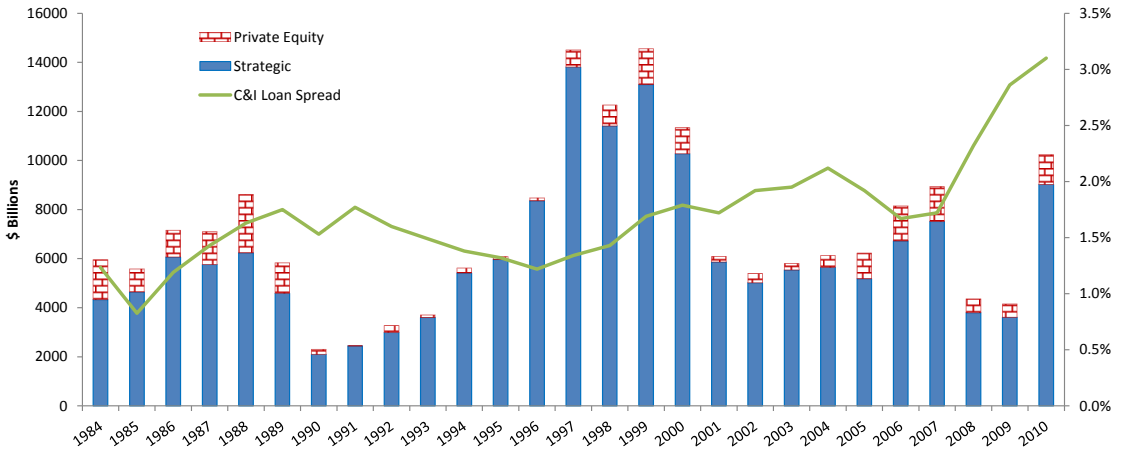

FIGURE 1. US M&A VOLUME ($10M-$1B) FINANCIAL VS. STRATEGIC

Any particular transaction has many factors that drive the ultimate acquirer's willingness-to-pay. And many theories propose reasons why particular firms or industries may be ripe for

[1]U.S. merger activity as reported by SDC Platinum data base. See Harford (2005), Rhodes-Kropf and Viswanathan (2004), Mitchell and Mulherin (1996), Andrade et al. (2001), and Holmstrom and Kaplan (2001) for empirical evidence on merger waves.

[2]Private equity firms are limited in the size of checks they can write to buy a firm by the amount they have under management and covenants with their investors, called limited partners or LPs. Both strategic and financial buyers can reasonably acquire public targets with values less than $1 billion. Increasing the target size cutoff dampens the percentage of PE activity in every period, but the increases and decreases in activity are still evident. We also removed deals less than $10M as a standard screen. The C&I spread is the commercial and industrial loan rates minus the federal funds rate. See William E. Fruhan (2010) for more on the role of PE in acquisitions and the shifting pattern across time. In the regressions that follow we do not cut the data by the size of the transaction.

acquisition activity.[3] However, the broad pattern of financial sponsor activity suggests a broad economic explanation for the coordination.

Little research directly considers the competition between financial and strategic buyers.[4] Recent papers by Bargeron et al. (2008), Hege et al. (2012), and Dittmar et al. (2012) focus on bidding behavior and target premiums between strategic and financial acquirers. Gorbenko and Malenko (2013) considers the bidding behavior of strategic vs. financial bidders focusing on how synergies cause different bidding behavior than the search for undervalued assets. Shivdasani and Wang (2011) report that structured credit fueled the most recent buyout boom. And Holmstrom and Kaplan (2001) document and discuss the LBO wave in the late 1980s. However, little research offers any broad insights into the rising and falling tides of private equity activity through the different merger waves.[5]

What drives either financial or strategic buyers to have a more dominant position in M&A activity at different points in time? This question is important not only because the economic magnitude of this activity is so large, but also because the balance of power between financial vs. strategic acquirers changes the ownership structure of assets and alters the incentives and governance mechanisms that surround the business that are the engine of our economy.[6]

One potential broad economic mechanism that would imply a shifting willingness-to-pay by strategic acquirers stems from Rhodes-Kropf and Viswanathan (2004) and Shleifer and Vishny (2003) who suggest that overvalued acquirers will bid more and overvalued targets are more willing to accept takeover offers.[7] But clearly, financial buyers who must pay in cash should avoid overvalued targets. This implies that patterns of financial vs. strategic activity could be

[3]See Jensen (1986), Maksimovic and Phillips (2001), Gorton et al. (2009), Jovanovic and Rousseau (2002), Mitchell and Mulherin (1996), Lehn et al. (1990), Mulherin and Boone (2000), and Harford (2005).

[4]Müller and Panunzi (2004), Morellec and Zhdanov (2008) and Ivashina and Kovner (2011) examine the leverage of financial buyers but they do not consider potential strategic buyers.

[5]We discuss our relationship to the only paper of which we know, Haddad et al. (2011), below.

[6]Academic work as well as the lay press suggest that there are potentially many different costs and benefits of public vs. private ownership. The difference can alter incentives, promote a long or short run focus, allow for tighter monitoring and less shirking, etc.

[7]Support for the misvaluation theory has been found by Rhodes-Kropf et al. (2005), Ang and Cheng (2006), Dong et al. (2006) and others.

driven by the same phenomenon. However, a quick look at figure 1 suggests that something else must explain financial sponsor activity as the local peaks of financial sponsor activity *relative* to strategic activity correspond with stock market peaks such as the late 90s and 2006-2007, with dips in the early 90s and 2001 recessions.

Harford (2005) shows that interest rates, specifically the spread between the average interest rate on commercial and industrial loans and the Federal Funds rate, are significantly inversely correlated with merger activity as can be seen in Figure 1. Although Harford (2005) proposes no formal theory of merger activity, he argues that this spread is a proxy for overall liquidity or ease of financing.

In this paper we combine ideas from the above work and introduce the possibility of misvalued debt markets. We demonstrate how misvalued debt can both fuel M&A activity and alter the balance between financial and strategic buyers.

While it seems reasonable that if equity markets can be misvalued then so can debt markets, it is much less obvious that "cheap" debt should lead to more acquisition activity. After all, the targets can also access cheap debt and so are more valuable as stand-alone entities when debt is cheap. On top of this, it is not clear how debt misvaluation should alter the interplay between financial and strategic buyers. Just believing that debt markets are overvalued does not imply a benefit to one type of buyer. After all, if both types of acquirers find a misvalued debt market, cannot both take advantage of it? Since it is not ex-ante obvious what misvalued debt might do to the market for acquisitions or how it would differentially impact the participants, our model provides important insights and understanding. We also provide some supportive evidence of our main theoretical implications in the data to help show the strength of the theory.

While we assume that each type of buyer and the target can equally access the debt market, there exist fundamental differences that alter the benefit to each. The fundamental differences between a strategic buyer and a financial buyer are 1) strategic buyers have a current project (or projects) they are considering combining with the target, while financial sponsors evaluate the

target as a stand-alone project, and 2) financial buyers have a different corporate governance structure (monitoring technology) than strategic buyers.[8] We interact misvalued debt with these fundamental differences to develop both a co-insurance effect and a monitoring effect of misvalued debt.

Co-insurance arises anytime less-than-perfectly correlated projects are combined. This idea was first proposed by Lewellen (1971) and then extended by Higgins and Schall (1975) and Galai and Masulis (1976) and has been repeatedly considered in the financial literature both empirically and theoretically. For example, see Kim and McConnell (1977) for an early empirical examination of co-insurance on debt prices after mergers, while Leland (2007) completes an in-depth theoretic examination, and Faure-Grimaud and Inderst (2005) considers the effect of uncorrelated projects in the context of conglomerates and governance. We build on this work to examine how co-insurance interacts with the potential misvaluation of debt claims even when agents are risk neutral.

We show that financial sponsors are better able to take advantage of interest rates that are "too low" because strategics are diversifying and therefore minimizing the error investors make. While financial buyers are hurt relatively more by interest rates that are too high because diversification is highly valued when project failure rates are expected to be high. Therefore, even though both strategic and financial buyers would like to take advantage of interest rates that are "too low" and avoid borrowing when interest rates are "too high" they are differentially impacted by the errors and are willing to pay *relatively* more or less depending on the sign of the error made on interest rates.

There is also a monitoring effect because PE buyers are often thought to have better oversight and governance than strategics. However, this monitoring technology is costly. When overvaluation reduces the perception of the moral hazard / governance problem it reduces the perceived

[8] We will see that it may be beneficial for strategics to acquire targets in a bankruptcy remote way. To the extent this is possible (while still achieving synergies) one prediction from our model is when this is more likely to occur.

cost of monitoring. This, in turn, enhances the ability of financial buyers to increase leverage and pay more. In which case the governance of a financial buyer relative to a strategic buyer will potentially cause financial buyers to dominate in overvalued debt markets. The joint presence of moral hazard and misvaluation yields interesting insights and allows us to contribute at a methodological level to the literature by analyzing an agency model with asymmetric information between investors and managers.[9]

Overall, the potential for misvalued debt has a number of interesting empirical implications. First and foremost, the possibility of misvalued debt not only changes the likelihood of an acquisition, it also changes the type of buyer and the way the assets are owned. These predictions have empirical content because although debt market mispricing may be difficult to determine in real time, by looking backward we should be able to find times when when credit was particularly misvalued and see if debt overvaluation corresponds with increased M&A activity and increased PE activity relative to strategic buyers.

We take our predictions to the data to show some suggestive evidence on the effect of misvalued debt. We introduce a novel measure of debt market overvaluation and find that it strongly correlates with the ratio of private equity (PE) to strategic merger activity. Moreover, debt market overvaluation drives out any relationship between the PE/Strategic merger activity ratio and the high-yield credit spread. Although we do not test all of our predictions, as this is predominantly a theory paper, we do find a number of other results that support the relevance of our theory.

Our theory predicts that PE firms will tend to dominate strategic buyers during times when debt markets are overvalued, but the relative dominance of PE firms to strategics should be even greater if the strategic acquirer is a conglomerate. Conglomerates have even larger co-insurance

[9]Our paper contributes to the burgeoning literature on the effect of differential beliefs on contracting such as Landier and Thesmar (2009), Gervais et al. (2011), and Goel and Thakor (2008). While these papers look at managers who are overoptimistic, we assume the manager is correctly informed but the investor mistakes (possibly optimism) interact with the moral hazard problem.

effects. Thus, the effects we propose suggest that overvalued debt markets should lead to greater dominance of financial buyers over conglomerates than over more focused strategic acquirers. We also find support for this prediction in the data.

Moreover, the model has implications for the cross section of conglomerates' leverage. As we have just argued, in overvalued debt markets conglomerates are not able to raise as much leverage as financial buyers. On the other hand, conglomerates should do relatively more acquiring (and less divesting) during *undervalued* debt markets, but during undervalued debt markets leverage use will be relatively lower. Therefore, if, as in Baker and Wurgler (2002), the effects on capital structure are persistent, then since more stand-alone firms with financial backers and high leverage will be created in overvalued debt markets and conglomerates will tend to make relatively more acquisitions during undervalued debt markets, conglomerates may have lower leverage on average.

Note that although the possibility of overvalued debt may help financial buyers win the target, overvalued debt may not help financial buyers' returns. Overvalued debt increases all financial buyer's willingness-to-pay, but competition may cause the gains to go to the target. Since PE firms are more likely to win in overvalued credit markets, they should use more leverage and pay higher prices. Axelson et al. (2013) find support for this idea and report that credit market conditions affect the prices paid and are the main driver of the quantity of debt used in buyouts. Furthermore, Axelson et al. (2013) find that highly levered transactions are associated with lower fund returns. Also, Hege et al. (2012) report that sellers of assets to PE buyers earn positive returns significantly greater than in sales to public operating firms.

Together these implications and early findings suggest that the possibility of misvalued debt may have important impacts on both firms and investors, on who buys whom, and for default levels in the economy. We hope these ideas guide future work to some interesting findings.

A recent working paper, Haddad et al. (2011), offers an alternative view on the shifting buyout activity. The authors argue that more LBOs should occur when risk-free rates are high and the

risk premium is low due to the benefits and cost of concentrated ownership. Much like the work in M&A that has shown effects due both to misvaluation and changing economic conditions, it is likely that buyout activity is also affected both by fundamentals and misvaluation. It would be interesting to look for both effects in the data.

I. The Model

The basic set up comes from the workhorse model of Holmstrom and Tirole (1997) with some interesting additions. This setup has been used to model the effect of financial intermediaries such as banks and private equity firms on aggregate investment when there are financing constraints. We build on this model to more easily connect the results to the literature and also because it provides a straight-forward way of modeling governance issues among the different types of organizational forms.

The economy consists of three types of agents: managers, private equity partners, and investors. They differ in both their abilities to generate returns and their information sets, in a way that will be clear shortly. All agents are risk-neutral. We differ from Holmstrom and Tirole (1997) in that we focus on the highest willingness-to-pay for a project as well as whether or not the project can obtain financing. We also add potential misvaluation.

A. Managers and Private Equity Partners

There is a project for sale with a current manager, who owns the project, and there are two potential buyers of the project: a PE firm (who joins with a manager), and a manager with a current project (a merger or strategic acquirer). Whether or not the project is purchased, it requires an investment I in period 1 to realize its return in period 2. In period 2, the investment generates a verifiable return equaling either 0 (failure) or R (success). A stand-alone project returns R, a project with a PE partner who monitors the project, returns R^{pe}, and a project together with another project returns R^s per project.

The probability that the project succeeds is either p_H or p_L depending on the manager's project choice (or equivalently effort choice), with $\Delta p \equiv p_H - p_L > 0$. Projects are run by managers who receive private benefits of 0, b or B where $0 < b < B$. Projects with a private benefit of b or B have a low success probability of p_L while the 'good', high probability, projects have no private benefits. This can be interpreted either as reduced/increased effort affecting probabilities of success, or as a managerial pet project with higher private benefits but lower expected returns. Thus, without proper incentives managers will choose lower expected return projects with higher private benefits.

The potential benefit of including a private equity investor is a greater return ($R^{pe} > R$) and that PE firms can monitor the project and prevent the manager from choosing the high private benefit project. However, PE firms must pay a cost, $c > 0$, to monitor and will therefore only monitor if they have the incentives to do so. We assume that $b + c - B > 0$ so that there is both a cost and a potential benefit to engaging with a PE firm and not all firms should do so.

Potential buyers of the project are willing to pay up to a maximum value $\overline{V}^{pe}$ if they are a PE firm, or $\overline{V}^{s}$ if they are a manager with another project (strategic acquisition with synergies). The stand-alone manager values the project at $\overline{V}$ which is just the highest amount they could extract from the firm if it is not sold. The price paid by a buyer is for the right to invest I in the project. Therefore, the total amount needed for the project is $\overline{V}^{i} + I$. The buyer may pay for the project and the needed investment with either the cash they posses or by raising money from investors. Stand-alone and strategic managers have capital A_m and PE investors may choose to invest capital A_{pe}. In order to focus on the interesting case when outside investors are needed we will assume that $A_m + A_{pe} < I$. Initially, and to facilitate the comparison between different organizational forms, we assume $A_{pe} = 0$; then, in section IV.C, we consider how different amounts of internal funds alter strategic and financial buyer's willingness-to-pay. We also assume that there are infinitely many investors who do not monitor and demand an

expected return of γ.[10] Since an optimal contract in this setup pays investors first and gives the residual to those who need incentives, we will often refer to managers as raising debt from investors.

The figure below summarizes the three possible organizational forms. The setup so far is similar to Holmstrom and Tirole (1997) except that we have introduced the idea of a strategic firm as well as the notion of an acquisition and a highest willingness-to-pay.

	Stand-alone	PE Acquisition	Strategic Acquisition	Assumption
Success Payoff	R	R^{pe}	$2R^s$	
Maximum Value	$\overline{V}$	$\overline{V}^{pe}$	$\overline{V}^s$	
Private Benefits	B	b	$2B$	$B > b$
Monitoring Cost	$-$	c	$-$	$b + c - B > 0$
Internal Funds	A_m	$A_m + A_{pe}$	$2A_m$	$I > A_m + A_{pe}$

FIGURE 2. SUMMARY OF PARAMETERS AND ASSUMPTIONS

B. *Uninformed Investors*

The most interesting addition to the standard modeling assumptions is the potential for investors to not know and thus estimate with error or misperceive the probability of success and failure. We assume that all managers (including acquiring managers) and private equity investors know p_H and p_L. However, investors do not know the true probabilities and instead use the probabilities p'_H and p'_L in assessing expected values.

A difference between the probabilities used by managers and those used by investors could arise fully rationally due to asymmetric information as in Myers and Majluf (1984). Or, any biases, irrationality, or limited cognitive ability and limits to arbitrage could also result in an equilibrium misperception in the probability of success (see Barberis and Thaler (2003), Hirshleifer (2001), and Shleifer (2000) for summaries). In this paper we take no stand on the source of the mistake

[10] γ could include a return due to the supply and demand for capital as well as for the equilibrium amount of expected agency costs in the model.

only that it is possible for investors to be mistaken. Uninformed investors still require a return γ and have probability beliefs such that only the good projects are economically viable, i.e., $p'_H R - \gamma I > 0 > p'_L R - \gamma I + B$.

The project probabilities and mistakes have project specific parts and parts that relate to the industry or economy as a whole, as well as other parts that relate to different characteristics of the firm (such as geography or asset intangibility). Informed players know the mistake but not the components of the mistake. If probabilities arise from many different unknown sources actions by the informed are not fully revealing. This makes arbitrage more challenging and thus the limits to arbitrage argument more plausible. For simplicity we do not examine how uninformed investors might update given the actions of the informed. The idea is that there is enough noise in a single deal that investors would learn little about aggregate debt market mispricing from a single deal.[11]

If debt markets can be under or overvalued, then the obvious conclusion is that firms should tend to issue more debt when it is overvalued. Furthermore, it would seem that all types of buyers and the stand-alone firm could take advantage of it equally, but we will see that this is not the case. Instead valuation bubbles in the debt market can lead to overall increases in acquisition activity but also to waves of dominance of one type of buyer over another.

II. Organizational Forms

This section will determine the highest amount the PE firm and the strategic buyer would be willing to offer, while simultaneously determining the reservation price of the stand-alone firm. With these benchmarks established the following section will examine the drivers that give each

[11] Under asymmetric information uninformed investors would update their beliefs conditional on informed player actions. Given the richness of the model we leave this for future work and suppress updating. The ideas we present here would continue to hold with updating as long there was enough noise in the model that informed actions were not fully revealing. For example, in Rhodes-Kropf and Viswanathan (2004), buyers are mispriced but sellers cannot distinguish between overvaluation or high synergies and so when market wide overvaluation is high sellers update prices but still overestimate the synergies. The inclusion of updating could create wave dynamics such as in Rhodes-Kropf and Viswanathan (2004) in that each deal would cause small shifts in the misvaluation until early deals were realized and revealed the truth. We model the willingness-to-pay in a single deal without updating or dynamics.

type of organizational form a higher willingness-to-pay and thus an advantage in the takeover market.

A. *Private Equity Buyout*

We first consider a manager who combines forces with a PE investor as an alternative organizational form to manage the company's assets.

One optimal contract requires the manager to invest A_m and the uninformed investors to invest the balance of $\overline{V}^{pe} + I - A_m$. The contract then pays everyone nothing if the project fails and if the project succeeds divides the payoff R^{pe} into $R_m^{pe} > 0$ for the manager, $R_{pe}^{pe} > 0$ for the PE investor and $R_u^{pe} > 0$ for the uninformed investor, where $R_{pe}^{pe} + R_m^{pe} + R_u^{pe} = R^{pe}$. Investors will only invest if they believe the manager will choose the good project. However, if the PE firm monitors the manager (at a cost $c \geq 0$) investors need only believe that $p'_H R_m^{pe} \geq p'_L R_m^{pe} + b$. Therefore, the incentive-compatible investor belief requires that the manager is paid at least

$$R_m^{pe} \geq b/\Delta p', \tag{1}$$

and the belief that the PE monitors management requires the investors to believe that $p'_H R_{pe}^{pe} \geq p'_L R_{pe}^{pe} + c$. Therefore, the incentive-compatible investor belief also requires

$$R_{pe}^{pe} \geq c/\Delta p'. \tag{2}$$

If conditions (1) and (2) hold then uninformed investors will invest $\overline{V}^{pe} + I - A_m$ as long as they also expect to earn γ on this investment. Thus, $p'_H R_u^{pe} = \gamma(\overline{V}^{pe} + I - A_m)$. Given the required return to investors, the manager earns $R_m^{pe} = R^{pe} - R_{pe}^{pe} - \gamma(\overline{V}^{pe} + I - A_m)/p'_H$ if the project is successful. Using this expression and the investors' perception of the PE's IC constraint, the

investors think that the manager's IC constraint is

$$Investor's\ view\ of\ IC \quad R_m^{pe} = R^{pe} - c/\Delta p' - \gamma(\overline{V}^{pe} + I - A_m)/p'_H \geq b/\Delta p'$$

However, uninformed investors potentially have an incorrect view. The manager will actually only choose the good project (while the PE investor will monitor) if

$$R_m^{pe} = R^{pe} - c/\Delta p - \gamma(\overline{V}^{pe} + I - A_m)/p'_H \geq b/\Delta p \tag{3}$$

This is the true IC constraint for the manager.

The notion that there is both a true IC constraint and a different perceived IC constraint is a novel aspect of our model. Only if the *perceived* IC constraint holds will investors invest, but only if the actual IC constraint, equation (3), holds will managers choose the better project.

In solving for the highest willingness-to-pay we can treat the manager and PE investor as one unit because they are both informed. Thus, either the manager will choose the better project and the PE investor will monitor or both will shirk.[12]

The manager's expected return must also be greater than γA_m otherwise the manager would rather invest A_m elsewhere. We assume an inelastic supply of projects that earn γ. Therefore, the manager's individual rationality constraint is

$$Manager's\ IR \begin{cases} R_m^{pe} \geq \gamma A_m/p_H\ if\ Manager\ IC\ holds \\ R_m^{pe} \geq (\gamma A_m - B)/p_L\ if\ Manager\ IC\ does\ not\ hold \end{cases}$$

This is different from a standard model without misvaluation because in a standard model the manager's IC always holds in equilibrium. However, with misvaluation it is possible that investors believe that the IC holds and believe that the managers will choose the better project

[12]Specifically, we assume that $R_m^{pe} < B/\Delta p$ otherwise the manager behaves without monitoring

even when they will not. In an equilibrium with misvaluation investors may invest and find that the manager chooses to shirk. Thus, the IR constraint must ensure that the managers' decision to participate is rational even when their IC does not hold.[13]

Having derived all the relevant constraints of the model, we start by solving the optimization program that derives the maximum willingness-to-pay of each type. This result is contained in the following proposition.

PROPOSITION 1: *The highest willingness-to-pay by a PE firm, $\overline{V}^{pe}$, is such that the following holds:*

$$R^{pe} - \gamma(\overline{V}^{pe} + I - A_m)/p'_H = \max[(b+c)/\Delta p', \gamma A_m/p_H + c/\Delta p] \quad if\ \gamma A_m/p_H \geq b/\Delta p \quad (4a)$$

$$R^{pe} - \gamma(\overline{V}^{pe} + I - A_m)/p'_H = \max[(b+c)/\Delta p', (\gamma A_m - B)/p_L] \quad if\ \gamma A_m/p_H < b/\Delta p \quad (4b)$$

The result of proposition 1 is four equations that describe the potential highest willingness-to-pay. Which one is in effect depends on the model's parameters. In some cases either the perceived IC or IR will bind at a point where the real IC is met (equation (4a)). Or, the perceived IC or IR will bind at a point where the real IC is potentially not met (equation (4b)). In words, the PE/Manager combination is willing to raise its offer until either the perceived IC or an IR binds.

Although the point of the paper is to compare the PE offer to the strategic offer, the stand-alone firm will serve as a benchmark. The following corollary demonstrates the reservation price of a stand-alone firm.

[13]The PE IR always holds because if their IC holds then $R^{pe}_{pe} \geq c/\Delta p > c/p_H$ and if their IC does not hold than any positive R^{pe}_{pe} is greater than or equal to the IR bound of zero.

COROLLARY 1: *The reservation value of the stand-alone firm, $\overline{V}$, is such that the following holds:*

$$R - \gamma(\overline{V} + I - A_m)/p'_H = \max[B/\Delta p', \gamma A_m/p_H] \quad if\ \gamma A_m/p_H \geq B/\Delta p \quad (5a)$$

$$R - \gamma(\overline{V} + I - A_m)/p'_H = \max[B/\Delta p', (\gamma A_m - B)/p_L] \quad if\ \gamma A_m/p_H < B/\Delta p \quad (5b)$$

One might have expected the stand-alone value of the firm to simply be the discounted net present value of the investment. Without misvaluation the price would either be the net present value or would be constrained by the inability to borrow due to the moral hazard problem. With misvaluation there is a difference between $B/\Delta p'$ and $B/\Delta p$ as well as $(b+c)/\Delta p'$ and $(b+c)/\Delta p$ (in Proposition 1). Thus, it is the mispricing directly and through its interaction with the moral hazard problem that leads to differences in the willingness-to-pay. Mispricing also creates the possibility that managers, with or without a PE partner, shirk in equilibrium. This cannot happen in a standard model but is possible with mispricing. We will return to this in a moment.

B. Strategic Acquisition

In this section we consider a manager who already has a project and is trying to buy a second project. We will call this manager a strategic acquirer and assume she has access to cash in the amount of twice A_m (i.e. $A_s = A_m$) to allow proper comparison with alternative organizational forms.

Because our definition of a firm is a pair consisting of a project and a manager, after a strategic acquisition the new entity will have two managers, each with a project. Each project still requires an investment of I and generates a return R^s with the same real and perceived probabilities as

described earlier. The payoffs of all claims are based on the outcome of both projects. Thus, we are ruling out project financing as this would be the same as a manager with a single project, which we have already analyzed.[14]

With two projects, one optimal contract requires the acquiring manager to invest $2A_m$, and the uninformed investors to invest the balance of $2\left(\overline{V}^s + I - A_m\right)$. An optimal contract then pays the two managers nothing if *both* projects fail, pays the managers nothing if one project fails, and if both projects succeed divides the payoff $2R^s$ into $2R^s_m > 0$ for both managers (each receives R^s_m) and $R^s_u > 0$ for the uninformed investor, where $2R^s_m + R^s_u = 2R^s$.

Given that managers and projects are symmetric, incentives will always be such that both managers will choose the good project or both will choose the worse project.[15] Furthermore, uninformed investors will always perceive that both managers will choose the same type of project given the incentives.[16] Thus, given that only good projects are economically viable, uninformed investors will only invest if they believe managers will choose the better projects. Now, however, a manager only gets paid if both projects pay off, thus investors need to believe that $p'^2_H R^s_m \geq p'_H p'_L R^s_m + B$.[17] Therefore, the incentive compatible investor belief requires that the manager is paid at least

$$\textit{Investor's view of IC} \qquad\qquad R^s_m \geq B/p'_H \Delta p' \tag{6}$$

However, since $p'_H \Delta p' \neq p_H \Delta p$ the manager will not actually choose the good project unless $R^s_m \geq B/p_H \Delta p$ – we must account for this when we consider the manager's individual rationality

[14]This is equivalent to assuming that the returns from each project cannot be verifiably attached to that project.

[15]If the first manager choosing the good project means the second manager wants to choose the bad project, then $p^2_H R^s_m < p_H p_L R^s_m + B$. But this implies $p_H p_L R^s_m < p^2_L R^s_m + B$ because $p_L/p_H < 1$. Which means that if the second manager chooses the bad project then so will the first. So it is a Nash equilibrium for both to choose the high private benefit project. If the first manager choosing the bad project means the second manager wants to choose the good project, then $p_H p_L R^s_m \geq p^2_L R^s_m + B^s$. But this implies $p^2_H R^s_m \geq p_H p_L R^s_m + B$ because $p_H/p_L > 1$. Which means that if the second manager chooses the good project then so will the first. So it is then a Nash equilibrium for both to choose the good project.

[16]The math in the last footnote holds with primes on each probability.

[17]We assume investors focus on the pareto-dominating equilibrium where both mangers choose the good project as long as it is incentive compatible.

constraint.

If condition (6) holds then uninformed investors will invest $2\left(\overline{V}^s + I - A_m\right)$ if they expect to earn γ on this investment. Thus, $p_H'^2 R_u^s + 2p_H'(1-p_H')R^s = 2\gamma(\overline{V}^s + I - A_m)$. Note that this equation uses the fact that in case only one of the projects is successful the payoff to the investor is the entire cash flow available, R^s, thus investors retain a debt-like priority. Hence the only unknown variable is R_u^s.

Given the previous equations, both managers will only choose the better projects if

$$Manager's\ IC \qquad R_m^s = R^s - \gamma(\overline{V}^s + I - A_m)/p_H'^2 + (1-p_H')R^s/p_H' \geq B/p_H\Delta p.$$

And investors will only provide debt for the project if they believe managers will choose the better projects.

The manager's expected return must also be greater than γA_m otherwise she would rather invest A_m elsewhere. As before, we assume an inelastic supply of projects that earn γ. Therefore, the manager's individual rationality constraint is

$$Manager's\ IR \begin{cases} R_m^s \geq \gamma A_m/p_H^2\ if\ Manager\ IC\ holds \\ R_m^s \geq (\gamma A_m - B)/p_H p_L\ if\ Manager\ IC\ does\ not\ hold \end{cases}$$

We can use the same logic as above to arrive at the strategic buyer's willingness-to-pay, presented in the following proposition.

PROPOSITION 2: *The highest $\overline{V}^s$ a strategic acquirer is willing to pay is defined by*

$$R^s/p_H' - \gamma(\overline{V}^s + I - A_m)/p_H'^2 = \max[B/p_H'\Delta p', \gamma A_m/p_H^2] \qquad if\ \gamma A_m/p_H \geq B/\Delta p \quad (7a)$$

$$R^s/p_H' - \gamma(\overline{V}^s + I - A_m)/p_H'^2 = \max[B/p_H'\Delta p', (\gamma A_m - B)/p_H p_L] \qquad if\ \gamma A_m/p_H < B/\Delta p \quad (7b)$$

The different possible equations stem from the same interaction between the misvaluation the perceived IC, the real IC and the IR discussed above for Proposition 1.

This completes the characterization of a strategic acquisition where two projects are organized under the same firm. Having examined the three possible organizational forms we next compare them and derive the main results and predictions of the paper.

III. Moral Hazard and Misvaluation

In order to analyze how the moral hazard problem and its corporate governance implications are affected by the possibility of misvaluation, we will start by adding some additional structure to our existing model. In particular, we will think of p'_H and p'_L not just as parameters but functions of an underlying variable that measures the extent of asymmetric information or misvaluation, μ. That is, with a slight abuse of notation, let us define $p'_H \equiv p'_H(\mu)$ and $p'_L \equiv p'_L(\mu)$, where p' is a continuous, differentiable and strictly increasing function of μ over its domain: $(-\infty, +\infty)$, it is bounded between 0 and 1 and $1 \geq \Delta p' \equiv p'_H - p'_L > 0$, $\forall \mu$. Moreover we shall note that $p'_H(0) = p_H$ and $p'_L(0) = p_L$; namely, in the absence of misvaluation ($\mu = 0$) the perceived probability p' coincides with the true probability, p, and since $0 \leq p' \leq 1$, we also require that $\lim_{\mu \to \infty} p'(\mu) = 1$ and $\lim_{\mu \to -\infty} p'(\mu) = 0$. Given this structure, $\mu > 0$ results in overvaluation while $\mu < 0$ results in undervaluation.

In order to understand the potential impacts of overvaluation it is important to distinguish between two possible types of overvaluation. We do so in the next proposition which separates overvaluation depending on whether it effects 'good' projects more or less than 'bad' projects, as this distinction alters the perceived moral hazard problem.

PROPOSITION 3: *Overvaluation has an ambiguous effect on the moral hazard problem. If* $\partial p'_H/\partial \mu > \partial p'_L/\partial \mu$, *overvaluation reduces the perceived moral hazard problem, but makes equilibrium shirking possible. If* $\partial p'_H/\partial \mu < \partial p'_L/\partial \mu$, *the opposite is true: overvaluation increases the perceived moral hazard problem, but the equilibrium has no shirking.*

A striking result occurs when overvaluation is introduced into a standard moral hazard setting. Because misvaluation causes the investor to incorrectly perceive probabilities, a difference between the true and perceived incentive compatibility constraint appears. Absent misvaluation, only the no-private-benefit project is funded in equilibrium because it is the only economically viable project. However, with misvaluation, the possibility that under some parameter configurations the perceived IC holds whereas the true does not, allows a firm to be funded even though the worse project is chosen in equilibrium.

When $\partial p'_H/\partial\mu > \partial p'_L/\partial\mu$, which we will call *loosening* overvaluation, overvaluation decreases the perception of the moral hazard problem and increases the willingness of investors to lend relative to *tightening* overvaluation where $\partial p'_H/\partial\mu < \partial p'_L/\partial\mu$. With loosening overvaluation actual misbehavior is possible even though the investor perception is that the problem has gotten better. In fact, equilibrium shirking is possible precisely because investors perceive the problem to be better than it actually is.

This notion of the impact of overvaluation on behavior matches the ideas of Jensen (2005), Bolton et al. (2006) and Bolton et al. (2005) wherein overvaluation worsens the moral hazard problem. However, this is not the only possibility. With tightening overvaluation investors overestimate the probability but simultaneous perceive the moral hazard problem to be worse. In this case they require the manager to be paid even more before they are willing to lend in order to believe that he will not shirk. Of course, since the manager is paid even more than is needed he does not shirk in equilibrium - thus the moral hazard problem is improved. Relative to loosening overvaluation, with tightening overvaluation investors are willing to fund fewer managers and lend less. In fact, if this tightening effect is large enough investors will be less willing to fund an overvalued firm than one that is not misvalued.

Loosening misvaluation seems logically like the most common and intuitive type of overvaluation, but in what follows we will consider the implications of both types of overvaluation. The notions of loosening or tightening overvaluation are interesting because they lead to dif-

ferent predictions. Loosening overvaluation leads to increased lending relative to tightening overvaluation (although both have high prices). We will see that some of the predicted effects of overvaluation will be more pronounced in overvalued times with increased lending. We will examine this interaction in the data at the end of the paper.

IV. Comparing Different Organizational Forms

We split this section into two parts. The first analyzes the relative ability of the different organizational forms to create value and thus bid higher for a given target. We call this the 'price' effect. Within the first part, we separate out the main drivers of the willingness-to-pay into the coinsurance effect and the monitoring effect. In the second part of the section we focus on the predictions of the model in terms of the aggregate number of firms that we expect could be acquired under one or another organizational form. We call this the 'quantities' effect.

A. The Price Effect

In order to highlight the effect that results from diversification in markets with asymmetric information we first abstract away from the moral hazard part of our set-up. We do so without loss of generality in the sense that this effect does not depend on the extent or existence of moral hazard between investors and management, we choose to isolate it only for expositional reasons. To do so, we simply need to limit the importance of the moral hazard problem until it is not affecting prices. This requires only a small enough b and B but for simplicity we assume that $b = B = 0$. We also assume $R^{pe} = R^s$ so there is both no moral hazard issue and no return benefit to any organizational form. The following proposition contains an important result of this paper.

PROPOSITION 4 (The Co-insurance Effect): *Absent moral hazard, if debt is overvalued, $\mu > 0$, then $\overline{V}^{pe} > \overline{V}^{s}$. The opposite is true when debt is undervalued. Moreover, the difference in willingness-to-pay $\overline{V}^{pe} - \overline{V}^{s}$ increases (decreases) with overvaluation (undervaluation).*

PROOF:

First, using the results in proposition 1 and 2, it is easy to see that the relevant equations become (4b) and (7b) since $A_m/p_H p_L \geq A_m/p_H^2 > 0$. *The difference between* $\overline{V}^{pe}$ *and* $\overline{V}^{s}$ *is, after some algebra,*

$$\left(\left(\frac{p'_H}{p_H}\right)^2 - \frac{p'_H}{p_H}\right) A_m.$$

The term is positive if and only if $p'_H > p_H$, *that is, when debt is overvalued. By taking the derivative with respect to* p'_H *it is immediate to see that the derivative is positive as well.*

This proposition shows us that one effect of overvaluation always helps non-diversified PE companies outbid strategic buyers. More generally, the more diversified the merged company becomes, the larger the disadvantage when debt is overvalued. This occurs because the combination of projects effectively reduces the valuation mistake being made by investors. That is, they underestimate the default probability, but that makes them underestimate the co-insurance benefit. The mistakes offset and thus an overvalued debt market cannot be as exploited by a strategic buyer as it can be by a stand-alone or PE buyer.

The co-insurance effect penalizing strategics does not mean that financial buyers will always beat strategics in overvalued markets. In general, there are other effects that will also influence who is willing to pay more, such as potential synergies, and, of course, governance effects that we explore next.

We now add back the moral hazard environment. As we have explained, one of the main differences between financial and strategic acquirers is that the monitoring capacity of PE sponsors alleviates the agency cost caused by the moral hazard problem. In order to highlight the effect that results from the interaction between overvaluation and moral hazard we assume the moral hazard problem is large enough that it is affecting prices. Specifically, in order to isolate the impact of misvaluation on the moral hazard problem we assume that private benefits are large enough relative to the firm's cash ($B > \gamma A_m(1 - p_L)$ and $b > \gamma A_m \Delta p/p_H$). These assumptions

are again without loss of generality in the sense that the moral hazard effect does not depend on the existence or magnitude of the issues that stem from diversification/co-insurance. We also now allow R^{pe} and R^s to vary and consider the set of synergies and PE value enhancements that result in one or the other type being willing to pay more. The following proposition then demonstrates the monitoring effect, which is a central point in our paper. We will see that overvaluation alters the set of financial buyers who are willing to pay more than a strategic acquirer and also changes the relative amount each is willing to offer.

PROPOSITION 5 (The Monitoring Effect): *If debt is overvalued, $\mu > 0$, and there is loosening overvaluation, $\partial p'_H/\partial\mu > \partial p'_L/\partial\mu$, then the set of financial and strategic buyers such that the financial buyer is willing to pay more than the strategic acquirer is larger, i.e., for any given R^s, increasing μ increases the set of R^{pe}s such that $\overline{V}^{pe} > \overline{V}^s$. Furthermore, within this set of financial and strategic buyers overvaluation increases the financial buyers relative willingness to pay, $\partial(\overline{V}^{pe} - \overline{V}^s)/\partial\mu > 0$.*

However, if debt is overvalued, $\mu > 0$, and there is tightening overvaluation, $\partial p'_H/\partial\mu < \partial p'_L/\partial\mu$, then the set of financial and strategic buyers such that the financial buyer is willing to pay more than the strategic acquirer is smaller, and within this set, overvaluation may or may not increase the financial buyers relative willingness to pay.

The two types of overvaluation have distinct effects on the moral hazard problem because they differentially affect the perception of the problem. The perception of the agency cost changes the value of monitoring and hence alters the ability of the firm to borrow money, which in turn alters the willingness to pay. If the perception of the moral hazard problem gets better (loosening overvaluation) then investors perceive the monitoring costs to be lower and thus perceive the total value creation of a financial buyer to be greater. This increases the investors willingness-to-lend to the financial buyer which in turn both changes the set of PE firms that can win as well as increases their relative willingness to pay.

An interesting corollary to both of the above propositions is that their effects are magnified by the current interest rate environment.

COROLLARY 2: *The required rate of return, γ, amplifies the effects of overvaluation. In particular, the lower γ is, the larger the effect of overvaluation on the difference in the willingness-to-pay of financial and strategic buyers.*

This suggests that in times when the required return is low overvaluation affects the price difference between financial and strategic buyers to a larger extent. Lowering the discount rate increases the financial and strategic buyers willingness-to-pay (it increases the net present value of the project) but also the rate at which these amounts differ with overvaluation. This is because the marginal effect of overvaluation is in itself proportional to the value of the company. Thus, whatever the first order effect of overvaluation is, it is magnified by a lower required return.

Overall, as long as synergies (R^s) or financial buyer gains (R^{pe}) are large relative to the stand-alone project then increasing overvaluation will increase the willingness-to-pay of both types of buyers relative to the stand-alone reservation value. This effect is straightforward, but what is more interesting is how they are relatively affected. We argue that the fundamental differences between a strategic buyer and a financial buyer are that strategic buyers have a current project, and financial buyers have a better monitoring technology (although it is a costly technology). We see above that both differences have implications for the relative dominance of one over the other. Whether or not financial buyers tend to be willing to pay more than strategic buyers when the market is overvalued is a combination of the monitoring effect, the coinsurance effect and other firm parameters such as synergies. A strategic buyer is unable to take full advantage of overvaluation because he has a current project that partially offsets the lenders valuation mistake. In other words, diversified acquirers are not able to extract information rents to the extent that financial buyers do. At the same time, when overvaluation lowers the perceived agency cost the increased costs associated with the PE monitoring technology are seen as less

of a burden, allowing them to borrow more and pay more. These two effects working together suggest a potential mechanism for a changing ratio of strategic to financial acquirers that depends on the level of overvaluation in debt markets.

The model provides novel intuition as to why and when PE may dominate strategic buyers and thus how to examine the data. First, we would like to find at least suggestive evidence that relative PE activity is higher in periods when debt is misvalued. But moreover, if the coinsurance effect is correct, then the relative dominance of PE should be even greater as compared to conglomerate strategic buyers. This is because conglomerate buyers are more diversified and should be more impacted by the coinsurance effect (see online appendix for proof). Furthermore, Proposition 5 showed that with loosening overvaluation the monitoring effect should help financial buyers to a greater extent than with tightening overvaluation. This suggests an interaction effect – the relative PE dominance should be even greater in times when debt is overvalued *and* there is increased lending activity in the market. And finally, if PE activity is relatively higher in periods with greater misvaluation this effect should be even larger when interest rates are low. We turn to the data to examine these ideas in Section VI but first we examine the quantities effect.

B. The Quantities Effect and Aggregate Acquisition Activity

The hidden-action agency problem creates an ex-ante financing constraint and establishes a minimum amount of internal funds needed to obtain outside financing. This cutoff determines whether a particular organizational form (PE, strategic or stand-alone) will be able to sell a debt instrument in order to finance the investment and acquisition. As this cutoff changes, the number of potential PE or strategic buyers will increase or decrease, further explaining the shifting type of acquirer (financial or strategic).

In this section we examine, among other things, when overvaluation allows more companies to raise financing under the sponsorship of a PE firm versus a strategic deal. This effect, which

we refer to as the *quantity* effect, should be added to the price effects discussed in the previous section in order to have a complete picture of the determinants of merger activity.

We start by solving for the minimum required cash for each type of firm organization. The minimum cash is always the point at which the perceived pledgable income is equal to the amount raised from outsiders, $I - A_m$. For a PE acquirer the minimum acceptable cash is

$$A_m \geq \overline{A}_m^{pe} = I - \frac{p'_H}{\gamma}(R^{pe} - \frac{b+c}{\Delta p'}). \tag{8}$$

For a stand-alone firm,

$$A_m \geq \overline{A}_m = I - \frac{p'_H}{\gamma}(R - \frac{B}{\Delta p'}). \tag{9}$$

Or for a strategic acquisition the minimum A_m is defined by

$$A_m \geq \overline{A}_m^{s} = I - \frac{p'_H}{\gamma}\left(R^{s} - \frac{B}{\Delta p'}\right). \tag{10}$$

If and when $\overline{A}_m^{pe} < \overline{A}_m^{s}$ all firms with $A_m \in [\overline{A}_m^{pe}, \overline{A}_m^{s})$ can only be acquired by a financial sponsor. Moreover, because such mass of firms possess the smallest amount of internal funds, they would also be highly leveraged deals.

The following proposition and corollary compare the three cutoffs.

PROPOSITION 6 (PE Buyout Activity and Strategic Activity): *If $\partial p'_H/\partial\mu > \partial p'_L/\partial\mu$ (loosening overvaluation), then*

i) debt overvaluation ($\mu > 0$) loosens financial constraints on all organizational forms, allowing the funding of deals with lower internal funds;

ii) debt overvaluation ($\mu > 0$) increases the set of financial and strategic buyers for which the minimum acceptable cash in a PE deal is less than in a strategic deal ($\overline{A}_m^{pe} < \overline{A}_m^{s}$). In other words, for any given R^s, increasing μ increases the set of R^{pe}s such that $\overline{A}_m^{pe} < \overline{A}_m^{s}$.

However, if $\partial p'_H/\partial\mu < \partial p'_L/\partial\mu$ (tightening overvaluation), then debt overvaluation ($\mu > 0$) may or may not allow for the funding of deals with lower internal funds, and decreases the set of financial and strategic buyers for which $\overline{A}^{pe}_m < \overline{A}^{s}_m$.

The driver of point one stems from the same intuition as Proposition 3 - if overvaluation reduces the perception of the moral hazard problem then it loosens the constraints on all types of organizational form. Loosening overvaluation reduces this perception. With tightening overvaluation there are two counteracting effects. The value of the investment is perceived to be higher, this loosens financial constraints, however, the moral hazard problem is perceived to be worse, this tightens financial constraints. The dominate effect depends on the particular parameters.

If we consider the more intuitive type of overvaluation – loosening overvaluation that reduces financial constraints – then we find that overvaluation unambiguously increases PE activity because it increases the situations in which only a PE firm will be able to acquire the target. The following corollary demonstrates that loosening overvaluation also increases overall acquisition activity by both financial and strategic acquirers.

COROLLARY 3: *Loosening overvaluation increases $(\overline{A}_m - \overline{A}^{pe}_m)$ and $(\overline{A}_m - \overline{A}^{s}_m)$ as long as financial buyers are economically efficient and strategics have positive synergies. Tightening overvaluation may or may not have the same effect.*

This corollary tells us that loosening overvaluation increases the set of firms that must be acquired by either a financial buyer or a strategic. Of course synergies must be positive or PE benefits must outweigh the increased monitoring costs, or else there are no firms that can be acquired. In summary, the quantity effect not only changes the ratio of financial to strategic acquirers, but also increases overall activity.

We have shown that with loosening overvaluation there exists an increase in the mass of firms with $A_m \in [\overline{A}^{pe}_m, \overline{A}^{s}_m)$ which only financial bidders can buy and hence a PE buyout is the optimal organizational form, while for firms such that $A_m \geq \overline{A}^{s}_m$ both types of buyers are likely to be

present in an auction for the company. And furthermore, if we believe some strategics have synergies greater than or equal to zero, then $\overline{A}_m \geq \overline{A}_m^s$. For firms with enough capital all three organizational forms are possible. The figure below illustrates the case which becomes more likely with loosening overvaluation, $\overline{A}_m > \overline{A}_m^s > \overline{A}_m^{pe}$. Thus, with loosening overvaluation PE firms can purchase targets with even less cash and take on even greater leverage.

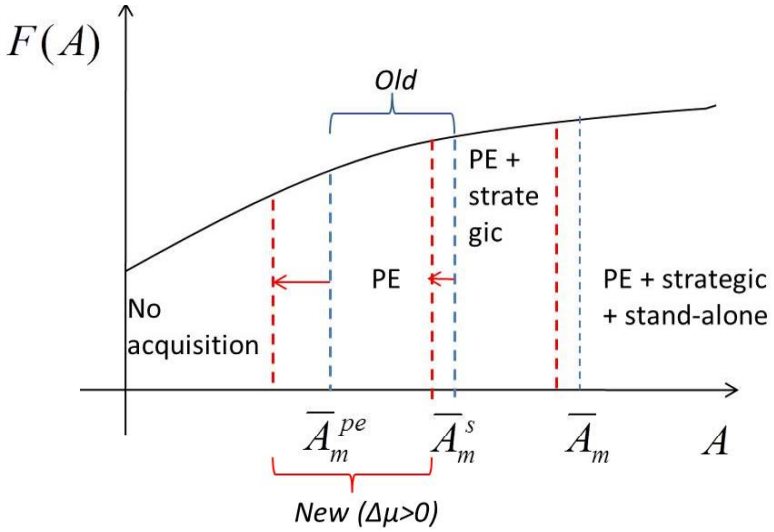

FIGURE 3. EFFECT OF OVERVALUATION ON MINIMUM REQUIRED CAPITAL.

Combining the quantity results from this section with the previous results on pricing we have that leverage should be higher in PE deals, for two reasons. One, when overvaluation causes financial buyers to pay more, they finance this with increased leverage. And two, since I is fixed, if a PE buyer alleviates the financing constraint those firms that now access investors will do so with larger amounts of debt. This is consistent with the empirical evidence that PE deals are not only highly leveraged but have leverage that depends on debt market conditions more than fundamental factors (see Axelson et al. (2013)). However, Axelson et al. (2013) argue that because leverage and returns are negatively related, their findings are inconsistent with a market-timing story. Our model shows that overvaluation may cause the willingness-to-pay to increase but this does not imply increased returns. The benefit of overvalued debt markets may

accrue to the target.

Overall we have shown how debt overvaluation can have an effect both on the acquirer willingness-to-pay and on the acquirer ability to finance the deal that could explain why we see increased financial sponsor activity that correlates with overvaluation in the debt market, particularly in highly active debt markets.

C. The Impact of Cash

In order to more easily compare the organization forms, we assumed above that PE investors brought no additional cash to the transaction. In this subsection we relax this assumption. If the financial buyer brings cash to the acquisition then, since monitoring ability is scarce, the financial buyer commands a premium return on his cash, $\gamma_{pe} \geq \gamma$.[18] Therefore, we endogenize the amount of cash brought by the financial buyer. We do so by finding the amount that allows for the highest offer. Thus, the PE's individual rationality constraint will determine PE capital, A_{pe}. If the PE IC holds then the PE investor is willing to alter his capital until the point where $\gamma_{pe} A_{pe} = p_H c/\Delta p$. Thus, investors must perceive that the PE investor will monitor and it must be individually rational for him to do so. If the PE IC does not hold, then the PE investor does not invest any capital.

PROPOSITION 7: *Allowing financial buyers to have positive cash increases their willingness-to-pay, but does not change the effect of overvaluation on their willingness-to-pay.*

Thus, if we endogenize the financial buyer's cash we see that this provides another reason that the financial buyer may offer a higher price, but cash does not change the effects of misvaluation.

[18]The minimum acceptable rate of return when the PE IC holds is determined by the condition $p_H c/\Delta p - c = \gamma A_{pe} = \gamma p_H c/\gamma_{pe}\Delta p$ which translates into $\gamma_{pe} = \gamma p_H/p_L$.

V. Predictions and Discussion

A. The Merger Wave of 2005-07

The starting point of this paper was the observation that the one thing that seemed to characterize the last wave of acquisition activity of 2005-2007 was the relatively more predominant role of financial buyers. It has been argued by both industry practitioners and some academics that this period was characterized as a period of potentially overvalued debt and hence "too low" yields and increased lending. This casual observation is consistent with, and predicted by, our model. Our model provides a characterization of this last merger wave as one potentially caused by, or at least magnified by, the misvaluation of debt.

B. The Collapse of the PE Market

Our static setup can also be taken a little further, in a more dynamic thought experiment. Let us assume that debt maturities are shorter than the investment horizon: in this case financial buyers must impound their forecast of future expected misvaluation in debt markets into their willingness-to-pay today. If debt markets shift from over to undervaluation it may turn out that a financial buyer paid significantly more than the investment is now worth given that it has to be refinanced with underpriced debt. To be clear, this was not a mistake *ex-ante* but will lead to the possibility of sudden collapses *ex-post* that are not related to a change in the health of the underlying target. Furthermore, the larger the original debt market mispricing the larger the resulting financial distress situation. Therefore, depending on the costs of financial distress, the underlying target firm may be impacted in a way that would not have occurred had debt markets been correctly priced at all times.

C. Divestitures and Asset Sales

Even though we have motivated this paper in the context of acquisition activity, its predictions and implications go beyond asset expansion and can be more generally related to overall restructuring activity. One example of this broader interpretation can be made in the context of optimal asset sale policies. When debt is overvalued a diversified company can potentially unlock value by divesting a division. As a stand-alone entity the division should be better able to extract information rents from lesser informed investors. However, a divestiture will only be an optimal strategy provided, of course, that there are no significant synergies between the division to be divested and the rest of the divisions that comprise the original firm. Hence in terms of overvalued debt markets, our paper suggests not only more acquisition activity (with potentially more financial buyers) but also more divestitures or asset sales undertaken by diversified companies or conglomerates. The reason for this prediction is the same driving our acquisition results, namely, the interaction of information asymmetries and diversification of cash flows.

D. Correlated Projects

A limiting force on the co-insurance effect occurs when firm's cash flows are positively correlated, as opposed to independent. In this case, the price effect shown in Proposition 4 is diminished and financial buyers enjoy a lower advantage, compared to strategics. An extreme example is the case of perfectly correlated projects. If the two projects are perfectly positively correlated, then the possibility of diversification disappears. The strategic acquirer scenario then becomes equal to the stand-alone case. The relevant comparison becomes the stand-alone and the private equity cases, where the differences arise from the different agency costs and monitoring. We highlight this observation because it has empirical content: strategic acquirers whose cash flows are more correlated with the target's are more able to outbid financial buyers.

VI. Evidence

Although this is predominantly a theory paper, we present some evidence that demonstrates support for the idea that debt market misvaluation may be an important driver. We hope this will encourage future work to take a more in-depth look.

In practice, misvaluation would imply that firms with relatively high ratings default too often. As it turns out, Moody's tracks the ex-post accuracy of its rating measures, using the 5-year Average Position (henceforth, AP). According to Moody's, the position of any debt issuance is defined as the share of debt issuances in a cohort rated better than it in the year the debt was issued. It assumes each debt issuance occupies the midpoint of its rating category. For example, the position of every Aa2 debt issuance is the share of the cohort rated Aaa or Aa1 plus half the share rated Aa2. The 5 year AP is then calculated as simply the average of the positions of the debt issuances that defaulted within 5 years. Intuitively, a more powerful rating system should have low rated defaults and high rated non-defaulters, meaning the AP should be high.

A higher AP reflects better ex-post accuracy of Moody's ratings. If all defaulters were initially given the lowest rating, then the AP would approach one. Alternatively if all defaulters were initially given a random rating then the AP would be about 1/2. And if all defaulters were initially given the best rating then the AP would approach zero. Thus, if more defaulters are given higher ratings then the AP would fall. Therefore, our concept of overvaluation (higher rated companies defaulting too often) will be captured by lower average positions. Moody's has provided us with quarterly cohort 5-year average position (AP) measures, and using the raw data from Moody's we have constructed AP for each of the Fama-French 12 industries.

We also use an alternative measure of misvaluation - the ratio of ratings downgrades to upgrades three years after the year of interest. We get similar inferences using this alternative. In head-to-head tests, the downgrade-to-upgrade ratio loses significance in the presence of average

position (AP).[19] So we report the results from the use of average position.

We control for other measures of bond market activity and conditions, such as the 5-year Treasury rate, the high-yield credit spread, and the average spread over the Federal Funds rate for commercial and industrial loans. As a general measure of equity valuations, we also control for the median market to book ratio (based on the Compustat population) and the standard deviation of the market to book ratio. For the level of economic activity we employ change in GDP.

Our measure of private equity activity is the fraction of the value of all deals for public targets accounted for by financial sponsors (also known as private equity or leveraged-buy-outs (LBOs). We calculate this on an annual basis. Figure 4 plots the average position and the percentage of PE activity. For our annual regression the dependent variable is the fraction of value of all deals done by PE in a given Fama-French industry, and we also look at a dependent variable as an indicator variable set to 1 for high PE periods. We define a high PE period as a year where the average fraction of activity accounted for by PE activity is more than 8.86% (which is the sample mean of the value ratio of PE deals).

Since our predictions are sharper for the relative impacts of misvaluation on PE versus conglomerate activity we also construct the $PE/(PE + conglomerate)$ ratio using the value of PE and conglomerate deals. Because we are interested in the co-insurance effect we define a conglomerate acquirer as an acquirer that is in Fama-French 12 industries other than the target company - these are clearly diversified entities.

Table I presents summary statistics for the variables used in our estimation. The average fraction of activity accounted for by PE acquirers is 8.86% and 27.27% of our years are high PE periods. The $PE/(PE + conglomerate)$ ratio averages 21%. The aggregate average position fluctuates within a relatively tight range (between 81% and 92%), so even relatively small changes

[19] We suspect this is because downgrades-to-upgrades is not cohort specific so it makes it difficult to identify exactly when the misvaluation occurred.

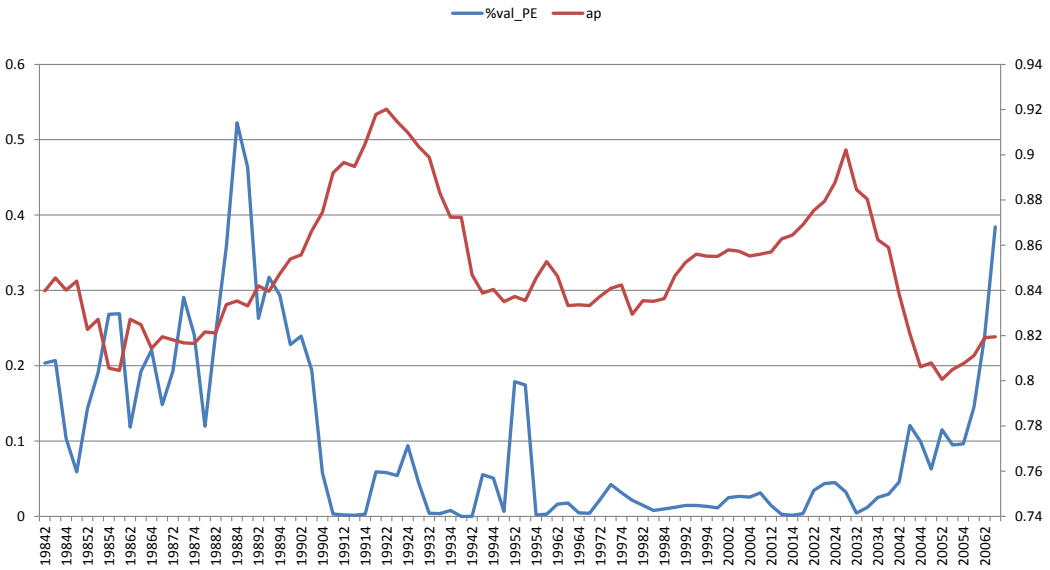

FIGURE 4. MOODY'S AVERAGE POSITION (ap) AND THE PERCENTAGE OF PE ACTIVITY ($\%val\_PE$)

in the average position reflect large changes in bond market 'misvaluation'. At the industry level, on the other hand, the range expands to 50% and 99%.

[See Table I]

We start by estimating a Tobit model of the fraction of financial buyers. We use a Tobit in order to account for the potential censoring of the dependent variable at 0. We present the results as marginal effects in Table II (columns 1 through 6), where the first row contains aggregate average position (AP), our measure of bond market pricing accuracy, and the second row the same variable calculated at the Fama-French 12, FF12, industry level. Initially we run regressions without average position so that we see the expected effects for the control variables. For example, the high-yield spread is negatively correlated with PE activity. We then add average position. It is significantly negative, confirming that in periods when 'overvaluation' is high, as measured with a low AP, PE activity increases as a fraction of total M&A activity. The effect is economically large as well: a 1% decrease in aggregate AP increases the fraction of PE activity by 3.2%. For industry level AP, the range of values is about 5 times that of

the aggregate AP and the coefficient about 1/5th of the aggregate AP so that a 1% decrease in industry AP increases the ratio of PE activity by 0.6%. Since the mean of PE activity is 8.9% it is indeed economically important. Interestingly, the high-yield spread loses significance when debt mispricing (AP) is included (see columns 3, 4 and 6). Thus, high PE activity does not seem to be just about changing economic conditions but rather is highly related to ratings mistakes.[20] Said another way, to the extent that AP is an accurate measure of mispricing and our theory is correct, then AP should drive out or reduce the coefficient on the high yield spread because the remaining variation in the high yield spread should relate to fundamental reasons that are not related to mispricing.

Column 5 includes industry fixed effects to control for industry unobserved heterogeneity. Note that the coefficient on AP continues to be significant even though, as we would expect, it is slightly less negative than in column 4. Thus, times when the industry AP is above its average, PE activity is also above its industry average. The smaller coefficient in column 5 suggests that some of the effect in column 4 comes from cross industry effects - industries with lower AP tend to have higher PE activity than those with higher AP. For robustness, column 6 in Table II presents logistic regressions predicting the probability of high PE activity. The effect of AP has the predicted sign and it is also significant. In unreported results we also rerun our analysis with private equity activity measured as the fraction of the count (rather than value) of all deals for public targets accounted for by financial sponsors, and find similar results. Finally, in untabulated results we include the aggregate dollars raised by PE firms as a control (as well as lagged dollars raised) and find similar coefficients. This controls for any concerns that the effect of PE dominance may be coming from an effect due to increased capital availability rather than the shifting bond market misvaluation.

[See Table II]

[20]Our treasury results are consistent with the prediction of a recent working paper, Haddad et al. (2011), that argues that more LBOs should occur when risk-free rates are high. It is not surprising that PE activity is related both to changing economic conditions as well as misvaluation.

In table III we continue to test some of the results and mechanisms of our theory. First, the coinsurance effect, shown in proposition 4, predicts that a conglomerate acquirer should be even more impacted in their relative ability to acquire when debt markets become overvalued because they are diversified and most impacted by the coinsurance effect. In Table III (column 1 and 2) we present Tobit regressions, the dependent variable of which is the ratio of PE activity to PE plus conglomerate activity, $PE/(PE + conglomerate)$. AP is again significantly negative, confirming that in periods when misvaluation increases, as measured by low AP, PE activity increases relative to conglomerate activity. The effect is economically large as well: a 1% decrease in AP increases the fraction $PE/(PE + conglomerate)$ by 4.83%. Since the mean of $PE/(PE + conglomerate)$ is 24.2% it is indeed economically important. As predicted by 4, the effect is 50% larger than it is for all acquirers (see column 3 of table II). Thus, the relative impact of PE to conglomerates is even stronger than on overall activity, as predicted. This finding is supportive of the coinsurance effect and neither an obvious prediction or something previously known.

[See Table III]

In columns 3 and 4 of table III we take the idea of loosening and tightening overvaluation to the data to examine the monitoring effect. Proposition 5 predicts that the monitoring effect should help PE acquirers to a greater extent when there is loosening overvaluation. If loosening overvaluation is the type of overvaluation that prevails, aggregate lending should increase (see proposition 3). Therefore even if one cannot observe directly the type of overvaluation we could see whether the data is consistent with its implication in terms of aggregate lending. We define High ΔD as a year that belongs to the upper quartile of the aggregate change in debt issuance for all Compustat firms in any given year. The marginal effect of loosening overvaluation is captured by the interaction between the dummy for large increase in debt and AP (both aggregate and industry). As predicted, the interaction has a significantly negative sign, providing indirect

evidence of loosening overvaluation and the impact of the monitoring effect on PE activity.

Finally, in columns 5 and 6 we test the result in corollary 2. There we showed that the effect of overvaluation is amplified in times when the required rate of return is low. To test this idea we create a dummy called Low H-Y which takes the value of one for an year belonging to the lowest quartile of the high-yield spread. The interaction of such indicator and AP is negative and significant, consistent with the prediction of the corollary.

VII. Concluding Remarks

In this paper we introduce debt market misvaluation in M&A. We also highlight and explain the oscillating pattern of financial vs. strategic acquirers within merger waves. We demonstrate that debt misvaluation can explain increased activity and the relative dominance of financial buyers. This is non-obvious because an overvalued debt market should raise the value of stand-alone firms as well as the willingness-to-pay of both financial and strategic acquirers as they can all access cheap debt. We model how misvaluation interacts with both co-insurance (Lewellen (1971)) and the moral hazard problem, to give financial firms a relative advantage when debt markets are overvalued.

We find a strong correlation in the data between measures of debt market misvaluation and the fraction of acquisition activity due to PE acquirers. This is consistent with our theory, which provides a possible explanation for this correlation. Further predictions of our theory are supported by the data. Thus, the evidence is consistent with the idea that misvaluation in the debt market is driving the relative dominance of PE activity.

Overall, by combining moral hazard and co-insurance with the idea of debt misvaluation we gain considerable insights into a previously unexplored pattern. We hope that future work will further examine the impact of potentially misvalued debt markets and show its relevance to M&A activity in the same way that so much has followed from the ideas of equity misvaluation.

REFERENCES

Andrade, Gregor, Mark Mitchell, and Erik Stafford. "New Evidence and Perspectives on Mergers." *Journal of Economic Perspectives* 15 (2001), pp. 103–120.

Ang, James S., and Yingmei Cheng. "Direct evidence on the market-driven acquisitions theory." *Journal of Financial Research* 29 (2006), pp. 199–216.

Axelson, Ulf, Tim Jenkinson, Per Stromberg, and Michael S. Weisbach. "Borrow Cheap, Buy High? The Determinants of Leverage and Pricing in Buyouts." *Forthcoming, Journal of Finance* (2013).

Baker, Malcolm, and Jeff Wurgler. "Market timing and capital structure." *Journal of Finance* 57 (2002), pp. 1–32.

Barberis, Nicholas, and Richard H. Thaler. "A Survey of Behavioral Finance." In George Constantinides, Milton Haris, and Rene M. Stulz, editors, "Handbook of the Economics of Finance," Amsterdam, North Holland: MacMillan (2003).

Bargeron, Leonce L., Frederik P. Schlingemann, Rene M. Stulz, and Chad J. Zutter. "Why do private acquirers pay so little compared to public acquirers?" *Journal of Financial Economics* 89 (2008), pp. 375–390.

Bolton, Patrick, Jose Scheinkman, and Wei Xiong. "Pay for Short-Term Performance: Executive Compensation in Speculative Markets." *Journal of Corporation Law* (2005).

Bolton, Patrick, Jose Scheinkman, and Wei Xiong. "Executive Compensation and Short-termist Behavior in Speculative Markets." *Review of Economic Studies* 73 (2006), pp. 577–610.

Dittmar, Amy, Di Li, and Amrita Nain. "If pays to Follow the Leader:Acquiring Targets Picked by Private Equity." *Journal of Financial and Quantitative Analysis* 47 (2012), pp. 901–931.

Dong, Ming, David Hirshleifer, Scott Richardson, and Siew Hong Teoh. "Does Investor Misvaluation Drive the Takeover Market?" *Journal of Finance* 61 (2006), pp. 725–762.

Faure-Grimaud, Antoine, and Roman Inderst. "Conglomerate entrenchment under optimal financial contracting." *American Economic Review* 95 (2005), pp. 850–861.

Galai, D., and Ronald W. Masulis. "The Option Pricing Model and the Risk Factor of Stock." *Journal of Financial Economics* (1976).

Gervais, Simon, J.B. Heaton, and Terrance Odean. "Overconfidence, Compensation Contracts, and Capital Budgeting." *Journal of Finance* 66 (2011), pp. 1735–1777.

Goel, Anand M., and Anjan V. Thakor. "Overconfidence, CEO selection and corporate governance." *Journal of Finance* 63 (2008), pp. 27372784.

Gorbenko, Alexander S., and Andrei Malenko. "Strategic and Financial Bidders in Takeover Auctions." *Forthcoming, Journal of Finance* (2013).

Gorton, Gary, Matthias Kahl, and Richard Rosen. "Eat or be eaten: A theory of mergers and merger waves." *Journal of Finance* 64 (2009), pp. 1291–1344.

Haddad, Valentin, Erik Loualiche, and Matthew Plosser. "Seeing the Forest Through the Trees: The Impact of Aggregate Discount Rates on Buyout Activity." *University of Chicago working paper* (2011).

Harford, Jarrad. "What Drives Merger Waves." *Journal of Financial Economics* 77 (2005), pp. 529–560.

Hege, Ulrich, Stefano Lovo, Myron B. Slovin, and Marie E. Sushka. "Asset Sales and the Role of Buyers: Strategic Buyers versus Private Equity." *HEC Paris working paper* (2012).

Higgins, Robert, and Lawrence Schall. "Corporate bankruptcy and conglomerate merger." *Journal of Finance* 30 (1975), pp. 93–113.

Hirshleifer, David. "Investor psychology and asset pricing." *The Journal of Finance* 56 (2001), pp. 1533–1597.

Holmstrom, Bengt, and Steven N. Kaplan. "Corporate Governance and Merger Activity in the United States: Making Sense of the 1980s and 1990s." *Journal of Economic Perspectives* 15 (2001), pp. 121–144.

Holmstrom, Bengt, and Jean Tirole. "Financial Intermediation, Loanable Funds, and the Real Sector." *The Quarterly Journal of Economics* 112 (1997), pp. 663–691.

Ivashina, Victoria, and Anna Kovner. "The private equity advantage: Leveraged buyout firms and relationship banking." *Review of Financial Studies* 24 (2011), pp. 2462–2498.

Jensen, Michael. "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers." *American Economic Review* 76 (1986), pp. 323–329.

Jensen, Michael. "Agency Costs of Overvalued Equity." *Financial Management* 34 (2005), pp. 5–19.

Jovanovic, Boyan, and Peter Rousseau. "The Q-Theory of Mergers." *The American Economic Review, Papers and Proceedings* 92 (2002), pp. 198–204.

Kim, E. Han, and John McConnell. "Corporate mergers and the co-insurance of corporate debt." *Journal of Finance* 32 (1977), pp. 349–365.

Landier, Augustin, and David Thesmar. "Financial contracting with Optimistic Entrepreneurs." *Review of Financial Studies* 22 (2009), pp. 118–150.

Lehn, Kenneth, Jeffry Netter, and Annette Poulsen. "Consolidating Corporate Control: Dual-Class Recapitalization versus Leveraged Buyouts." *Journal of Financial Economics* 27 (1990), pp. 557–580.

Leland, Hane. "On purely financial synergies and the optimal scope of the firm: implications for mergers, spin-offs, and structured finance." *Journal of Finance* 62 (2007), pp. 765–807.

Lewellen, W. G. "A Pure Financial Rationale for the Conglomerate Merger." *Journal of Finance* (1971).

Maksimovic, Vojislav, and Gordon Phillips. "The Market for Corporate Assets: Who Engages in Mergers and Asset Sales and Are There Efficiency Gains?" *The Journal of Finance* LVI (2001), pp. 2019–2065.

Mitchell, Mark L., and J. Harold Mulherin. "The impact of industry shocks on takeover and restructuring activity." *Journal of Financial Economics* 41 (1996), pp. 193–229.

Morellec, Erwan, and Alexei Zhdanov. "Financing and Takeovers." *Journal of Financial Economics* 87 (2008), pp. 556–581.

Mulherin, J. Harold, and Audra L. Boone. "Comparing acquisitions and divestitures." *Journal of Corporate Finance* 6 (2000), pp. 117–139.

Müller, Holger M., and Fausto Panunzi. "Tender Offers and Leverage." *Quarterly Journal of Economics* 119 (2004), pp. 1217–1248.

Myers, Stewart C., and N. S. Majluf. "Corporate financing and investment decisions when firms have information that investors do not have." *Journal of Financial Economics* 13 (1984), pp. 187–221.

Rhodes-Kropf, Matthew, David Robinson, and S. Viswanathan. "Valuation Waves and Merger Activity: The Empirical Evidence." *Journal of Finance* 77 (2005), pp. 561–603.

Rhodes-Kropf, Matthew, and S. Viswanathan. "Market Valuation and Merger Waves." *Journal of Finance* 59 (2004), pp. 2685–2718.

Shivdasani, Anil, and Yihui Wang. "Did Structured Credit Fuel the LBO Boom." *Journal of Finance* 66 (2011), pp. 1291–1328.

Shleifer, Andrei. *Inefficient Markets–An Introduction to Behavioral Finance*. Oxford: Oxford University Press, 1 edition (2000).

Shleifer, Andrei, and Robert W. Vishny. "Stock Market Driven Acquisitions." *Journal of Financial Economics* 70 (2003), pp. 295–311.

William E. Fruhan, Jr. "The Role of Private Equity Firms in Merger and Acquisition Transactions." *Harvard Business School Case 9-206-101* (2010).

Table I. Summary Statistics

Value by PE is the sum of the value of transactions by PE sponsors divided by the total M&A value. This is calculated for each Fama-French 12 industry. High PE is a dummy variable that takes the value of 1 if PE participation as a percentage of total deal value is above 8.86% and 0 otherwise. Aggregate AP is Moody's 5-year average position, a measure of the accuracy of a given year's bond ratings over the following 5 years. FF12 AP is the same measure at the industry level. We define AP more formally in section VI. 5-year Treasury is the yield to maturity for 5-year Treasuries. The High-Yield Spread is the difference between the Bank of America Merrill Lynch High-yield 100 index yield and the 5-year Treasury Yield. The C&I Spread is the spread between the average rate on commercial and industrial loans and the Federal Funds rate (Series E.2 from the Federal Reserve). The Change in GDP is the annual growth rate of GDP. Median M/B and Std Dev (M/B) are the median and standard deviation of the market-to-book ratio for Compustat firms (data are winsorized at the 1st and 99th percentile) at the Fama-French 12 industry level. There are 176 annual-industry observations from 1984 to 2005.

Variable	Mean	Std Dev	Min	Max
Value by PE	0.0886	0.1579	0	0.8374
High PE	0.2727	0.4466	0	1
Aggregate AP	0.8540	0.0299	0.8079	0.9179
FF12 AP	0.8288	0.0920	0.5	0.9935
5yr Treasury	5.9028	1.6809	3.03	9.09
High-Yield Spread	6.0638	2.2299	3.771	12.476
C&I Spread	1.6216	0.2461	1.19	2.12
Change in GDP	3.0833	1.2591	-0.2330	4.8254
Median M/B	1.5301	0.4352	0.9024	3.2877
Std Dev M/B	9.5218	20.3417	0.2864	158.0153
Observations	176			

Table II. Financial Buyer's Activity Relative to Strategic's

This table shows Tobit regressions (columns 1-5) and a logistic regression (column 6). Value PE is the fraction of total PE participation over total deal value. High PE is a dummy variable that takes the value of 1 if PE participation as a percentage of total deal value is above 8.86% and 0 otherwise. Observations are the annual and industry level. Reported values are marginal effects. Standard errors are in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	Value PE	Value PE	Value PE	Value PE	Value PE	High PE
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Aggregate AP			-3.2256***			
			(0.8887)			
FF12 AP				-0.6240***	-0.5318***	-0.7756**
				(0.1740)	(0.2047)	(0.3449)
5yr Treasury	0.0429***	0.0413***	0.0460***	0.0448***	0.0389***	0.0888***
	(0.0119)	(0.0122)	(0.0116)	(0.0117)	(0.0114)	(0.0207)
High-Yield Spread	-0.0192**	-0.0209***	0.0135	-0.0126	-0.0158**	-0.0158
	(0.0079)	(0.0079)	(0.0120)	(0.0079)	(0.0078)	(0.0151)
C&I Spread	0.2942***	0.2801***	0.2314***	0.2733***	0.2356***	0.4609***
	(0.0905)	(0.0921)	(0.0877)	(0.0879)	(0.0843)	(0.1763)
Change in GDP	0.0217	0.0246	0.0118	0.0205	0.0206	0.0229
	(0.0152)	(0.0150)	(0.0146)	(0.0143)	(0.0140)	(0.0283)
M/B (industry)		-0.0810**	-0.0816**	-0.0704*	-0.1187*	-0.1097
		(0.0383)	(0.0365)	(0.0366)	(0.0641)	(0.0848)
St Dev M/B		0.0007	0.0005	0.0009	0.0011	0.0020
		(0.0009)	(0.0008)	(0.0008)	(0.0009)	(0.0015)
Industry FE	N	N	N	N	Y	N
Observations	176	176	176	176	176	176

Table III. Financial Buyer's Activity. Further Tests

This table shows Tobit regressions. Value PE is the fraction of total PE participation over total deal value. PE Cong is defined as PE/(PE+Conglomerate) and analogous to Value PE, except that only deals by PE sponsors and by conglomerate acquirers are included. Conglomerate acquirers are defined as acquirers with SIC codes different from the target firm according to the Fama-French 12 industries classification. High ΔD is an indicator that is 1 in a year that belongs to the upper quartile of the aggregate change in debt issuance for all Compustat firms in any given year. Low H-Y is an indicator this is 1 for any year belonging to the lowest quartile of High Yield Spread. Observations are at the annual level and either at the industry or aggregate level. Reported values are marginal effects. Standard errors are in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

	PE Cong	PE Cong	Value PE	Value PE	Value PE	Value PE
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Aggregate AP	-4.830***	-4.264***		-3.1736***		-2.9088***
	(1.545)	(1.474)		(0.8993)		(0.8941)
FF12 AP			-0.4789**		-0.5742***	
			(0.1972)		(0.1739)	
High ΔD			0.6107*	4.6679*		
			(0.3471)	(2.5304)		
AP x High ΔD				-5.4247*		
				(2.9672)		
FF12 AP x High ΔD			-0.7786*			
			(0.4339)			
AP x Low H-Y						-0.0951*
						(0.0527)
FF12 AP x Low H-Y					-0.1045*	
					(0.0540)	
5yr Treasury	0.052***	0.040**	0.0445***	0.0322**	0.0393***	0.0407***
	(0.020)	(0.011)	(0.0117)	(0.0134)	(0.0119)	(0.0119)
High-Yield Spread	0.0100	0.0003	-0.0141*	0.0182	-0.0213**	0.0025
	(0.0212)	(0.0207)	(0.0079)	(0.0123)	(0.0091)	(0.0134)
C&I Spread	0.438***	0.349**	0.2735***	0.1511	0.2234**	0.1904**
	(0.139)	(0.136)	(0.0883)	(0.0935)	(0.0903)	(0.0895)
Change GDP			0.0198	-0.0037	0.0205	0.0131
			(0.0142)	(0.0162)	(0.0142)	(0.0145)
M/B (industry)	-0.0942	-0.216*	-0.0733**	-0.0719**	-0.0690*	-0.0793**
	(0.0644)	(0.112)	(0.0363)	(0.0362)	(0.0363)	(0.0362)
St Dev M/B	-0.0003	0.0005	0.0009	0.0006	0.0008	0.0005
	(0.0015)	(0.0017)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Industry FE	No	Yes	No	No	No	No
Observations	173	173	176	176	176	176

Technical Appendix

Proof of Proposition 1.

By definition, $\overline{V}^{pe}$ is the largest number such that the manager's payoff satisfies the perceived IC constraint, $R_m^{pe} \geq b/\Delta p'$, and the relevant IR, which is either $R_m^{pe} \geq \gamma A_m/p_H$ or $R_m^{pe} \geq (\gamma A_m - B)/p_L$ depending on whether the manager's true IC constraint binds. Thus, the "if" statement in the proposition checks to see if the true IC constraint is met when the IR constraint binds. The manager's ability to extract value is constrained by the perceived IC and IR constraints.

First, if $\gamma A_m/p_H \geq b/\Delta p$, the true IC binds if the manager participates because $R_m^{pe} \geq \gamma A_m/p_H \Rightarrow R_m^{pe} \geq b/\Delta p$. Therefore the manager exerts effort and the relevant IR in this case is $R_m^{pe} \geq \gamma A_m/p_H$. The highest willingness-to-pay is defined by the constraint that allows shareholders to extract the highest value. Since uninformed investors of the project expect to get $p'_H R_u^{pe} = \gamma(\overline{V} + I - A_m)$, and $R^{pe} - R_u^{pe} = R_m^{pe} + R_{pe}^{pe}$, we can rewrite the perceived IC constraint as

$$R^{pe} - \gamma(V^{pe} + I - A_m)/p'_H \geq (b + c)/\Delta p'$$

and also the IR constraint as

$$R^{pe} - \gamma(V^{pe} + I - A_m)/p'_H \geq \gamma A_m/p_H + c/\Delta p.$$

It is easy to see that the maximum willingness-to-pay is constrained by the maximum value of the right hand side of the above constraints, which explains the max function in the proposition. If $(b + c)/\Delta p' \geq \gamma A_m/p_H + c/\Delta p$,

$$\overline{V}^{pe} = \frac{p'_H\left(R^{pe} - (b + c)/\Delta p'\right)}{\gamma} - I + A_m$$

and if $\gamma A_m/p_H + c/\Delta p > (b + c)/\Delta p'$,

$$\overline{V}^{pe} = \frac{p'_H R^{pe}}{\gamma} - I + \left(1 - \frac{p'_H}{p_H}\right) A_m - p'_H \frac{c}{\Delta p}.$$

Secondly, if $\gamma A_m/p_H < b/\Delta p$ then $(\gamma A_m - B)/p_H < (\gamma A_m - b)/p_H < \gamma A_m/p_L$. Therefore, if $(b + c)/\Delta p' < (\gamma A_m - B)/p_L$ then the manager chooses the lower probability project and the relevant IR is $R_m^{pe} \geq (\gamma A_m - B)/p_L$. If $(b + c)/\Delta p' \geq (\gamma A_m - B)/p_L$,

$$\overline{V}^{pe} = \frac{p'_H\left(R^{pe} - (b + c)/\Delta p'\right)}{\gamma} - I + A_m$$

and if $(\gamma A_m - B)/p_L > (b+c)/\Delta p'$,

$$\overline{V}^{pe} = \frac{p'_H\left(R^{pe} + B/p_L\right)}{\gamma} - I + \left(1 - \frac{p'_H}{p_L}\right) A_m.$$

Proof of Corollary 1.

The result follows directly from proposition 1 by simply setting $R^{pe} = R$, $c = 0$ and $b = B$. *Q.E.D.*

Proof of Proposition 2.

The proof follows the same steps as the proof of proposition 1 using the derivation of the different equations from the main text. *Q.E.D.*

Proof of Proposition 3.

From Corollary 1 we know that if $B/\Delta p'$ is larger than or equal to either $\gamma A_m/p_H$ or $(\gamma A_m - B)/p_L$ then

$$\overline{V} = \frac{p'_H\left(R - B/\Delta p'\right)}{\gamma} - I + A_m.$$

Note that from the perceived IC constraint, the moral hazard cost is equal to $B/\Delta p'$. If $\partial p'_H/\partial\mu > \partial p'_L/\partial\mu$ then the perceived moral hazard cost decreases with overvaluation because

$$\frac{\partial B/\Delta p'}{\partial\mu} = -\frac{B}{\Delta p'}\left(\frac{\partial p'_H}{\partial\mu} - \frac{\partial p'_L}{\partial\mu}\right) < 0,$$

whereas when $\partial p'_L/\partial\mu > \partial p'_H/\partial\mu$ the opposite is true.

In the first case, which we call loosening overvaluation because it loosens the perceived IC constraint, it is possible for the perceived IC constraint to hold at the same time as the true IC constraint does not. To show this, assume that $\gamma A_m < B/\Delta p$ (in which case it follows that $(\gamma A_m - B)/p_L < \gamma A_m$). In that case it is possible that $B/\Delta p' > \gamma A_m$, implying that investors believe that the manager is exerting effort and it is perceived to be individually rational to do so, but since $B/\Delta p' > B/\Delta p$ her true IC is not met. This possibility does not arise with tightening overvaluation because then $B/\Delta p' < B/\Delta p\ \forall\mu$, hence when the perceived IC holds so does the true IC constraint. *Q.E.D.*

Proof of Proposition 5.

First, note that $B/(1-p_L) > \gamma A_m \Rightarrow B/\Delta p' > \gamma A_m$, $\forall\mu$. Moreover loosening overvaluation implies $\Delta p' > \Delta p$, $\forall\mu$ hence $B/\Delta p > \gamma A_m$. This means that the equation determining maximum willingness-to-pay by a strategic acquirer is given by (7b). Second, if $p_H b/\Delta p > \gamma A_m$ then it is also easy to verify that what determines highest willingness-to-pay of a PE buyer is (4b).

Altogether, we must consider

$$\overline{V}^{pe} = \frac{p'_H}{\gamma}(R^{pe} - \frac{b+c}{\Delta p'}) - I + A_m$$

and

$$\overline{V}^{s} = \frac{p'_H}{\gamma}(R^{s} - B/\Delta p') - I + A_m.$$

The difference is

$$\overline{V}^{pe} - \overline{V}^{s} = \frac{p'_H}{\gamma}\left[(R^{pe} - R^{s}) - \frac{b+c-B}{\Delta p'}\right],$$

and the set of parameter values such that $\overline{V}^{pe} - \overline{V}^{s} > 0$ include any set $\{R^{pe}, R^{s}, b, c, B, \Delta p'\}$ such that

$$R^{pe} - R^{s} > \frac{b+c-B}{\Delta p'} \equiv \Delta R^*(\mu).$$

Furthermore, for a given $\{b, c, B, \Delta p'\}$ there is a set $\{R^{pe}, R^{s}\}$ such that $\overline{V}^{pe} - \overline{V}^{s} > 0$, i.e., $R^{pe} - R^{s} > \Delta R^*(\mu)$. Taking derivatives, we find

$$\frac{\partial\left(\overline{V}^{pe} - \overline{V}^{s}\right)}{\partial\mu} = \left(\frac{R^{pe} - R^{s}}{\gamma} - \frac{b+c-B}{\gamma\Delta p'}\right)\frac{\partial p'_H}{\partial\mu} + p'_H\frac{b+c-B}{\gamma\Delta p'^2}\left[\frac{\partial p'_H}{\partial\mu} - \frac{\partial p'_L}{\partial\mu}\right].$$

First note that $\left(R^{pe} - R^{s} - \frac{b+c-B}{\Delta p'}\right)\frac{\partial p'_H}{\partial\mu} > 0$ iff $R^{pe} - R^{s} > \Delta R^*(\mu)$. This is so because of the definition of $\Delta R^*(\mu)$ and by noting that overvaluation implies $\frac{\partial p'_H}{\partial\mu} > 0$.

LEMMA 1: *Loosening overvaluation implies* $\frac{\partial\Delta R^*(\mu)}{\partial\mu} < 0$ *whereas tightening overvaluation implies* $\frac{\partial\Delta R^*(\mu)}{\partial\mu} > 0$.

PROOF:

Using (VII) and taking derivatives yields

$$\frac{\partial\Delta R^*(\mu)}{\partial\mu} = -\frac{b+c-B}{\Delta p'^2}\left[\frac{\partial p'_H}{\partial\mu} - \frac{\partial p'_L}{\partial\mu}\right].$$

Given that $b + c - B > 0$, *a necessary condition for* $\frac{\partial\Delta R^*(\mu)}{\partial\mu} < 0$ *is* $\frac{\partial p'_H}{\partial\mu} - \frac{\partial p'_L}{\partial\mu} > 0$, *which is the condition for loosening overvaluation. Similarly a necessary condition for* $\frac{\partial\Delta R^*(\mu)}{\partial\mu} > 0$ *is* $\frac{\partial p'_H}{\partial\mu} - \frac{\partial p'_L}{\partial\mu} < 0$, *which is the condition for tightening overvaluation.*

The lemma above implies that loosening overvaluation causes the set of returns $\{R^{pe}, R^{s}\}$ such that $R^{pe} - R^{s} > \Delta R^*(\mu)$ to increase since $\frac{\partial\Delta R^*(\mu)}{\partial\mu} < 0$. Moreover for those $\{R^{pe}, R^{s}\}$ such that $R^{pe} - R^{s} > \Delta R^*(\mu)$, $\frac{\partial\left(\overline{V}^{pe} - \overline{V}^{s}\right)}{\partial\mu} > 0$ since $R^{pe} - R^{s} - \frac{b+c-B}{\Delta p'} > 0$ and by loosening overvaluation $\frac{\partial p'_H}{\partial\mu} - \frac{\partial p'_L}{\partial\mu} > 0$.

On the other hand, tightening overvaluation causes the set of returns $\{R^{pe}, R^s\}$ such that $R^{pe} - R^s > \Delta R^*(\mu)$ to decrease since $\frac{\partial \Delta R^*(\mu)}{\partial \mu} > 0$. Moreover for those $\{R^{pe}, R^s\}$ such that $R^{pe} - R^s > \Delta R^*(\mu)$ the sign of $\frac{\partial\left(\overline{V}^{pe} - \overline{V}^s\right)}{\partial \mu}$ is ambiguous since by definition $R^{pe} - R^s - \frac{b+c-B}{\Delta p'} > 0$ but tightening overvaluation implies $\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu} < 0$, hence the overall marginal effect of overvaluation depends on the parameter values and which of the two effects dominate. *Q.E.D.*

Proof of Corollary 2.

We differentiate the difference in willingness to pay with respect to overvaluation to obtain

$$\frac{\partial\left(\overline{V}^{pe} - \overline{V}^s\right)}{\partial \mu} = \frac{1}{\gamma}\left(R^{pe} - R^s - \frac{b+c-B}{\Delta p'}\right)\frac{\partial p'_H}{\partial \mu} + \frac{1}{\gamma}\frac{p'_H\left(b+c-B\right)}{\Delta p'^2}\left[\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu}\right].$$

To evaluate how the marginal effect of overvaluation is affected by the required rate of return γ we take derivatives of the expression above to find that

$$\frac{\partial\left(\overline{V}^{pe} - \overline{V}^s\right)}{\partial \mu \partial \gamma} = -\frac{1}{\gamma^2}\left(R^{pe} - R^s - \frac{b+c-B}{\Delta p'}\right)\frac{\partial p'_H}{\partial \mu} - \frac{1}{\gamma^2}\frac{p'_H\left(b+c-B\right)}{\Delta p'^2}\left[\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu}\right].$$

Notice that if and when $\partial\left(\overline{V}^{pe} - \overline{V}^s\right)/\partial \mu < 0 \Rightarrow \partial\left(\overline{V}^{pe} - \overline{V}^s\right)/\partial \mu \partial \gamma > 0$ and vice versa. In words, if overvaluation has a negative (positive) effect on $\overline{V}^{pe} - \overline{V}^s$ then a lower γ will make such effect even more negative (positive). Thus the direct effect of misvaluation is amplified by the required rate of return and the amplification result does not depend on the sign of $\partial\left(\overline{V}^{pe} - \overline{V}^s\right)/\partial \mu$. *Q.E.D.*

Proof of Proposition 6.

First, from (8) and (9) we can express $\overline{A}^{pe}_m - \overline{A}^s_m$ as

$$\overline{A}^{pe}_m - \overline{A}^s_m = -\frac{p'_H}{\gamma}\left[R^{pe} - R^s - \frac{b+c-B}{\Delta p'}\right];$$

and the set of parameter values such that $\overline{A}^{pe}_m - \overline{A}^s_m < 0$ include any $\{R^{pe}, R^s, b, c, B, \Delta p'\}$ such that

$$R^{pe} > R^s + \frac{b+c-B}{\Delta p'} \equiv \widetilde{R}(\mu).$$

Furthermore, for a given $\{b, c, B, \Delta p', R^s\}$ there is a set of values for R^{pe} such that $\overline{A}^{pe}_m - \overline{A}^s_m < 0$, i.e., $R^{pe} > \widetilde{R}(\mu)$. Taking derivatives, we find

$$\frac{\partial\left(\overline{A}^{pe}_m - \overline{A}^s_m\right)}{\partial \mu} = \left(\frac{R^{pe} - R^s}{\gamma} - \frac{b+c-B}{\gamma \Delta p'}\right)\frac{\partial p'_H}{\partial \mu} + p'_H\frac{b+c-B}{\gamma \Delta p'^2}\left[\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu}\right].$$

First note that $\left(R^{pe} - R^s - \left(b+c-B\right)/\Delta p'\right)\frac{\partial p'_H}{\partial \mu} > 0$ iff $R^{pe} > \widetilde{R}(\mu)$. This is so because of the

definition of $\widetilde{R}(\mu)$ and by noting that overvaluation implies $\frac{\partial p'_H}{\partial \mu} > 0$.

LEMMA 2: *Loosening overvaluation implies* $\partial \widetilde{R}(\mu)/\partial \mu < 0$ *whereas tightening overvaluation implies* $\partial \widetilde{R}(\mu)/\partial \mu > 0$.

PROOF:

Note that

$$\frac{\partial \widetilde{R}(\mu)}{\partial \mu} = -\frac{b+c-B}{\Delta p'^2}\left[\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu}\right],$$

given that $b+c-B > 0$, *a necessary condition for* $\frac{\partial \widetilde{R}(\mu)}{\partial \mu} < 0$ *is* $\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu} > 0$, *which is the condition for loosening overvaluation. Similarly a necessary condition for* $\frac{\partial \widetilde{R}(\mu)}{\partial \mu} > 0$ *is* $\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu} < 0$, *which is the condition for tightening overvaluation.*

The lemma above implies that loosening overvaluation causes the set of returns R^{pe} such that $R^{pe} > \widetilde{R}(\mu)$ to increase since $\frac{\partial \widetilde{R}(\mu)}{\partial \mu} < 0$. Moreover for those R^{pe} such that $R^{pe} > \widetilde{R}(\mu)$, $\frac{\partial \overline{A}_m^{pe} - \overline{A}_m^s}{\partial \mu} > 0$ since $R^{pe} - R^s - (b+c-B)/\Delta p' > 0$ and by loosening overvaluation $\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu} > 0$.

On the other hand, tightening overvaluation causes the set of returns R^{pe} such that $R^{pe} > \widetilde{R}^{pe}(\mu)$ to decrease since $\frac{\partial \widetilde{R}^{pe}(\mu)}{\partial \mu} > 0$. Moreover for those R^{pe} such that $R^{pe} > \widetilde{R}^{pe}(\mu)$ the sign of $\frac{\partial \overline{A}_m^{pe} - \overline{A}_m^s}{\partial \mu}$ is ambiguous since by definition $R^{pe} - R^s - (b+c-B)/\Delta p' > 0$ but tightening overvaluation implies $\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu} < 0$, hence the overall marginal effect of overvaluation depends on the parameter values and which of the two effects dominate. *Q.E.D.*

Proof of Corollary 3.

Taking derivatives of $\overline{A}_m - \overline{A}_m^{pe}$ with respect to μ results in the following expression:

$$\frac{\partial\left(\overline{A}_m - \overline{A}_m^{pe}\right)}{\partial \mu} = \left(\frac{R^{pe} - R}{\gamma} - \frac{b+c-B}{\gamma \Delta p'}\right)\frac{\partial p'_H}{\partial \mu} + \frac{p'_H}{\gamma}\frac{b+c-B}{\Delta p'^2}\left[\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu}\right].$$

A PE acquisition is economically efficient as long as the benefits outweigh the costs, i.e., $R^{pe} - R > \frac{b+c-B}{\Delta p'}$. If so then $\frac{\partial\left(\overline{A}_m - \overline{A}_m^{pe}\right)}{\partial \mu} > 0$ as long as $\frac{\partial p'_H}{\partial \mu} - \frac{\partial p'_L}{\partial \mu} > 0$, which is the definition of loosening misvaluation.

On the other hand, if overvaluation is tightening the effect of overvaluation is ambiguous even when $\frac{R^{pe} - R}{\gamma} - \frac{b+c-B}{\gamma \Delta p'} \leq 0$.

Taking derivatives of $\overline{A}_m - \overline{A}_m^s$ with respect to μ results in the following expression:

$$\frac{\partial\left(\overline{A}_m - \overline{A}_m^s\right)}{\partial \mu} = \left(\frac{R^s - R}{\gamma}\right)\frac{\partial p'_H}{\partial \mu},$$

which is positive as long as synergies are non-negative, i.e., $R^s > R$. *Q.E.D.*

Proof of Proposition 7.

A first step requires rewriting Proposition 1 to take into account the financial buyer's decision to contribute her own funds in the deal. The lemma below is the equivalent of proposition 1 with (endogenously determined) PE capital, once we take into account that the PE only invests her own capital A_{pe} if her IC constraint holds (which can only occur when the manager's IC holds). In which case the PE capital, A_{pe}, is determined in equilibrium by the IR constraint, provided that this increases the willingness-to-pay (if adding more capital decreases the offer price then the PE firm adds no capital).

LEMMA 3: *Including A_{pe} will modify the amount borrowed from uninformed investors and also the IR for the PE manager, therefore, (4a) becomes*

$$R^{pe} - \gamma \left(V^{pe} + I - A_m - A_{pe}\right)/p'_H = \max\left[(b+c)/\Delta p', \gamma A_m/p_H + \gamma_{pe}A_{pe}/p_H\right] \quad if\ \gamma A_m/p_H \geq b/\Delta p$$

and (4b) can be rewritten as

$$R^{pe} - \gamma \left(V^{pe} + I - A_m - A_{pe}\right)/p'_H = \max\left[(b+c)/\Delta p', \left(\gamma A_m - B\right)/p_L\right] \quad if\ \gamma A_m/p_H < b/\Delta p.$$

If $\gamma A_m/p_H \geq b/\Delta p$, there are two cases that we must assess. If $\max[(b+c)/\Delta p', \gamma A_m/p_H + \gamma_{pe}A_{pe}/p_H] = (b+c)/\Delta p'$, then A_{pe} increases the bid and equals $p_H c/\gamma_{pe}\Delta p$, based on the PE IR constraint, which is given by

$$p_H R^{pe}_{pe} = \gamma_{pe} A_{pe}$$

The true IC constraint is

$$R^{pe}_{pe} \geq c/\Delta p.$$

Therefore the PE's willingness to pay is given by

$$\overline{V}^{pe} = \frac{p'_H\left(R^{pe} - (b+c)/\Delta p'\right)}{\gamma} - I + A_m + \frac{p_H c}{\gamma_{pe}\Delta p}.$$

On the other hand if $\max[(b+c)/\Delta p', \gamma A_m/p_H + \gamma_{pe}A_{pe}/p_H] = \gamma A_m/p_H + \gamma_{pe}A_{pe}/p_H$ then

$$\overline{V}^{pe} = p'_H R^{pe}/\gamma - I + A_m + A_{pe} - p'_H A_m/p_H - p'_H \gamma_{pe} A_{pe}/\gamma p_H.$$

Since $p'_H > p_H$ and $\gamma_{pe} > \gamma$ then A_{pe} negatively affects the maximum bidding price, and in equilibrium $A_{pe} = 0$, and

$$\overline{V}^{pe} = p'_H R^{pe}/\gamma - I + A_m - p'_H A_m/p_H$$

If $\max[(b+c)/\Delta p', (\gamma A_m - B)/p_L] = (\gamma A_m - B)/p_L$, then when $\gamma A_m/p_H < b/\Delta p$ the manager's true IC does not hold, and therefore the PE manager does not monitor and $A_{pe} = 0$. Therefore,

$$\overline{V}^{pe} = \frac{p'_H (R^{pe} + B/p_L)}{\gamma} - I + \left(1 - \frac{p'_H}{p_L}\right) A_m.$$

If $\max[(b+c)/\Delta p', (\gamma A_m - B)/p_L] = (b+c)/\Delta p'$, then

$$\overline{V}^{pe} = \frac{p'_H (R^{pe} - (b+c)/\Delta p')}{\gamma} - I + A_m + A_{pe}.$$

Furthermore, if $(b+c)/\Delta p' > \gamma A_m/p_H + \gamma_{pe} A_{pe}/p_H$ (with $A_{pe} = p_H c/\gamma_{pe}\Delta p$) then the IC holds and

$$\overline{V}^{pe} = \frac{p'_H (R^{pe} - (b+c)/\Delta p')}{\gamma} - I + A_m + \frac{p_H c}{\gamma_{pe}\Delta p}.$$

otherwise the IC does not hold and $A_{pe} = 0$ so

$$\overline{V}^{pe} = \frac{p'_H (R^{pe} - (b+c)/\Delta p')}{\gamma} - I + A_m.$$

As we can see from comparing the new price expressions with proposition 1, $\overline{V}^{pe}$ weakly increases in the amount $A_{pe} = p_H c/\gamma_{pe}\Delta p$. In other words, $\overline{V}^{pe}$ increases by $p_H c/\gamma_{pe}\Delta p$ when $A_{pe} > 0$. Otherwise it is equal to the case with no PE capital. This proves the first part of the proposition. Furthermore, since

$$\overline{V}^{pe} = \overline{V}^{pe}(\text{No PE capital}) + p_H c/\gamma_{pe}\Delta p,$$

it is immediate to realize that

$$\frac{\partial \overline{V}^{pe}}{\partial \mu} = \frac{\partial \overline{V}^{pe}(\text{No PE capital})}{\partial \mu},$$

which concludes the proof. *Q.E.D.*