Winner's Curse in Takeovers? Evidence from Investment Bank Valuation Disagreement *

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Abstract: Existing literature debates the existence of the winner's curse in mergers and acquisitions, a phenomenon in which the winning bidder fails to account for the uncertainty about the target value and thus overpays for the acquisition. Using a unique setting where target firms hire multiple investment banks as advisors, we construct a novel measure of target valuation uncertainty based on the disagreement of investment banks on target valuation. We find that in the presence of high valuation disagreement, bidders on average pay significantly higher acquisition premiums, and bidders who pay higher premiums have lower returns around merger announcements and in the long run. These bidders also create lower merger synergies. Our results are robust to the control for selection bias using Heckman two-stage model with an exclusion restriction. Moreover, the winner's curse is more pronounced when bidders have overconfident CEOs. Overall, our findings suggest that the winner's curse does exist in takeovers and causes distortions in resource allocation.

Keywords: Mergers and acquisitions, winner's curse, valuation disagreement, acquisition premiums, bidder returns, merger synergies, CEO overconfidence

JEL Classification: G41; G14; G34

Well-developed theories on the winner's curse can potentially explain poor bidder performance in mergers and acquisitions (Roll, 1986), and the key condition for the winner's curse is the uncertainty concerning the target value (e.g., Capen, Clapp, and Campbell, 1971; Bazerman and Samuelson, 1983; Varaiya, 1988). Higher disagreement on the estimated target value makes it more likely that a winning bid, lying in the right tail of the bid distribution, significantly exceeds the fair value of the target firm.[1] If bidders fail to account for the uncertainty of the target value, then the bidder with the largest positive valuation error will win the competition.[2] The empirical relevance of the winner's curse is central to takeover efficiency, because with the winner's curse, the bidder who overpays the most will acquire the target instead of the bidder who can create the highest synergy. To date, however, we only have limited empirical evidence of the winner's curse in mergers and acquisitions.[3]

A major challenge for testing the winner's curse is accurately measuring the divergence of opinion about target valuation among potential bidders. In this paper, we exploit a unique institutional feature to directly identify the divergence of opinion about target valuation. In an acquisition of a publicly traded U.S. company, the target firm is required to file relevant merger documents with the U.S. Securities and Exchange Commission (SEC) before deal completion. The target firms almost always hire investment banks to provide valuation analysis, and the bank valuation (called "fairness opinions") needs to be disclosed in merger filings.[4] We manually collect bank valuations for deals with multiple investment banks and construct a measure of *valuation disagreement* based on the investment banks' disagreement on target valuation.

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[1] For example, Bazerman and Samuelson (1983) state that "… *if a $1 bill is auctioned off, there will be no uncertainty about the value of the item, and no variance in bidder estimates would be predicted*."

[2] The takeover process is highly competitive. Recent studies show that even when there is a lack of competing public bidders, there are often private merger negotiations before the deal is publicly announced. See, for example, Eckbo, Malenko, and Thorburn (2020) for a detailed review on the private negotiation process in recent research.

[3] While earlier studies such as Roll (1986) and Varaiya (1988) suggest the existence of the winner's curse in mergers and acquisitions, Boone and Mulherin (2008) find little evidence for the winner's curse using manually collected data on the private auction process. We describe this debate in Section 1.

[4] Bidders may also hire investment banks to conduct valuation analysis, but such analysis is often not disclosed to the public. See Sections 2.1 and 2.2 for more details.

Our valuation disagreement measure is more suitable for studying the winner's curse in takeovers than traditional investor disagreement measures such as analyst forecast dispersion or stock return volatility. First, traditional measures are typically constructed using only one piece of information (e.g., analysts' earnings forecasts or historical stock returns). Thus, they are imperfect proxies for the overall firm valuation. In contrast, investment banks incorporate all possible information relating to the business, operations, earnings, cash flows, assets, liabilities and prospects of the target firm to provide estimates of the overall firm value, which is directly related to the takeover offer price. As a result, investment banks' disagreement on target firm value is much more likely to reflect valuation disagreement among potential bidders compared to traditional measures. Second, investment banks' valuation disagreement incorporates *confidential* information on the merging parties while traditional disagreement measures incorporate only public information.[5] Third, traditional disagreement measures consider only target firms' stand-alone value, while valuation disagreement incorporates both stand-alone target value and *merger synergy*, which is a key driver of the acquisition premium. Empirically, we find low correlations between our valuation disagreement measure and the commonly used investor disagreement proxies (0.07 to 0.25).

We obtain the M&A data from the Securities Data Corporation (SDC) database from 1994 to 2020.[6] Our final sample consists of 462 M&A deals in which target firms hire two or more investment banks to provide valuation analyses. We find banks have a substantial disagreement on the deal value even though they have the same access to the confidential information provided by the target

[5] During the private negotiation process, potential bidders receive confidential information after signing a confidentiality agreement. Oftentimes, these confidential agreements are mutual so that the target and bidder can access each other's private information to evaluate potential synergy. Investment banks hired by the target firm are granted access to the confidential information of the target firm (as well as private information of potential bidders in the case of a mutual confidentiality agreement being signed). As a result, investment banks have a substantial information advantage relative to outsiders such as equity analysts and investors.

[6] Our sample starts from 1994 because this is the first year that firms started the electronic merger filings through the SEC's EDGAR (Electronic Data Gathering, Analysis, and Retrieval) system.

management. For example, the average investment banks' disagreement on the maximum value of the target firm's equity values per share is about 15% relative to the target firm's pre-merger stock price.

We test two major hypotheses of the winner's curse in M&As. First, with the winner's curse, bidders fail to account for the high uncertainty of the target value and thus overpay for the acquisitions. Therefore, the winner's curse hypothesis predicts that higher valuation disagreement leads to higher acquisition premiums paid by bidders. Second, a high acquisition premium in the presence of high valuation disagreement is likely caused by the winner's curse, therefore leading to a poor bidder performance. On the contrary, a high acquisition premium without the presence of high valuation disagreement is unlikely to be driven by the winners' curse, therefore not leading to a poor bidder performance. Thus, the second hypothesis predicts that when there is a high valuation disagreement, bidders have lower returns when they pay higher premiums to acquire target firms.

Whether or not the above two hypotheses hold is an empirical question. If alternatively, bidders fully account for valuation uncertainty, then we can expect valuation disagreement to have *no relation* with acquisition premium or bidder performance. Moreover, as argued in Bazerman and Samuelson (1983), higher valuation uncertainty may lead to a *lower* acquisition premium if a risk-averse bidder assigns a lower certainty equivalent amount to the target, causing a *negative* relation between valuation disagreement and acquisition premium.

We construct both value-based and return-based acquisition premium measures and find that, consistent with the winner's curse hypothesis, acquirers pay a significantly higher acquisition premium when there is a higher valuation disagreement. For example, an increase of one standard deviation in the valuation disagreement about median target value is associated with a six percentage-point increase in acquisition premium, or a 16% increase from the mean. These results are robust after we control for commonly used investor disagreement measures in the regression analysis.

We acknowledge that target firms do not randomly make a decision to solicit fairness opinions

from multiple investment banks, which can potentially cause sample selection bias as we require deals in our sample to have multiple investment banks. To address this concern, we employ a two-stage Heckman selection model with an exclusion restriction (Heckman, 1979). Specifically, in the first stage, we follow Liu (2020) and construct an exogenous measure of peer firms' concurrent demand for fairness opinions. Because of the limited supply of banks that issue fairness opinions, a higher demand from peer firms for fairness opinions predicts a lower likelihood for the focal firm to use multiple fairness opinions. Our acquisition premium results remain robust after we control for the inverse Mill's ratio calculated from the first-stage model.

Next, we investigate the interactive effect of valuation disagreement and acquisition premium on bidder performance. We first measure bidder performance by bidder announcement returns and find that, consistent with the winner's curse, higher valuation disagreement leads to a more negative relation between acquisition premium and bidder announcement return. Once valuation disagreement exceeds 0.83 standard deviation above its mean, the relation between acquisition premium and bidder announcement return becomes negative. When valuation disagreement rises to a very high level of two standard deviations above its mean, a one standard deviation increase in acquisition premium is associated with a *decrease* of bidder return by 1.4%, which is large given the average bidder announcement return of -0.2%.

We also find similar results using the bidder's long-term return in the windows of one year to three years after merger completion. For example, when valuation disagreement equals one standard deviation above the mean, a one standard deviation increase in premium is associated with a decrease of one-year return by 1.3% for bidders. This result is consistent with the winner's curse hypothesis and supports the finding in several previous studies that short-term announcement returns may not fully capture acquirers' underperformance (e.g., Gong, Louis, and Sun, 2008; Malmendier, Moretti, and Peters, 2018).

While the above results provide evidence on the winner's curse hypothesis and indicate bidders' overpayment, they do not necessarily suggest resource misallocation. Specifically, a bidder's poor performance may reflect the relative gains between the target and the bidder (a division of merger synergy) rather than the level of merger synergy. We therefore follow the literature and measure merger synergies using combined bidder and target announcement returns, and find that higher valuation disagreement also leads to a more negative relation between acquisition premium and merger synergies. These findings indicate that when valuation disagreement is high, winners who pay higher acquisition premiums are actually the ones who create *lower* merger synergies. Therefore, our results suggest that the winner's curse causes distortions of resource allocation in M&As.

We conduct several additional tests to examine the mechanism of the winner's curse hypothesis. Winner's curse roots in bidder managers' irrationality, and Roll (1986) suggests that overconfident managers are more likely to overlook the winner's curse than their peers. Using the CEO overconfidence measure proposed by Malmendier and Tate (2005, 2008), we find that the results on winner's curse are much more pronounced for the bidders with overconfident CEOs. We also evaluate an alternative explanation that bidder managers with agency conflicts may overpay to acquire target firms with greater valuation uncertainty, because valuation uncertainty could make it more difficulty for investors to detect overpayment. Inconsistent with this explanation, we do not find our results to be stronger among bidder firms with weaker corporate governance.

We also investigate how valuation disagreement influences the dynamics of the private process that happens before deal announcement. Existing literature suggests that the target firms have incentives to control the number of bidders (Hansen, 2001; Brown, Liu, and Mulherin, 2021). Under the winner's curse hypothesis, valuation uncertainty increases the likelihood that some bidder firms have high valuation errors. Therefore, a target firm with higher valuation uncertainty only needs to

approach a small number of bidders to obtain a high acquisition premium.[7] We find that, consistent with this prediction, target firms with higher valuation disagreement, despite receiving higher acquisition premium, contact fewer bidders during the private sale process and have fewer bidders entering into a confidential agreement.

A growing literature uses the number of private bidders to measure takeover competition and study various topics including the winner's curse (e.g., Boon and Mulherin, 2008). Our finding raises concerns about this practice and suggests that, given target firms' incentives to control the number of bidders, a potentially high level of competition among bidders may enable the target firm to contact *fewer* bidders who have higher likelihoods to pay high premiums.

Finally, we study the relationship between investment bank disagreement and deal completion. Under the winner's curse hypothesis, the presence of valuation disagreement makes the winning bidder overpay for the acquisition, which in turn will increase the likelihood of target shareholder approval. Consistent with this prediction, we find that deals are more likely to go through when valuation disagreement is higher.

Our paper contributes to both the literature of winner's curse and that of M&A. Although earlier studies find evidence consistent with the winner's curse (e.g., Bazerman and Samuelson, 1983; Varaiya, 1988), later studies report evidence inconsistent with the winner's curse predictions (Boone and Mulherin, 2008).[8] Using a direct measure of target valuation uncertainty, we document strong evidence that supports the winner's curse hypothesis in the takeover market.

Second, our paper adds to the literature on the efficiency of the takeover market. Although the literature, in general, shows that the takeover market creates value by optimally reallocating assets

[7] These results are consistent with French and McCormick (1984) who illustrate that target firms have incentives to control the number of bidders invited to participate in the sale process to solicit higher offer prices.
[8] Some studies provide evidence that winning bidders overpay in takeovers (e.g., Malmendier and Tate, 2008; Malmendier, Moretti, and Peters, 2018; de Bodt, Gousin, and Roll, 2018), but they do not directly examine the winner's curse.

and resources, there are scenarios where target firms are not allocated to their most efficient buyers (e.g., Li, Taylor, and Wang, 2018).[9] Our paper extends this literature by showing that the winner's curse also contributes to resource misallocation in the takeover market.

Third, our paper extends the literature on the behavioral corporate finance, especially on the role of managerial cognitive bias in mergers and acquisitions (e.g., Roll, 1986; Malmendier and Tate, 2008; Aktas de Bodt, and Roll, 2016). Our paper provides new evidence that the irrationality of failing to account for target valuation uncertainty can have significant impact on bidder's takeover decisions and merger outcomes. Malmendier and Tate (2008) provide novel evidence on the negative impact of CEOs' overconfidence on their merger performance and suggest that overconfident managers overestimate their abilility to conduct mergers. We document that the winner's curse is particularly strong among the overconfident CEOs. This finding extends Malmendier and Tate's (2008) by revealing a new mechanism through which CEOs' overconfidence influences their takeover decisions.

Finally, our paper also sheds light on the debate about whether investment bank valuations in fairness opinions contain useful information in M&As. While some earlier studies criticize that fairness opinions are biased and uninformative (e.g., Bebchuk and Kahan, 1989; Elson, 1992), DeAngelo (1986, 1990) suggests that fairness opinions benefit transactions by imposing impartial, external constraints on equity values.[10] Our paper extends this literature by showing that not only the investment bank valuation itself, but disagreement on valuation can also provide useful information to merger participants. These findings also extend the literature on the informativeness of corporate filings (e.g., Brown and Tucker, 2011; Cohen, Malloy, and Nguyen, 2020).

1. Hypothesis Development and Related Literature on the Winner's Curse

[9] Li, Taylor, and Wang (2018) show that opportunistic bidders with overvalued shares can crowd out high-synergy bidders, causing considerable inefficiency for these deals.

[10] More recent studies also show that fairness opinion valuations contain incrementally relevant information (e.g., Cain and Denis, 2013; Shaffer, 2020; Guo, Liu, and Tu, 2021).

1.1 Hypothesis Development

Earlier studies suggest that bidders do not fully incorporate the winner's curse in takeovers. Capen, Clapp, and Campbell (1971) use the winner's curse to explain winner bidders' low returns on investments in competitive bids for oil and gas leases. The authors hypothesize that in a bidding situation where the value of the object being sold is uncertain, a bidder who overestimates the value and therefore overbids is more likely to win the bidding.

Bazerman and Samuelson (1983) further illustrate that a key condition for the winner's curse is the degree of uncertainty concerning the value of the item up for bid. They argue that increasing the disagreement makes it much more likely that a winning bid, lying in the right tail of the bid distribution, will exceed the actual value of the item for sale. Roll (1986) suggests that the winner's curse may exist in the corporate takeover process. Varaiya (1988) predicts that the magnitude of the winner's curse is determined by the level of bidders' divergence of opinion and the level of competition.

The above discussion leads to the winner's curse hypothesis. Under this hypothesis, bidders' failure to fully discount bids for target valuation uncertainty will increase the likelihood and magnitude of the winner's curse. Even if bidders attempt to discount for target valuation uncertainty, as long as the discount is insufficient to counteract the upward bias in their winning bids, high uncertainty in target valuation can still result in the winner's curse (Bazerman and Samuelson, 1983). The winner's curse hypothesis predicts that bidders pay higher acquisition premiums as the level of disagreement on target valuation increases. We therefore state the following hypothesis:

H1a. The relation between acquisition premiums and the level of disagreement on target valuation is significantly positive.

We also consider an alternative hypothesis. If rational bidders are conscious of the winner's curse, they will note the uncertainty concerning the target value and realize that their valuations are subject to errors. If bidders fully take target value uncertainty into account and rationally adjust for

the winner's curse when making their bids, then the winning bidder's offer price will be an accurate assessment of the target value (Eckbo, 2009). Furthermore, Bazerman and Samuelson (1983) raise the possibility that higher uncertainty of target value may even lead to *lower* bids if risk-averse bidders assign lower certainty equivalent amounts to the targets with more uncertain value. We refer to this alternative hypothesis as the rational bidding hypothesis. Under this hypothesis, bidders efficiently account for the "winner's curse," and therefore do not overpay for the acquisitions even when target valuation uncertainty is high. We therefore state the following competing hypothesis:

H1b. There is no relation or negative relation between the level of disagreement on target valuation and acquisition premiums.

The winner's curse hypothesis has implications not only on acquisition premiums, but also on bidder's merger performance. Specifically, a high acquisition premium itself does not necessarily indicate overpayment, since a high premium can simply reflect a higher level of anticipated synergy. However, a high premium in the presence of high valuation disagreement is most likely to be caused by the winner's curse, which is detrimental to the bidder. Therefore, under the winner's curse hypothesis, when there is a high valuation disagreement, a high acquisition premium should lead to low bidder merger performance. We thus state the following hypothesis on bidders' merger performance:

H2a. In the presence of high valuation disagreement, bidders who pay higher acquisition premiums have lower merger performance.

In contrast, under the rational bidding hypothesis, we do not expect bidders to have lower performance when they pay high premiums to acquire targets with high valuation uncertainty. We thus state the following alternative hypothesis on bidders' merger performance:

H2b. The interactive effect of acquisition premiums and valuation disagreement on bidders' merger performance is insignificant.

1.2 Related Literature on the Winner's Curse in Takeovers

Empirical evidence on the winner's curse in corporate takeovers is mixed. Earlier studies suggest that takeover bidders may be subject to the winner's curse. Varaiya (1988) finds larger declines in bidders' stock prices when there is high variation in analyst estimates of the target's earnings, suggesting that bidders do not sufficiently discount their bids to reflect uncertainty about the target value. However, Officer, Poulsen, and Stegemoller (2009) report that bidder returns are significantly higher when acquiring private targets with high valuation uncertainty (measured by R&D intensity and idiosyncratic return volatility).

Giliberto and Varaiya (1989) report that, consistent with the winner's curse, winning bids in auctions of failed banks tend to be higher as the number of competing bidders increases. In contrast, Moeller, Schlingemann, and Stulz (2004) find that, inconsistent with the winner's curse, bidder returns are not significantly related to the level of public competition. Similarly, Boone and Mulherin (2008) find little relation between acquisition premium and the number of bidders contacted in the private auction process.

Using traditional investor disagreement measures, Chatterjee, John, and Yan (2012) find that the divergence of investor opinion is positively related to both acquisition premiums and merger synergies. The authors conclude that bidders require a higher level of merger synergy to compensate for the higher acquisition premiums associated with the higher divergence of opinion. More recently, de Bodt, Gousin, and Roll (2018) document overbidding in failed transactions, which provides indirect evidence that overbidding may arise from failing to fully account for the winner's curse. Malmendier, Moretti, and Peters (2018) measure losing bidders' post-merger performance and find that losers significantly outperform winners, suggesting overpayment in takeovers by winning bidders in contested transactions. We differ from the existing literature in that we construct a novel measure

target valuation uncertainty based on investment bank disagreement and directly test the winner's curse hypothesis.

2. Institutional Background on Fairness Opinions

2.1 The use of fairness opinions by target firms

In M&As, a target board of directors often seeks a fairness opinion from an investment bank when considering a proposed transaction.[11] In a fairness opinion, an investment bank provides an independent assessment of the value of the target firm and states whether the proposed offer price is fair to the client firm's shareholders from a financial point of view. Normally, a range of potential values of the target firm is provided in the opinion, together with the analytical methods used in deriving the price range. Liu (2020) reports that the three most commonly used valuation methods are discounted cash flow (DCF) analysis, public company multiple analysis, and precedent transaction analysis.

Although the ubiquitous use of fairness opinions can be traced back to the 1970s, the need for a fairness opinion had not been officially recognized as part of the corporate control transaction process until the Delaware Court issued its decision in Van Gorkom in 1985.[12] Fischel (1985) argues that the directors' failure to hire investment banks to provide valuation information is extremely problematic, because the target firms have no difficulty finding an "expert" who is willing to state that a price at a significant premium over the market price is "fair." Indeed, in the post-Van Gorkom period, almost all target firms obtain at least one fairness opinion. Earlier legal studies are very critical about fairness opinions for the lack of established standards and the potential conflicts of interest

[11] See Liu (2020) for more details about the institutional background on fairness opinions.

[12] The Court held that the target board of directors breached their fiduciary duty of care in making an informed judgment in approving the merger. The use of a fairness opinion is emphasized in the Van Gorkom decision, in which one of the principal bases for the Court's holding was the failure of the board in its decision-making process to obtain an independent financial analysis regarding the intrinsic value of the target firm.

because the fairness opinion usually is rendered by the same financial advisor who arranges the merger and charges fees that are contingent on deal completion. As a result, fairness opinions may just rubber stamp management proposals by manipulating financial models to generate figures that rationalize managers' decisions (e.g., Bebchuk and Kahan, 1989; Elson, 1992; Oesterle, 1992; Davidoff, 2006).

In contrast to legal scholars' dim view of fairness opinions, economists are less concerned about bank's potential conflicts of interests because banks have their reputation capital at stake, given that they are repeated players in the M&A markets. More recent empirical studies provide evidence that investment banks' fairness opinions are not driven by conflicts of interest, and that the contingent fee structure does not affect the quality of banks' advisory services (Rau, 2000; Calomiris and Hitscherich, 2007; Cain and Denis, 2013). More importantly, recent empirical studies show that the valuation figures from target-side fairness opinions provide incrementally relevant information (e.g., Cain and Denis, 2013; Shaffer, 2020; Eaton, Guo, Liu, and Officer, 2021; Guo, Liu, and Tu, 2021).[13]

2.2 The use of multiple fairness opinions and the timeline of merger negotiation

Liu (2020) shows a significant increase in the use of multiple fairness opinions by target firms, rising from about 5 percent in the mid-1990s to over 15 percent post 2010, and a key determinant of the use of multiple opinions is deal size. In addition, multiple fairness opinions are used to facilitate transactions when potential conflicts of interest are high, indicating valuation informativeness when multiple opinions are presented. Unlike our paper, Liu (2020) does not investigate the actual valuation range by each opinion advisor, nor does she compare valuations across investment banks.

The increasing number of target firms that seek multiple fairness opinions provides us with

[13] Prior studies generally find that fairness opinions provided by the bidder investment banks are less informative (e.g., Kisgen, Qian, and Song, 2009; Cain and Denis, 2013). More importantly, bidder fairness opinions are often not disclosed to the public. This is because bidder shareholders are typically not required to approve the deal, thus no proxy statement needs to be filed by the bidders in most cases. Bidder shareholder approval is required only if a bidder needs to issue 20% or more new shares to finance the deal. See Appendix IA1 in Li, Liu, Wu (2018) for more information on listing rules of the NYSE, AMEX, and NASDAQ and shareholder approval in M&As.

an ideal setting to investigate the valuation disagreement among investment banks and the associated effects. Figure 1 illustrates the timeline of fairness opinions and the merger negotiation process. Fairness opinion advisors are usually hired very early during the private merger negotiation process which normally starts several months prior to the public merger announcement. These advisors typically provide valuation estimates throughout the entire process, during which the target management negotiate the offer price and merger terms with potential bidders. Formal written opinions are provided to the target board just one or two days prior to the public announcement of the merger. The opinions are then disclosed in target firms' proxy statements through electronic filings on the SEC EDGAR website a few weeks after the public announcement and before deal completion. We collect investment banks' valuations from the "fairness of opinion" section of the merger documents. The next section describes our approaches of data collection and sample construction.

3. Data and Sample

3.1 Sample selection

Our sample consists of 462 M&A deals announced during the period of 1994 to 2020. We obtain the M&A data from the Securities Data Corporation (SDC) database, financial information from the Compustat database, stock return data from the CRSP database, analyst forecasts from the IBES database, and institutional ownership data from the Thomson Reuters 13f Filings database. We hand collect information about investment bank valuation from the fairness opinion section of SEC merger filings.

Panel A of Table 1 outlines our sample selection process. First, we begin with all mergers announced from 1994 to 2020 that have a deal value over $1 million from the SDC database. We only keep deals with public targets due to the availability of SEC filings by publicly listed firms. We also drop target firms with stock prices below $1 on the day before the deal announcement to ensure that

our results are not driven by distressed firms. We require the bidder to acquire at least 50% of the target firm's shares and have deal status of either "completed" or "withdrawn". In order to compute investment bank disagreement, we further require the target firm to have at least two financial advisors. These steps yield a sample of 1,745 deals with target firms that hire multiple investment banks.

For each of the 1,745 M&A deals, we locate the relevant merger documents filed by the target firm from the SEC EDGAR website, and manually collect information about investment bank valuation from the fairness opinion section.[14] Sometimes even if the target firm hires multiple investment banks as financial advisors, only one of banks provides a written fairness opinion that contains quantitative valuation information. We remove these deals because the measure of valuation disagreement requires more than one banks to provide the valuation analysis. Additionally, for tender offers, although target firms disclose whether they obtain fairness opinions, they often do not disclose the detailed valuation analyses in merger filings because a target shareholder vote and thus the valuation disclosure is not required.[15] Our final sample contains 462 M&A deals with non-missing investment bank disagreement measures and control variables. Panel B of Table 1 presents the distribution of our sample M&A deals by year. Consistent with Liu (2020), the number of deals using multiple fairness opinions generally increases over time, with 78% of our sample deals announced in the last 15 years of the sample period.

3.2 An Example of Investment Bank Valuation

We present an example in Appendix B to illustrate investment bank valuation in SEC filings and our approaches of data collection and measure construction. In this example, Taylor Morrison Home Corporation announced the acquisition of AV Homes, Inc. on June 7, 2018. Taylor Morrison

[14] See Section 2 and Figure 1 of Liu, Shu, Towery, and Wang (2022) for more discussions on the filing and disclosure requirements in M&As. Some deals have no merger documents available mainly because the target firms quickly reject bidder proposals before reaching a merger agreement.

[15] See Cain and Denis (2013) and Mergers and Acquisitions (Regulation M-A), 17 C.F.R. sec. 229.1014(b) (2013), for disclosure requirements in tender offers.

offered a mixed payment of stock and cash equivalent to $21.50 per share to the shareholders of AV Homes. AV Homes filed its definitive proxy statement on August 27, 2018 which discloses that J.P. Morgan Securities LLC and Moelis & Company LLC were hired as financial advisors for the merger. The proxy statement further discloses that both financial advisors provided quantitative fairness opinions using three different valuation approaches to analyze AV Homes, including the selected company analysis, the selected transaction analysis, and the discounted cash flow analysis.

We tabulate the valuation ranges derived under each method from each financial advisor in Appendix B. Since each investment bank used multiple methods, we first calculate for each investment bank the average of the minimum value across methods. For example, the minimum value provided by J.P. Morgen is $15.8 (the average of $13.25, $15.5, and $18.75) and that provided by Moelis is $16.9 (the average of $14.2, $17.1, and $19.25). We then calculate the standard deviation of minimum values between J.P. Morgan and Moelis, scaled by the target's stock price 64 days prior to the deal announcement, to proxy for investment banks' disagreement on the minimum value of target firm value (*VDisp_Min*). Similarly, we calculate investment banks' disagreement on the target firm's median value (*VDisp_Med*) and maximum value (*VDisp_Max*).

3.3 Descriptive statistics

Table 2 presents the descriptive statistics of the deals in our sample. The average deal size is $7.4 billion, indicating the economic significance of our sample deals despite the relatively small sample size. Economically, the aggregate deal value of our 462 transactions (which represent about 5% of total public target firms reported by SDC) accounts for over 20% of the total deal value for all takeovers with public targets during our sample period.[16]

[16] Although it is not uncommon for researchers to focus on large M&A deals due to their economic importance, readers should exercise caution in extrapolating our findings to small deals.

Consistent with prior literature that shows target shareholders receive substantial acquisition premiums, we find that the average acquisition premium is 38%. Ninety-eight percent of the deals are completed in our sample. About 9% of the deals have multiple bidders as reported by the SDC database, 42% of the deals are classified as diversifying, and only 2% are hostile. Forty-four percent of the deals use stock payment, and 11% are structured as tender offers.

The average investment banks' disagreement on the target firm's maximum value (*VDisp_Max*) is 14.7% of the target firm's pre-merger stock price. The average disagreements on the medium value (*VDisp_Med*) and minimum value (*VDisp_Min*) are 9.6% and 9.3%, respectively. These numbers indicate that investment banks have a substantial disagreement on the target firm's valuation despite the same information set. Additionally, the disagreement measure is the largest for the maximum value of the target firm.

For a subsample of deals with public bidders, the average 5-day bidder announcement return is -0.3%. The ratio of target size to bidder size has a mean of 0.42 (median=0.26), suggesting that the economic impact of the acquisition on the bidder firm is considerable. All variables are defined in Appendix A and all continuous variables are winsorized at the 1st and 99th percentiles.

4. Empirical Tests

4.1 Investment Bank Disagreement and Commonly Used Disagreement Measures

To provide a better understanding of the valuation disagreement measure, we first examine its relations with target firm characteristics and the commonly used investor disagreement measures in prior literature. We estimate the following equation:

$$VDisp = \beta_0 + \beta_1 Target\ Size + \beta_2 Target\ MTB + \beta_3 Target\ Leverage + \beta_4 Target\ ROA + \beta_5 Volatility + \beta_6 \Delta Breadth + \beta_7 AF\ Dispersion + \varepsilon \quad (1)$$

where *VDisp* is one of the three valuation disagreement measures. The major target firm characteristics in the independent variables include firm size, market-to-book ratio, leverage, and ROA.

All target firm characteristics are measured at the end of the most recent fiscal year prior to deal announcement. The independent variables also include three commonly used measures of investor disagreement (e.g., Chatterjee, John, and Yan, 2012). The first measure is the idiosyncratic volatility of the target firm (*Volatility*), defined as the standard deviation of the target's daily market-adjusted return in a period of 3-months prior to 63 trading days before the deal announcement. The second measure is the change in breadth of mutual fund ownership in the target firm (*⊿Breadth*), defined as the change in the number of mutual funds holding the target's stocks from the previous quarter to the current quarter, scaled by the total number of funds in the previous quarter. We require the end of the current quarter to fall in the 3-month window starting from 126 trading days prior to the deal announcement. The third measure is analyst forecast dispersion (*AF Dispersion*), defined the standard deviation of analyst forecasts for one-year-ahead earnings in a 3-month window from 126 trading days prior to 64 trading days prior to deal announcement, scaled by the target's stock price on the 64th trading day prior to the deal announcement.[17] We also include industry-fixed effects based on 1-digit SIC industries and year fixed effects.[18]

Column (1) of Table 3 presents the regression of the valuation disagreement based on the median value (*VDisp_Med*), which shows that the coefficients on all three investor disagreement variables are insignificant. Further, none of the coefficients on other control variables in Column are significant, indicating that investment bank disagreement is not significantly affected by target firm fundamentals. Columns (2) and (3) present regressions for the investment bank disagreement measures based on the maximum value (*VDisp_Max*) and the minimum value (*VDisp_Min*), respectively, and the results are similar. Overall, these results suggest that the measures of valuation disagreement likely capture new information incremental to the divergence of opinion among financial

[17] We lose 74 observations in Column (2) due to the availability of institutional ownership and analyst forecast data.
[18] Our results remain robust if we use the Fama-French 12 industry classification for industry fixed effects.

analysts, mutual funds, or outside investors.

4.2 Investment Bank Disagreement and Acquisition Premium

In this section, we test *H1a* and H*1b* about the relationship between valuation disagreement and acquisition premium using both a baseline OLS regression and a Heckman selection model to address potential sample selection bias.

4.2.1 OLS Regression

We first estimate a baseline OLS model to examine the relationship between valuation disagreement and acquisition premium. Our regression model is specified as follows:

$$\begin{aligned} Premium = \ & \beta_0 + \beta_1 VDisp + \beta_2 Volatility + \beta_3 \Delta Breadth + \beta_4 AF\ Dispersion + \beta_5 Target\ Size \\ & + \beta_6 Target\ MTB + \beta_7 Target\ Leverage + \beta_8 Toehold + \beta_8 Tender + \beta_9 Pct\ Stock \\ & + \beta_{10} Competing + \beta_{11} Diversify + \beta_{12} Friendly \\ & + \varepsilon \end{aligned} \quad (2)$$

where the dependent variable is the acquisition premiums paid by bidders to target shareholders, and the key independent variable is the valuation disagreement measure. We calculate both value-based and return-based acquisition premiums following Schwert (2000) and Officer (2003). The value-based target premium (*Target Premium*) is defined as the offer price divided by the target's stock price on trading day -64 (i.e., three calendar months before the merger announcement) minus 1. The return-based acquisition premium (*Target CAR*) is defined as the cumulative market-adjusted return from 63 trading days prior to deal announcement to 126 trading days after deal announcement.

We standardize the valuation disagreement measure and the commonly used investor disagreement measures to have a mean of zero and a standard deviation of one to facilitate the comparison of economic significance. Control variables include the percentage of payment by stocks, the dummy variables for diversifying takeovers, tender offers, hostile takeovers, competing offers, and

toehold, as well as target size, the ratio of market capitalizations between the bidder and the target, and target market-to-book ratio.

Column (1) of Table 4 presents the regression of value-based premium, in which the coefficient on *VDisp_Med* is positive and significant at the 1% level. This result is also economically significant, as the coefficient of 0.062 suggests that a one standard deviation increase in *VDisp_Med* is associated with a six-percent increase in the value-based premium, or a 16% increase from the mean. Column (2) further includes the three traditional investor disagreement measures as independent variables for a comparison with our valuation disagreement measure. Two of the three investor disagreement measures are insignificant, with idiosyncratic volatility being the only significant measure (at the 5% level). More importantly, the inclusion of the three investor disagreement measures has little impact on the magnitude and statistical significance of our valuation disagreement measure. We repeat the analysis using the two other valuation disagreement measures, *VDisp_Max* and *VDisp_Min* and find similar results in Columns (3) to (6) of Table 4.

Next, we present the regressions of return-based acquisition premium in Table 5, which shows that valuation disagreement is also significantly positively related to return-based target premium. This result is robust to the controls of the traditional investor disagreement measures, and economically significant as well. The coefficient of 0.057 indicates that an increase in *VDisp_Med* by one standard deviation is associated with an increase of return-based acquisition premium by 5.7 percentage points, or a 20% increase from its mean value.

Collectively, the results in Table 4 and Table 5 provide strong evidence that valuation disagreement is significantly positively associated with acquisition premiums. Further, these findings cannot be explained by the commonly used investor disagreement measures. These results support *H1a* of the winners curse that bidders fail to fully discount their bids for target value uncertainty.

4.2.2 Heckman Selection Model

Our sample deals are a subsample of all M&A deals because we are only able to observe investment bank disagreement for deals with fairness opinions from multiple investment banks. We acknowledge that the target firm's decision to hire multiple investment banks could be correlated with firm and deal characteristics, raising potential concerns about sample selection bias.

We follow prior research and address this potential sample selection problem using the two-stage Heckman model (Heckman 1979). In the first stage, we expand the sample to include all deals with fairness opinion valuation (i.e., both deals with a single fairness opinion and those with multiple fairness opinions). We estimate the likelihood of seeking multiple fairness opinions using a Probit model. The dependent variable, *MFO*, is an indicator that equals one if a deal has multiple fairness opinions, and zero otherwise. We include the same set of control variables as our baseline model in Equation (2). In addition, recent research highlights the importance of including a variable that meets the exclusion criteria in the first stage of a Heckman model (Lennox, Francis, and Wang 2012). In our setting, this variable must be exogenous to our test variables while strongly correlated with the choice of multiple fairness opinions. Following Liu (2020), we construct a variable that captures the concurrent demand for investment banks' fairness opinion analysis around deal announcement. Liu (2020) argues that a sudden increase in the demand for multiple opinions from industry peers will likely raise the costs of seeking a second opinion (or delay in receiving the second opinion) since the number of investment banks that provide fairness opinions has remained relatively stable. Therefore, we expect a negative relationship between a firm's decision to seek multiple fairness opinions and the concurrent demand for fairness opinions. Specifically, following Liu (2020), we calculate *Demand* as the ratio of the number of concurrent deals announced with multiple opinions to the total number of concurrent deals (excluding the focal transaction). Concurrent deals are defined as those announced within a one-year window in the same Fama-French 48 industry. We compute the inverse Mill's ratio

from the first-stage Probit model and then include it as an additional control variable in the second stage regression of target premium.

Table 6 reports the results using the two-stage Heckman procedure. We present the results from the first-stage model in Column (1). Consistent with Liu (2020), we observe a negative and significant coefficient on *Demand*, suggesting that a higher concurrent demand decreases the likelihood of seeking multiple fairness opinions. Columns (2) and (3) report the regressions of target premium after controlling for the inverse Mill's ratio.[19] For both value-based target premium and return-based target premium, our findings continue to hold after controlling for potential sample selection bias.

4.3 Acquisition Premium and Bidder Performance: The Role of Valuation Disagreement

In this section, we further explore the winner's curse by testing *H2a* that, in the presence of high valuation disagreement, bidders who pay higher acquisition premiums have lower merger performance. We measure bidder's merger performance using both merger announcement returns and long-term returns in the post-merger period.

4.3.1 Bidder's Merger Announcement Returns

We follow the literature and measure bidder performance using bidder announcement returns, and this analysis uses the subsample of deals with public bidders for which we can measure bidder stock returns. Our regression model is specified as follows:

$$Bidder\ CAR = \beta_0 + \beta_1 IB\ Disp + \beta_2 Premium + \beta_3 VDisp \times Premium + Controls + \varepsilon \qquad (3)$$

The dependent variable, *Bidder CAR*, is the 5-day market-adjusted cumulative abnormal return (CAR) surrounding the deal announcement. Our coefficient of interest is the interaction term between valuation disagreement and the acquisition premium. A significantly negative coefficient would be

[19] Note that the sample in Columns (2) and (3) of Table 11 is slightly smaller than Tables 4 and 5, because we use a Probit model in the first stage of the Heckman procedure and some observations are dropped due to the lack of variation in the outcome variable after controlling for industry and year fixed effects.

consistent with the winner's curse. We standardize the valuation disagreement and acquisition premium measures to ease the interpretation of economic significance.

We report the regression results in Table 7. In Column (1), the coefficient on *VDisp_Med* × *Premium* is significantly negative, indicating that higher valuation disagreement leads to a more negative relation between acquisition premium and bidder performance. Specifically, once the valuation disagreement measure exceeds 0.83 standard deviation above its mean, the relation between acquisition premium and bidder performance becomes negative.[20] This relation becomes increasingly negative as valuation disagreement rises further. For example, when the valuation disagreement measure equals one standard deviation above its mean, an increase in acquisition premium by one standard deviation is associated with a decrease of bidder returns by 0.2 percentage point. This result is economically significant given the average bidder return of -0.3%. When the valuation disagreement measure equals two standard deviations above its mean, an increase in acquisition premium by one standard deviation is associated with a 1.4-percent decrease in bidder returns.[21] These results lend strong support to *H2a* of the winners curse in M&As.

Column (2) of Table 7 further include the interaction terms of acquisition premium with the traditional investor disagreement measures (i.e., *Volatility*; *⊿Breadth*; *AF Dispersion*) for a comparison with our valuation disagreement measure. We find that all three interaction terms of traditional investor disagreement measures are *positive* rather than negative, and they are either insignificant or marginally significant at the 10% level (return volatility).[22] In the meantime, the interaction term of

[20] The 0.83 is based on the coefficient on *VDisp_Med* × *Premium* (-0.012) and that on *Premium* (0.010). *When VDisp_Med* equals 0.83 (0.010/0.012), the total coefficient on *Premium* will be zero (-0.012*0.83 + 0.010=0). Therefore, once *VDisp_Med* exceeds 0.83, the total coefficient on *Premium* will become negative.

[21] The decreases of 0.2% and 1.4% are calculated based on the coefficient of *VDisp_Med* × *Premium* (-0.012) and that of *Premium* (0.010). When *VDisp_Med* equals 1, the total coefficient of *Premium* will be -0.002 (=-0.012*1 + 0.010), or -0.2%. Similarly, when *VDisp_Med* equals 2, the total coefficient of *Premium* will be -0.014 (=-0.012*2 + 0.010), or -1.4%.

[22] The result on return volatility is consistent with the argument in Johnson (2004) that idiosyncratic uncertainty raises the option value of the claim, which implies higher bidder returns.

valuation disagreement remains negative and significant at the 1% level. These results demonstrate that the valuation disagreement measure more effectively captures target valuation uncertainty than investor disagreement measures. We repeat this analysis using the two alternative valuation disagreement measures *VDisp_Max* and *VDisp_Min*, and the results in Column (3) to Column (6) of Table 7 remain similar. Overall, the results in Table 7 are consistent with the bidder overpayment stated in *H2a* and providing further evidence on the winner's curse in takeovers.

4.3.2 Bidder's Long-Term Returns in the Post-Merger Period

Next, we test the *H2a* using bidder's long-run stock returns to measure bidder performance. In a perfectly efficient market, bidders' losses (overpayments) due to the winner's curse should be fully captured by bidders' merger announcement returns, leaving no abnormal returns in the post-merger period. However, previous studies suggest that announcement returns might not fully capture bidders' welfare changes due to market inefficiencies or price pressure around mergers (e.g., Malmendier, Moretti, and Peters, 2018; Mitchell, Pulvino, and Stafford, 2004; Liu and Wu, 2014; Loughran and Vijh, 1997; Louis, 2004). Therefore, we examine bidders' long-run returns to further assess the total effect of valuation disagreement on bidder performance.

For the subsample of completed deals, we calculate bidder's market-adjusted buy-and-hold returns in the one-, two-, and three-year windows starting from the month after the deal announcement (*BHR 1yr*, *BHR 2yr*, and *BHR 3yr*), respectively. We re-estimate Equation (3) and replace the dependent variable with the three measures of long-term returns. We present only the test using *VDisp_Med* for brevity and the results are similar when we use the other two valuation disagreement measures. Table 8 shows that the coefficient on *VDisp_Med* × *Premium* is significantly negative in all three regressions, suggesting that higher valuation disagreement also leads to a more negative relation between acquisition premium and bidder's long-term returns. Specifically, once valuation disagreement rises above 0.75 standard deviation relative to the mean, then the relation

between acquisition premium and long-term returns becomes negative.[23] This result is economically large. For example, when valuation disagreement equals one standard deviation above mean, an increase in acquisition premium by one standard deviation is associated with a decrease of one-year returns by 1.3%. Taken together, the results using bidders' announcement returns and long-term returns provide consistent supporting evidence for the winner's curse hypothesis. The result on bidders' long-term returns also suggests that the market reactions around merger announcements only partially capture bidders' wealth implications.

4.4 Valuation Disagreement and Merger Synergy

Our findings so far support the winner's curse hypothesis that the bidders fail to fully account for target valuation uncertainty and overpay for the acquisitions. While these findings indicate losses to bidders, they do not necessarily indicate resource misallocations or losses of social welfare. As long as the winning bidders are also the ones that create the highest merger synergies among all bidders, the winners' curse as well as bidders' overpayments affect only the relative gains of the target and bidder shareholders rather than the total social welfare.

In this section, we examine the effect of the winner's curse on merger synergies and in turn social welfare. Specifically, our previous results show that in the presence of high valuation uncertainty, bidders who pay higher acquisition premiums have lower merger performance. If the winner's curse does not cause resource misallocation, then the high acquisition premiums should be justified by high merger synergies (i.e., the winner's curse only causes a wealth transfer between the bidder and target). If, on the contrary, the winner's curse makes the bidder who overpays the most win the takeover bid instead of the bidder who can create the highest synergy, then the high acquisition premiums will not

[23] The 0.75 is based on the coefficient on *VDisp_Med* × *Premium* (-0.052) and that on *Premium* (0.039). *When VDisp_Med* equals 0.75 (0.039/0.052), the total coefficient on *Premium* will be zero (-0.052*0.75 + 0.039=0). Therefore, once *VDisp_Med* exceeds 0.75, the total coefficient on *Premium* will become negative.

be accompanied by high merger synergies. We therefore estimate the following model to test the interactive effect of valuation disagreement and target premium on merger synergy.

$$Synergy = \beta_0 + \beta_1 IB\ Disp + \beta_2 Premium + \beta_3 VDisp \times Premium + Controls + \varepsilon \qquad (4)$$

We follow the literature (e.g., Houston, James, and Ryngaert, 2001) and measure merger synergy using the combined bidder-target CAR, defined as the value-weighted average of bidder and target's five-day CARs surrounding the deal announcement, where the weights are bidder and target's market capitalizations. A positive coefficient on *VDisp* × *Premium* would support the efficient resource allocation despite the winner's curse, and a negative coefficient would suggest resource misallocation.

Table 9 reports the regression results using our three measures of valuation disagreement measures. Columns (1) presents the results using *VDisp_Med* as the valuation disagreement measure, and Column (2) further controls for the interaction terms between acquisition premium and traditional investor disagreement measures. We find that the coefficient on *VDisp_Med* × *Premium* is significantly negative in both regressions. When valuation disagreement is low, there is a positive relation between acquisition premiums and merger synergies, suggesting that the higher premiums paid by bidders are compensated by higher synergies created. However, this relation becomes less positive as valuation disagreement rises. Once valuation disagreement rises above 0.71 standard deviation relative to its mean, the relation between acquisition premium and merger synergy becomes negative.[24] For example, when *VDisp_Med* equals one standard deviation above its mean, an increase in acquisition premium by one standard deviation is associated with a decrease of synergy by 0.4 percentage point, or a 14% decrease from its mean.

Columns (3) to (6) of Table 9 present the regressions using the other two valuation disagreement measures, *VDisp_Max* and *VDisp_Min*, and the results are similar as those in Columns

[24] The 0.71 is based on the coefficient on *VDisp_Med* × *Premium* (-0.014) and that on *Premium* (0.010). *When VDisp_Med* equals 0.71 (0.010/0.014), the total coefficient on *Premium* will be zero (-0.014*0.71 + 0.010=0).

(1) and (2). Additionally, the coefficients of the interactions of traditional investor disagreement measures are mostly insignificant (significantly positive for analyst forecast dispersion). Overall, the results in Table 9 suggest that when valuation disagreement is high, the merger synergy is significantly lower for the deals affected by the winner's curse.

5. Further Analysis: Mechanism of the Winner's Curse

In this section, we further examine the mechanism of the winner's curse in takeovers. First, since the winner's curse requires managers' irrationality, we examine the relation between our previous findings and bidder CEOs' susceptibility to behavioral biases. We also evaluate an alternative explanation of based on agency conflicts, another common reason for the sub-optimal takeover decisions. Next, we investigate how valuation disagreement affects private negotiation process and deal completion likelihood to shed further light on the role of the winner's curse in takeover process. For brevity, we report only the results using the *VDisp_Med* measure of valuation disagreement, and the results are similar if we use the other two valuation disagreement measures based on the maximum and minimum values.

5.1 Behavioral Bias or Agency Conflict?

Behavioral bias and agency conflict are two major causes of acquirer managers' sub-optimal decisions (e.g., Malmendier and Tate, 2008; Masulis, Wang, and Xie, 2007). The winner's curse in takeovers is caused by behavioral biases rather than agency conflicts. Specifically, as defined in Capen, Clapp, and Campbell (1971), the winner's curse occurs in a competitive bidding situation where the value of the object being competed for is uncertain and the party that *unknowingly* overestimates the value the most tends to win it. In the takeover setting, Roll (1986) further suggests that successful acquirers may be overconfident in their valuations of deal synergies, therefore failing to properly

account for the winner's curse. Therefore, we examine if our results are stronger for acquirers with overconfident CEOs.

For a balanced analysis, we also examine an alternative explanation based on agency conflicts. Specifically, it is well documented that agency conflicts may cause the overinvestment by managers. Target valuation uncertainty could help bidder managers justify their overpayments caused by agency conflicts, which leads to a positive relation between target valuation disagreement and acquisition premiums. Note that this explanation indicates *intentional* overpayments by winning bidders while the winner's curse indicates *unintentional* overbidding.

To conduct the overconfidence analysis, we follow Malmendier and Tate (2005, 2008) and construct a measure of CEO overconfidence, *Holder67*, as an indicator variable that equals one if the bidder CEO holds vested options with average moneyness of 67 percent or higher at least twice in the years prior to deal announcement.[25] We then estimate the baseline regression of acquisition premiums (Equation 2) by adding the interaction between *Holder67* and *VDisp_Med* to the independent variables, controlling for the first-degree term of *Holder67*. Columns (1) of Table 10 presents the regression result, in which the coefficient of the interaction term is positive and significant at the 1% level, suggesting that the observed positive relation between acquisition premiums and valuation uncertainty becomes much stronger for bidders with overconfident CEOs.

We then conduct the regression analysis with the interaction term of corporate governance rather than CEO overconfidence. We measure corporate governance using institutional ownership because prior studies find that institutional investors play an important monitoring role in corporate events including M&As (e.g., Chen, Harford, and Li 2007; Hartzell and Starks 2003; Iliev et al. 2015;

[25] Kaplan, Sorensen, and Zakolyukina (2021) show that the option-based overconficence measure reliably captures CEO overconfidence.

Li et al., 2018).[26] We calculate institutional ownership of the bidder firm (*Bidder IO*) at the end of the most recent quarter that is at least 64 trading days prior to the deal announcement. In Columns (2) of Table 10, we find that the coefficient on the interaction term is insignificant (t-statistics 0.13), which is inconsistent with the agency explanation.

Next, we include CEO overconfidence or corporate governance into our second baseline analysis on merger performance. We first introduce a three-way interaction term among *Holder67*, *VDisp_Med,* and *Premium* to our baseline regression of bidder announcement returns (Equation 3), with controls of the corresponding double interactions. The coefficient on the triple interaction in Columns (3) of Table 10 is negative and significant at the 5% level, indicating that the poor merger performance due to the winner's curse becomes worse when bidders have overconfident CEOs. In contrast, Column (4) of Table 10 shows that the triple interaction for corporate governance is insignificant (t-statistic 0.78). Overall, the results in Table 10 are consistent with the winner's curse (behavioral bias explanation) but inconsistent with the agency explanation.

5.2 Valuation Disagreement and Private Process

While earlier empirical research measures takeover competition using the number of bidders in the public process (e.g., Schwert, 2000; Moeller, Schlingemann, and Stulz, 2004), the seminal study by Boone and Mulherin (2007) reveals an active private takeover process prior to the public merger announcement. Boone and Mulherin (2008) use the number of bidders in the private process to measure bidder competition and find that, inconsistent with the winner's curse in takeovers, there is no significant relation between the number of private bidders and bidder's merger performance.

To reconcile our findings with Boone and Mulherin (2008), we examine the connection between valuation disagreement and the number of bidders in the private process, especially the

[26] We do not use the commonly used G-index and E-index measures because they impose further data restrictions and significantly decrease our sample size.

validity of the number of private bidders as a proxy for takeover competition. This investigation also has general implications for the M&A literature because a growing number of studies have used the number of private bidders to measure takeover competition.

Our hypothesis is motivated by the existing literature that target firms have incentives to control the number of bidders. French and McCormick (1984) demonstrate that, given the fixed bidding costs, when there are many bidders, each bidder will lower its biding prices so that the higher profit (when winning) can offset the reduced likelihood of winning the bid. Moreover, Hansen (2001) states that if the target firm releases confidential information to many potential buyers, sometimes its competitors, then this information leakage will reduce the target firm's value and in turn lower the acquisition price. Brown, Liu, and Mulherin (2021) show that since 1990s, target firms control both the number of bidders and the flow of information. Under the winner's curse hypothesis, higher target valuation disagreement causes greater valuation errors by bidders and helps target firms selectively contact a smaller number of bidders that are likely to offer high prices. Therefore, we predict that target firms with higher valuation uncertainty will contact fewer bidders in the private process.

We manually collect the information about private process from the merger background section of SEC merger filings, and define *Mass Contact* as an indicator variable that equals one if more than ten potential bidders participate in the private sale process of a deal, and zero otherwise. Similarly, we define *Mass Confidential* as an indicator variable that equals one if more than five potential bidders have entered into confidential agreements with the target during the private process, and zero otherwise. We estimate regressions of *Mass Contact* and *Mass Confidential* on valuation disagreement, controlling for target firm characteristics such as size, market-to-book ratio, leverage, ROA, and idiosyncratic volatility.

Column (1) of Table 11 presents the regression of *Mass Contact*, in which the coefficient on valuation disagreement is negative and significant at the 5% level. We observe similar results in the

regression of *Mass Confidential* (Column 2). In Columns (3) and (4) of Table 11, we use the continuous variables for the number of contacted bidders (*Num Contact*) and the number of bidders with confidential agreements (*Num Confidential*). We find that the coefficient on valuation disagreement is insignificantly negative in Column (3) and significantly negative in Column (4). These results suggest that, consistent our prediction, higher valuation disagreement allows the target firm to strategically solicit bids from a smaller number of potential bidders rather than approaching many potential buyers. The few bidders involved in the private process are likely to have high valuation on the target value, and thus can offer higher prices.

The results in Table 11 raise concerns about using the number of bidders in the private process as a measure of takeover competition, as these results suggest that, given target firms' incentives to contact *few* bidders, more competitive target firms may choose to contact a *lower* rather than higher number of bidders because these target firms can more easily find bidders who are willing to pay high premiums. Our findings echo the studies by Aktas, de Bodt, and Roll (2010) and Betton, Eckbo, and Thorburn (2009) who also cast doubts on the usage of the number of private bidders to measure takeover competition.

5.3 Valuation Disagreement and Deal Completion

Under the winner's curse hypothesis, high valuation disagreement makes the winning bidder overpay for the acquisition, which in turn should increase the likelihoods of target shareholder approval and deal completion. To examine the relation between valuation disagreement and deal completion, we construct an indicator variable for deal completion, *Completion*, that equals one if the deal is completed, and zero otherwise. We then estimate regressions of *Completion* on valuation disagreement and control variables.

We present the regression results in Table 12. In Column (1), we include only the valuation disagreement measure without controls and the coefficient is positive and significant at the 5% level.

In Column (2) and (3), we control for firm and deal characteristics and deal characteristics and find that the coefficient of valuation disagreement remains similar. These results show that, consistent with the winner's curse hypothesis, deals with higher valuation disagreement are more likely to be completed.

6. Conclusion

Theories of the winner's curse in takeovers suggests that because bidders fail to fully account for the overbidding associated with the uncertainty about target value, winning bidders overpay and earn poor returns. Using unique, manually collected data on investment bank valuations of target firms, we test the winner's curse in takeovers. We identify a sample of target firms that hire multiple investment banks and construct measures of *valuation disagreement* based on the disagreement among investment banks about the target firms' valuation. Compared to the commonly used investor disagreement measures, valuation disagreement directly measures target valuation, incorporates private information of bidders, and includes merger synergies in addition to targets' standalone values.

We find that, consistent with the winner's curse hypothesis, bidders pay significantly higher premiums for targets with higher valuation disagreement. Also consistent with the winner's curse, we find that higher valuation disagreement leads to a more negative relation between acquisition premium and bidder performance measured by both bidder announcement returns and long-term post-merger stock returns. These results are stronger when bidder CEOs are overconfident, providing further support for the winner's curse hypothesis. Additionally, in the presence of high valuation disagreement, higher acquisition premiums are associated with lower merger synergies, indicating that the winner's curse cause resource misallocations in the M&A market. Further analyses show that higher valuation disagreement enables target firms to contact fewer bidders in the private process, and increases the likelihood of deal completion.

Despite the well-developed theory, to date we have only mixed empirical evidence about the existence of the winner's curse in mergers and acquisitions. Using the unique measure of valuation disagreement, we speak to this debate by providing new evidence that the winner's curse exists in the M&A market and causes resource misallocations. We also invent a novel measure of target valuation uncertainty, which can have broad applications in M&A studies.

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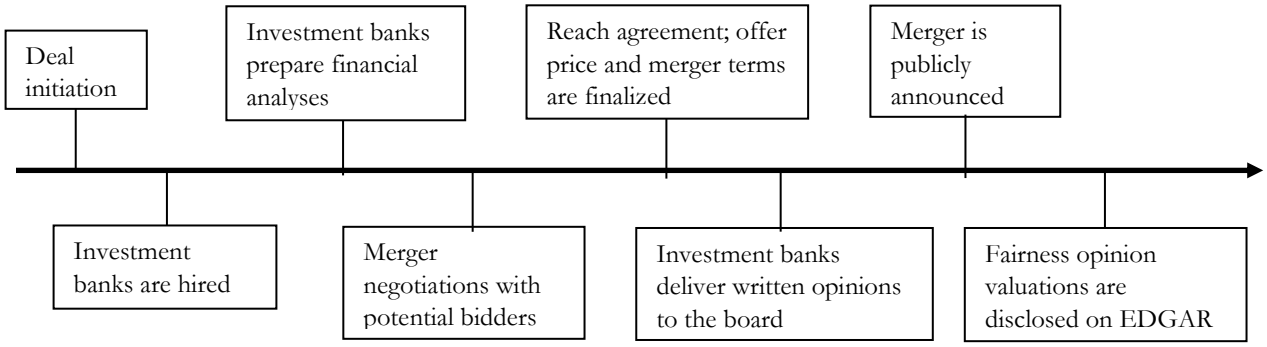
Figure 1. Timeline of Investment Bank's Valuation Analysis in a Typical Merger Deal

This figure illustrates the timeline of fairness opinions and the merger negotiation process for a typical merger deal.



Appendix A
Variable definitions

Variable	Definition
Key Variables	
VDisp_Med	The standard deviation of median valuation among investment banks for the same deal scaled by target stock price 64 trading days prior to deal announcement. We average the median value across methods if an investment bank uses multiple methods. The variable is standardized for interpretation purpose.
VDisp_Max	The standard deviation of maximum valuation among investment banks for the same deal scaled by target stock price 64 trading days prior to deal announcement. We average the maximum value across methods if an investment bank uses multiple methods. The variable is standardized for interpretation purpose.
VDisp_Min	The standard deviation of maximum valuation among investment banks for the same deal scaled by target stock price 64 trading days prior to deal announcement. We average the minimum value across methods if an investment bank uses multiple methods. The variable is standardized for interpretation purpose.
Target Premium	The difference between offer price and target stock price 64 trading days prior to deal announcement scaled by target price 64 trading day prior to deal announcement.
Target CAR (-63,+126)	The target's market-adjusted cumulative abnormal return from 63 trading days prior to deal announcement to 126 trading days after deal announcement.
Bidder CAR (-2,+2)	The bidder's 5-day market-adjusted cumulative abnormal return surrounding deal announcement.
Synergy	The value-weighted 5-day bidder-target combined market-adjusted cumulative abnormal returns surrounding deal announcement
Deal and Firm Characteristics	
Δ*Breadth*	The change in the number of funds, holding the target's shares from the previous quarter to the current quarter. The variable is standardized for interpretation purpose.
Volatility	The standard deviation of the target's daily market-adjusted abnormal stock return in a period of three months prior to the trading day −63. The variable is standardized for interpretation purpose.
AF Dispersion	The standard deviation of analysts' one-year ahead earnings forecasts in a three-month window from trading day −126 to trading day −64, scaled by the target's stock price 64 trading days prior to deal announcement. The variable is standardized for interpretation purpose.
Deal Value	The transaction value of the deal in billions.
Target Size	The natural logarithm of the target's total assets as of the most recent fiscal year end prior to deal announcement.
Target MTB	The target's market-to-book ratio as of the most recent fiscal year end prior to deal announcement.
Target Leverage	The target's long-term debt and short-term debt scaled by book value of equity at the end of the fiscal year prior to the deal announcement.
Target ROA	The target's net income scaled by total assets for the most recent fiscal year prior to the deal announcement.
Toehold	An indicator that equals one if the bidder owns more than 5% of the target's shares prior to the takeover announcement and zero otherwise.
Tender	An indicator variable that equals one for tender offers and zero for mergers.
Pct Stock	The percentage of stock payment in the whole payment package for a deal.
Variable	Definition

Competing	An indicator variable that equals one if there is more than one bidder in a deal.
Diversify	An indicator that equals one if the target and the bidder come from two different SIC 2-digit industries.
Friendly	An indicator variable that equals one for friendly takeovers and zero otherwise.
Relative Size	The ratio of target size to bidder size measured at the end of the fiscal year prior to the deal announcement.
Bidder MTB	The bidder's market-to-book ratio as of the most recent fiscal year end prior to deal announcement.
Mass Contact	An indicator that equals one if more than ten potential bidders have contacted the target during the private process and zero otherwise.
Mass Confidential	An indicator that equals one if more than five potential bidders have entered into confidential agreements with the target during the private process and zero otherwise.
Num Contact	The number of potential bidders that have contacted the target during the private process.
Num Confidential	The number of potential bidders that have entered into confidential agreements with the target during the private process.
Initial Premium	The difference between initial offer price and target stock price 64 trading days prior to deal announcement scaled by target price 64 trading day prior to deal announcement.
Completion	An indicator that equals one if the deal is completed and zero otherwise
BHR 1yr	The bidder's market-adjusted monthly buy-and-hold return measured over the one-year period starting from the first month after deal announcement.
BHR 2yr	The bidder's market-adjusted monthly buy-and-hold return measured over the two-year period starting from the first month after deal announcement.
BHR 3yr	The bidder's market-adjusted monthly buy-and-hold return measured over the three-year period starting from the first month after deal announcement.
MFO	An indicator that equals one if a deal has multiple fairness opinions and zero otherwise.
Demand	The ratio of the number of concurrent deals announced with multiple opinions to the total number of concurrent deals in the same Fama-French 48 industry. Concurrent deals are defined as those announced within a one-year window.
Bidder IO	Institutional ownership of the bidder firm at the end of the most recent quarter that is at least 64 trading days prior to deal announcement
Holder 67	An indicator variable that equals one if the bidder CEO holds vested options with average moneyness of 67 percent or higher at least twice during our sample period. The variable starts to take the value of one in the first year that the CEO exhibits such behavior and we measure the overconfidence of bidder CEO based on the most recent year prior to deal announcement.

Appendix B
Investment Bank Valuation Disagreement Example

In this appendix, we use the merger of AV Homes, Inc. (the target firm) and Taylor Morrison Home Corporation (the bidder firm) as an example to illustrate how investment bank disagreement is collected from SEC merger filings. AV Homes and Taylor Morrison entered into a merger agreement on June 7, 2018. AV Homes filed the definitive proxy statement on August 27, 2018 (available at https://www.sec.gov/Archives/edgar/data/39677/000119312518258270/d795191ddefm14a.htm).

The target firm's financial advisors, J.P. Morgan Securities LLC and Moelis & Company LLC., provided fairness opinions regarding the valuation of Spectra Energy. Both financial advisors used three different valuation approaches including selected company analysis, selected transaction analysis, and discounted cash flow analysis. The merger consideration was $21.50. We summarize each financial advisor's valuation range under each method in the following table. We then construct our measures of investment bank valuation disagreement.

Method	J.P. Morgan	Moelis & Company
Selected Company Analysis	These multiples were then applied to AV Homes estimated tangible book value as of March 31, 2018 and 2018E earnings per share based on AV Homes' management forecasts, yielding implied equity values for the AV Homes common stock of approximately $13.75 to $24.25 per share for tangible book value and **$13.25 to $22.25** for 2018E EPS.	Moelis then applied such multiple ranges to corresponding financial data for AV Homes including the Tangible Book Value at March 31, 2018 and management's estimate of 2018E EPS of $1.90 per share. This analysis indicated the following implied per share reference ranges for AV Homes for Price/2018E EPS: **$14.20 to $19.90**.
Selected Transaction Analysis	J.P. Morgan applied this range of multiples derived from such analysis to the AV Homes P/TBV as of March 31, 2018 and arrived at an estimated range of implied equity values for AV Homes common stock of between **$15.50 and $26.00** per share.	Moelis selected reference range multiples of 1.0x to 1.5x Tangible Book Value. Moelis then applied such multiple range to the Tangible Book Value at March 31, 2018. This analysis indicated the following implied per share reference range for AV Homes: **$17.10 to $26.10**.
Discounted Cash Flow Analysis	J.P. Morgan chose a range of discount rates from 8.75% to 9.75% as the weighted average cost of capital. The discounted cash flow analysis indicated a range of implied equity values per share of AV Homes Common Stock of between **$18.75 and $28.25**.	Moelis used a range of discount rates of 8.0% to 10.0% based on an estimate of AV Homes' weighted average cost of capital using the mid-year convention. This analysis indicated the following implied per share reference range for AV Homes: **$19.25 to $29.20**.

To construct our investment bank disagreement measure, we first take the average within an investment bank across multiple methods. In this case, the average maximum valuation for J.P. Morgan is $25.50 (the mean of $22.25, $26.00, and $28.25). Similarly, the average maximum valuation for Moelis is $25.07 (the mean of $19.90, $26.10, and $29.20). Next, we calculate the standard deviation of the average maximum value between J.P. Morgan and Moelis, which is 0.31 in this case. We use similar methods to compute the standard deviation based on median value and minimum value. For investment bank disagreement variables used in our main analyses, we further scale the standard deviation by the target firm's stock price 64 trading days prior to deal announcement and also standardize all disagreement variables for easier interpretation.

Table 1
Sample Construction and Distribution

This table presents the construction of our M&A sample and sample distribution over years. Panel A reports sample filters and the number of observations under each filter. Panel B reports sample distribution by year. Our sample period is from 1994-2019.

Panel A: Sample selection

Sample filters	# of deals
Merger deals announced between 1/1/1994 and 12/31/2020	46,948
Deal value >= $1 million	25,239
Target public status = "Public"	10,743
Target stock price 1 day prior to announcement >= $1	8,976
Percent of shares acquirer is seeking to purchase >= 50%	8,936
Deals with at least two target financial advisors	1,762
Deal status: "Completed" or "Withdrawn"	1,745
Deals with multiple target-side fairness opinions	663
Deals with available disagreement data and control variables	462

Panel B: Sample distribution

Year	# of deals	% of deals
1994	5	1.08%
1995	5	1.08%
1996	6	1.30%
1997	16	3.46%
1998	11	2.38%
1999	17	3.68%
2000	15	3.25%
2001	6	1.30%
2002	2	0.43%
2003	10	2.16%
2004	10	2.16%
2005	29	6.28%
2006	29	6.28%
2007	37	8.01%
2008	11	2.38%
2009	14	3.03%
2010	18	3.90%
2011	14	3.03%
2012	14	3.03%
2013	17	3.68%
2014	24	5.19%
2015	28	6.06%
2016	26	5.63%
2017	29	6.28%
2018	30	6.49%
2019	20	4.33%
2020	19	4.11%
Total	462	100%

Table 2
Descriptive Statistics

This table reports summary statistics for all variables in our sample. Our sample includes M&A deals announced between 1994 and 2020 with multiple target fairness opinions. All continuous variables are winsorized at the 1st and 99th percentiles. Variable definitions are provided in Appendix A.

Variable	N	Mean	SD	p25	median	p75
AF Dispersion	388	0.01	0.01	0.00	0.00	0.01
BHR 1yr	276	-0.01	0.31	-0.17	0.00	0.12
BHR 2yr	264	-0.04	0.38	-0.29	-0.03	0.19
BHR 3yr	243	-0.02	0.51	-0.33	-0.05	0.26
Bidder CAR (-2, +2)	293	0.00	0.09	-0.05	-0.01	0.03
Bidder MTB	293	4.38	10.04	1.57	2.30	3.46
Competing	462	0.09	0.28	0.00	0.00	0.00
Completion	462	0.98	0.15	1.00	1.00	1.00
Deal Value	462	7.42	12.95	1.07	2.82	6.87
Diversify	462	0.42	0.50	0.00	0.00	1.00
Friendly	462	0.98	0.14	1.00	1.00	1.00
Initial Premium	462	0.37	0.36	0.16	0.31	0.49
Mass Confidential	459	0.28	0.45	0.00	0.00	1.00
Mass Contact	461	0.29	0.45	0.00	0.00	1.00
Num Confidential	459	5.84	8.97	1.00	2.00	7.00
Num Contact	461	13.43	23.00	1.00	4.00	13.00
Pct Stock	462	31.58	40.57	0.00	0.00	65.03
Relative Size	293	0.42	0.48	0.08	0.26	0.58
VDisp_Max	462	0.15	0.21	0.02	0.08	0.19
VDisp_Med	462	0.10	0.13	0.01	0.05	0.14
VDisp_Min	462	0.09	0.12	0.01	0.05	0.12
Synergy	281	0.03	0.08	-0.02	0.02	0.07
Target CAR (-63, +16)	462	0.28	0.30	0.10	0.23	0.44
Target Leverage	462	1.12	3.38	0.17	0.80	1.83
Target MTB	462	3.27	6.92	1.39	2.19	3.78
Target Premium	462	0.38	0.38	0.16	0.32	0.50
Target ROA	462	0.01	0.13	0.00	0.03	0.07
Target Size	462	7,253.00	13,170.00	753.40	2,203.00	6,765.00
Log (Target Size)	462	7.73	1.59	6.63	7.70	8.82
Tender	462	0.11	0.31	0.00	0.00	0.00
Toehold	462	462	0.03	0.17	0.00	0.00
Volatility	388	0.02	0.01	0.01	0.02	0.03
⊿Breadth	388	0.00	0.01	0.00	0.00	0.00

Table 3
Valuation Disagreement and Traditional Investor Disagreement Measures

This table reports results on the regressions of valuation disagreement. The dependent variable in Columns (1), *VDisp_Med*, is the standard deviation of median valuation among investment banks for the same deal scaled by target stock price 64 trading days prior to deal announcement. In Columns (2), the dependent variable is the standard deviation of maximum valuation among investment banks for the same deal scaled by target stock price 64 trading days prior to deal announcement (*VDisp_Max*). In Columns (3), the standard deviation of minimum valuation among investment banks for the same deal scaled by target stock price 64 trading days prior to deal announcement (*VDisp_Min*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable		
	VDisp_Med	*VDisp_Max*	*VDisp_Min*
	(1)	(2)	(3)
Target Size	-0.031	-0.025	-0.004
	(-0.80)	(-0.49)	(-0.11)
Target MTB	-0.006	-0.008	-0.022***
	(-0.68)	(-0.74)	(-2.65)
Target Leverage	-0.026	-0.012	0.013
	(-0.97)	(-0.42)	(0.67)
Target ROA	-0.520	-0.593	-0.513
	(-0.94)	(-1.12)	(-1.09)
Volatility	0.049	0.086	0.062
	(0.73)	(1.31)	(1.03)
⊿Breadth	0.041	0.045	0.058
	(0.81)	(0.84)	(1.26)
AF Dispersion	0.068	0.032	0.089
	(0.81)	(0.49)	(1.14)
Industry & Year FE	Yes	Yes	Yes
Observations	388	388	388
R-squared	0.237	0.198	0.318

Table 4
Valuation Disagreement and Value-based Target Premium

This table reports results on the relationship between valuation disagreement and value-based total target premium. The dependent variable, *Target Premium*, is the difference between offer price and target stock price 64 trading days prior to deal announcement scaled by target price 64 trading day prior to deal announcement. Key independent variables include the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Max*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Min*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *Target Premium*					
	(1)	(2)	(3)	(4)	(5)	(6)
VDisp_Med	**0.062*** **	**0.065*** **				
	(2.59)	**(2.74)**				
VDisp_Max			**0.073*** **	**0.074*** **		
			(3.02)	**(2.84)**		
VDisp_Min					**0.075*** **	**0.081** **
					(3.00)	**(2.59)**
Volatility		0.072**		0.070*		0.071*
		(2.00)		(1.91)		(1.91)
ΔBreadth		-0.004		-0.005		-0.006
		(-0.23)		(-0.29)		(-0.32)
AF Dispersion		-0.011		-0.009		-0.013
		(-0.33)		(-0.28)		(-0.40)
Target Size	-0.009	0.012	-0.009	0.011	-0.004	0.013
	(-0.70)	(0.71)	(-0.71)	(0.66)	(-0.30)	(0.76)
Target MTB	0.003	0.005	0.003	0.005	0.005	0.006
	(0.70)	(0.98)	(0.69)	(1.01)	(1.01)	(1.27)
Target Leverage	-0.017*	-0.019**	-0.017**	-0.020**	-0.019**	-0.022**
	(-1.87)	(-1.99)	(-1.97)	(-2.09)	(-2.02)	(-2.19)
Toehold	-0.112	-0.111	-0.105	-0.107	-0.112	-0.105
	(-1.24)	(-1.04)	(-1.19)	(-1.01)	(-1.26)	(-0.96)
Tender	0.180***	0.125*	0.170***	0.115*	0.184***	0.131**
	(2.80)	(1.94)	(2.64)	(1.78)	(2.89)	(2.05)
Pct Stock	-0.002***	-0.002***	-0.001***	-0.002***	-0.002***	-0.002***
	(-2.83)	(-2.82)	(-2.64)	(-2.62)	(-3.21)	(-3.04)
Competing	0.040	0.014	0.041	0.020	0.045	0.018
	(0.68)	(0.24)	(0.71)	(0.32)	(0.76)	(0.29)
Diversify	-0.047	-0.074*	-0.058	-0.082*	-0.057	-0.073
	(-1.13)	(-1.65)	(-1.45)	(-1.94)	(-1.36)	(-1.62)
Friendly	-0.066	-0.012	-0.068	-0.014	-0.063	-0.013
	(-0.71)	(-0.14)	(-0.75)	(-0.17)	(-0.69)	(-0.15)
Industry & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	462	388	462	388	462	388
R-squared	0.328	0.371	0.338	0.378	0.334	0.376

Table 5
Valuation Disagreement and Return-based Target Premium

This table reports results on the relationship between valuation disagreement and return-based total target premium. The dependent variable, *Target CAR*, is the target's market-adjusted cumulative abnormal return from 63 trading days prior to deal announcement to 126 trading days after deal announcement. Key independent variables include the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Max*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Min*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *Target CAR (-63, +126)*					
	(1)	(2)	(3)	(4)	(5)	(6)
VDisp_Med	**0.057*** **	**0.057*** **				
	(3.40)	**(3.76)**				
VDisp_Max			**0.057*** **	**0.049*** **		
			(3.55)	**(3.56)**		
VDisp_Min					**0.062*** **	**0.058*** **
					(3.87)	**(3.39)**
Volatility		0.058**		0.057**		0.058**
		(2.43)		(2.39)		(2.36)
ΔBreadth		0.000		0.000		-0.000
		(0.02)		(0.01)		(-0.02)
AF Dispersion		0.012		0.014		0.011
		(0.49)		(0.59)		(0.46)
Target Size	-0.017*	-0.004	-0.017*	-0.006	-0.013	-0.004
	(-1.74)	(-0.38)	(-1.78)	(-0.48)	(-1.28)	(-0.34)
Target MTB	0.002	0.002	0.001	0.002	0.003	0.003
	(0.48)	(0.70)	(0.44)	(0.66)	(0.80)	(0.92)
Target Leverage	-0.004	-0.003	-0.004	-0.003	-0.006	-0.005
	(-0.63)	(-0.44)	(-0.74)	(-0.54)	(-0.98)	(-0.77)
Toehold	-0.138	-0.110	-0.136	-0.113	-0.140*	-0.110
	(-1.60)	(-1.13)	(-1.62)	(-1.19)	(-1.68)	(-1.16)
Tender	0.147***	0.098**	0.141***	0.091*	0.152***	0.102**
	(3.01)	(2.01)	(2.85)	(1.85)	(3.14)	(2.13)
Pct Stock	-0.002***	-0.002***	-0.001***	-0.002***	-0.002***	-0.002***
	(-3.55)	(-4.18)	(-3.27)	(-3.93)	(-3.88)	(-4.26)
Competing	-0.010	-0.021	-0.008	-0.015	-0.005	-0.016
	(-0.23)	(-0.47)	(-0.19)	(-0.33)	(-0.11)	(-0.36)
Diversify	-0.036	-0.065**	-0.044	-0.071**	-0.044	-0.064*
	(-1.12)	(-1.97)	(-1.37)	(-2.10)	(-1.33)	(-1.89)
Friendly	-0.062	-0.028	-0.060	-0.024	-0.057	-0.024
	(-1.17)	(-0.44)	(-1.14)	(-0.37)	(-1.10)	(-0.37)
Industry & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	462	388	462	388	462	388
R-squared	0.349	0.417	0.350	0.412	0.350	0.413

Table 6
Controlling for Sample Selection Bias: Heckman Selection Model

This table reports results from the Heckman selection model. In the first stage, we include deals with both single and multiple fairness opinions. We estimate a Probit model on the likelihood of obtaining multiple fairness opinions. The dependent variable is an indicator for deals with multiple fairness opinions (*MFO*). The key independent variable, *Demand*, is ratio of the number of concurrent deals announced with multiple opinions to the total number of concurrent deals in the same Fama-French 48 industry. In the second stage, we control for the inverse Mill's ratio (*IMR*) calculated from the first-stage model. The dependent variables in the second stage include the difference between offer price and target stock price 64 trading days prior to deal announcement scaled by target price 64 trading day prior to deal announcement (*Target Premium*) and the target's market-adjusted cumulative abnormal return from 63 trading days prior to deal announcement to 126 trading days after deal announcement (*Target CAR*). The key independent variable in the second stage is the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable		
	MFO	*Target Premium*	*Target CAR (-63,+126)*
	1st Stage	2nd Stage	2nd Stage
	(1)	(2)	(3)
Demand	**-0.063*** **		
	(-3.55)		
VDisp_Med		**0.066*** **	**0.058*** **
		(2.69)	**(3.40)**
Target Size	0.043***	0.064	-0.028
	(19.34)	(1.17)	(-0.82)
Target MTB	0.005***	0.011	0.000
	(5.34)	(1.38)	(0.06)
Target Leverage	-0.007***	-0.028**	-0.002
	(-3.57)	(-2.13)	(-0.25)
Toehold	-0.059***	-0.166	-0.091
	(-3.02)	(-1.28)	(-0.77)
Tender	-0.023**	0.170**	0.152***
	(-2.38)	(2.37)	(2.91)
Pct Stock	-0.000**	-0.002***	-0.002***
	(-2.20)	(-3.37)	(-3.26)
Competing	-0.004	0.025	-0.011
	(-0.33)	(0.42)	(-0.26)
Diversify	0.007	-0.047	-0.044
	(0.88)	(-1.13)	(-1.31)
Friendly	0.096***	0.097	-0.077
	(4.88)	(0.63)	(-0.83)
IMR		0.219	-0.045
		(1.24)	(-0.41)
Industry & Year FE	Yes	Yes	Yes
Observations	5,637	440	440
R-squared	0.274	0.343	0.359

Table 7
Valuation Disagreement and Bidder Announcement Return

This table reports results on the relationship between valuation disagreement and bidder announcement return. The dependent variable, *Bidder CAR*, is bidder's 5-day market-adjusted cumulative abnormal return surrounding deal announcement. Key independent variables include the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Max*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Min*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *Bidder CAR (-2, +2)*					
	(1)	(2)	(3)	(4)	(5)	(6)
VDisp_Med	0.009	0.013*				
	(1.34)	(1.79)				
Premium	0.010	0.002	0.012*	0.005	0.011	0.004
	(1.47)	(0.28)	(1.68)	(0.57)	(1.54)	(0.44)
VDisp_Med * Premium	**-0.012****	**-0.016*****				
	(-2.11)	**(-2.80)**				
VDisp_Max			0.009	0.011		
			(1.22)	(1.34)		
VDisp_Max * Premium			**-0.011*****	**-0.012****		
			(-3.02)	**(-2.55)**		
VDisp_Min					0.011	0.015**
					(1.45)	(1.99)
VDisp_Min * Premium					**-0.009***	**-0.012****
					(-1.69)	**(-2.53)**
Volatility		-0.006		-0.007		-0.007
		(-0.59)		(-0.63)		(-0.69)
*Volatility * Premium*		0.008*		0.007		0.008*
		(1.75)		(1.54)		(1.67)
⊿Breadth		-0.005		-0.004		-0.004
		(-0.80)		(-0.64)		(-0.71)
*⊿Breadth * Premium*		0.004		0.006		0.004
		(0.72)		(0.92)		(0.74)
AF Dispersion		0.015*		0.015**		0.016**
		(1.97)		(1.97)		(2.09)
*AF Dispersion * Premium*		0.006		0.005		0.006
		(1.28)		(0.97)		(1.26)
Target Size	-0.004	-0.005	-0.003	-0.006	-0.003	-0.005
	(-0.87)	(-0.99)	(-0.78)	(-1.02)	(-0.75)	(-0.91)
Relative Size	-0.012	-0.008	-0.007	-0.004	-0.008	-0.004
	(-0.51)	(-0.26)	(-0.32)	(-0.12)	(-0.36)	(-0.13)
Bidder MTB	-0.001	-0.000	-0.001	-0.001	-0.001	-0.000
	(-1.10)	(-0.68)	(-1.34)	(-1.01)	(-1.30)	(-0.89)
Target MTB	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001
	(-1.05)	(-0.58)	(-1.02)	(-0.60)	(-1.07)	(-0.66)
Toehold	0.027	0.033	0.030	0.034	0.028	0.030
	(1.25)	(1.29)	(1.30)	(1.28)	(1.33)	(1.23)
Tender	0.017	0.001	0.015	-0.001	0.018	0.004
	(0.90)	(0.07)	(0.80)	(-0.07)	(0.95)	(0.19)
Pct Stock	0.000	0.000	0.000	0.000	0.000	0.000
	(0.99)	(0.70)	(0.93)	(0.72)	(0.76)	(0.61)
Competing	-0.007	-0.007	-0.009	-0.011	-0.010	-0.013
	(-0.34)	(-0.30)	(-0.48)	(-0.48)	(-0.51)	(-0.53)
Diversify	-0.005	0.002	-0.003	0.006	-0.005	0.004
	(-0.37)	(0.09)	(-0.21)	(0.33)	(-0.36)	(0.21)
Friendly	-0.025	-0.024	-0.026	-0.023	-0.024	-0.021
	(-0.85)	(-0.59)	(-0.92)	(-0.58)	(-0.82)	(-0.52)
Industry & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	293	250	293	250	293	250
R-squared	0.298	0.388	0.304	0.382	0.293	0.384

Table 8
Valuation Disagreement and Bidder Long-Run Return

This table reports results on the relationship between valuation disagreement and the bidder's long-run return performance. Dependent variables include the bidder's 1-year market-adjusted buy-and-hold return starting from the month after deal announcement (*BHR 1yr*), the bidder's 2-year market-adjusted buy-and-hold return starting from the month after deal announcement (*BHR 2yr*), and the bidder's 3-year market-adjusted buy-and-hold return starting from the month after deal announcement (*BHR 3yr*). The key independent variable is the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated, and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable		
	BHR 1yr	*BHR 2yr*	*BHR 3yr*
	(1)	(2)	(3)
VDisp_Med	0.009	0.027	0.039
	(0.35)	(0.82)	(0.77)
Premium	0.039	0.047	0.057
	(1.28)	(1.32)	(1.15)
VDisp_Med * Premium	**-0.052****	**-0.068****	**-0.104*****
	(-2.40)	**(-2.59)**	**(-2.61)**
Target Size	0.009	0.015	-0.025
	(0.63)	(0.87)	(-1.03)
Relative Size	0.065	0.020	0.039
	(1.20)	(0.28)	(0.39)
Bidder MTB	-0.001	0.000	0.002
	(-0.64)	(0.02)	(0.35)
Target MTB	-0.001	-0.004	-0.011*
	(-0.44)	(-0.88)	(-1.75)
Toehold	-0.148*	-0.163*	-0.163**
	(-1.78)	(-1.83)	(-2.01)
Tender	-0.087	-0.197**	-0.347***
	(-1.32)	(-2.09)	(-2.80)
Pct Stock	-0.001	-0.001*	-0.001
	(-1.46)	(-1.75)	(-0.96)
Competing	-0.029	0.010	0.030
	(-0.41)	(0.10)	(0.21)
Diversify	0.018	0.022	-0.011
	(0.47)	(0.38)	(-0.14)
Friendly	-0.148	0.031	-0.225
	(-1.08)	(0.37)	(-1.36)
Industry & Year FE	Yes	Yes	Yes
Observations	276	264	243
R-squared	0.300	0.292	0.282

Table 9
Valuation Disagreement and Merger Synergy

This table reports results on the relationship between valuation disagreement and merger synergy. The dependent variable, *Synergy*, is the value-weighted 5-day bidder-target combined market-adjusted cumulative abnormal returns surrounding deal announcement. Key independent variables include the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Max*), the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Min*). All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *Synergy*					
	(1)	(2)	(3)	(4)	(5)	(6)
VDisp_Med	0.005	0.008				
	(1.11)	(1.55)				
Premium	0.016**	0.010	0.017***	0.012	0.017**	0.012*
	(2.43)	(1.38)	(2.66)	(1.65)	(2.59)	(1.66)
VDisp_Med * Premium	**-0.010****	**-0.014*****				
	(-2.25)	**(-3.33)**				
VDisp_Max			0.005	0.007		
			(0.99)	(1.21)		
VDisp_Max * Premium			**-0.010*****	**-0.011*****		
			(-3.47)	**(-3.17)**		
VDisp_Min					0.009	0.008
					(1.60)	(1.27)
VDisp_Min * Premium					**-0.008****	**-0.012*****
					(-2.03)	**(-3.05)**
Volatility		0.002		0.001		0.001
		(0.16)		(0.12)		(0.06)
*Volatility * Premium*		0.003		0.003		0.003
		(0.82)		(0.67)		(0.68)
⊿Breadth		-0.003		-0.001		-0.002
		(-0.49)		(-0.27)		(-0.35)
*⊿Breadth * Premium*		0.004		0.005		0.004
		(0.82)		(1.12)		(0.94)
AF Dispersion		0.009		0.009		0.010
		(1.27)		(1.34)		(1.44)
*AF Dispersion * Premium*		0.010**		0.008*		0.009**
		(2.11)		(1.86)		(2.10)
Target Size	-0.001	0.002	-0.001	0.001	-0.000	0.002
	(-0.31)	(0.33)	(-0.19)	(0.30)	(-0.12)	(0.37)
Relative Size	-0.006	-0.007	-0.002	-0.002	-0.002	-0.002
	(-0.53)	(-0.58)	(-0.15)	(-0.19)	(-0.23)	(-0.19)
Bidder MTB	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(-0.45)	(0.08)	(-0.64)	(-0.24)	(-0.63)	(-0.11)
Target MTB	-0.001	-0.000	-0.001	-0.000	-0.001	-0.000
	(-0.85)	(-0.17)	(-0.82)	(-0.20)	(-0.88)	(-0.35)
Toehold	0.062**	0.070**	0.064**	0.070**	0.062**	0.066**
	(2.17)	(2.38)	(2.10)	(2.26)	(2.28)	(2.28)
Tender	0.015	-0.004	0.014	-0.006	0.016	-0.003
	(0.77)	(-0.20)	(0.72)	(-0.29)	(0.82)	(-0.13)
Pct Stock	0.000	-0.000	0.000	-0.000	0.000	-0.000
	(0.71)	(-0.35)	(0.63)	(-0.34)	(0.46)	(-0.37)
Competing	-0.014	-0.016	-0.017	-0.021	-0.017	-0.020
	(-0.79)	(-0.75)	(-0.94)	(-1.01)	(-0.95)	(-0.96)
Diversify	-0.013	-0.009	-0.010	-0.005	-0.012	-0.006
	(-1.18)	(-0.67)	(-0.98)	(-0.38)	(-1.17)	(-0.50)
Friendly	-0.026	-0.025	-0.027	-0.025	-0.026	-0.022
	(-0.76)	(-0.63)	(-0.81)	(-0.62)	(-0.77)	(-0.55)
Industry & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	281	238	281	238	281	238
R-squared	0.293	0.393	0.302	0.388	0.292	0.390

Table 10
Exploring the Mechanism of the Winner's Curse

This table reports results from cross-sectional tests that explore the mechanism of the winner's curse. The dependent variable in Columns (1) and (2), *Target Premium*, is the difference between offer price and target stock price 64 trading days prior to deal announcement scaled by target price 64 trading day prior to deal announcement. The dependent variable in Columns (3) and (4), *Bidder CAR*, is bidder's 5-day market-adjusted cumulative abnormal return surrounding deal announcement. Key independent variables include the difference between offer price and target stock price 64 trading days prior to deal announcement scaled by target price 64 trading day prior to deal announcement (*Premium*) and the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement (*VDisp_Med*). All other variables are defined in Appendix A. We do not report control variables for brievity. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable			
	Target Premium		*Bidder CAR (-2,+2)*	
	(1)	(2)	(3)	(4)
VDisp_Med	-0.019	0.035	0.003	0.013
	(-0.44)	(0.78)	(0.30)	(1.63)
Holder67	0.057		0.001	
	(1.02)		(0.06)	
VDisp_Med*Holder67	**0.139*** **		0.001	
	(2.74)		(0.11)	
Bidder IO		-0.018		-0.004
		(-0.25)		(-0.22)
VDisp_Med*Bidder IO		**0.008**		-0.017
		(0.13)		(-1.18)
Premium			0.019**	0.010
			(2.23)	(1.11)
*Premium*Holder67*			-0.008	
			(-0.66)	
*VDisp_Med*Premium*			0.001	-0.014*
			(0.16)	(-1.94)
VDisp_Med*Premium*Holder67			**-0.029** **	
			(-2.57)	
*Premium*Bidder IO*				0.006
				(0.37)
VDisp_Med*Premium*Bidder IO				**0.010**
				(0.78)
Industry & Year FE	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes
Observations	229	294	228	293
R-squared	0.493	0.363	0.359	0.303

Table 11
Valuation Disagreement and Private Process

This table reports results on the relationship between valuation disagreement and the number of bidders in the private process. The dependent variable in Column (1), *Mass Contact*, is an indicator that equals one if more than ten potential bidders have contacted the target during the private process and zero otherwise. The dependent variable in Column (2), *Mass Confidential*, is an indicator that equals one if more than five potential bidders have entered into confidential agreements with the target during the private process and zero otherwise. The dependent variable in Column (3), *Num Contact*, is the number of potential bidders that have contacted the target during the private process. The dependent variable in Column (4), *Num Confidential*, is the number of potential bidders that have entered into confidential agreements with the target during the private process. The key independent variable, *VDisp_Med*, is the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement. All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable			
	Mass Contact	*Mass Confidential*	*Num Contact*	*Num Confidential*
	(1)	(2)	(3)	(4)
VDisp_Med	**-0.036****	**-0.039****	**-1.132**	**-0.711***
	(-2.01)	**(-2.31)**	**(-1.18)**	**(-1.83)**
Volatility	0.014	0.032	0.452	0.319
	(0.53)	(1.16)	(0.34)	(0.64)
Target Size	-0.067***	-0.055***	-3.440***	-1.138***
	(-4.59)	(-3.34)	(-4.11)	(-3.34)
Target MTB	-0.008**	-0.008**	-0.311**	-0.138**
	(-2.51)	(-2.37)	(-2.30)	(-2.25)
Target Leverage	0.007	0.008	0.608**	0.086
	(0.91)	(1.10)	(2.15)	(0.73)
Target ROA	-0.025	0.168	4.663	2.472
	(-0.14)	(1.00)	(0.51)	(0.67)
Industry & Year FE	Yes	Yes	Yes	Yes
Observations	461	459	461	459
R-squared	0.290	0.276	0.208	0.199

Table 12
Valuation Disagreement and Deal Completion

This table reports results on the relationship between valuation disagreement and the likelihood of deal completion. The dependent variable (*Completion*) is an indicator that equals one if the deal is completed and zero otherwise. The key independent variable, *VDisp_Med*, is the standard deviation of median valuation among investment banks for the same deal scaled by the target firm's stock price 64 trading days prior to deal announcement. All other variables are defined in Appendix A. Heteroscedasticity-robust standard errors are estimated and robust t-statistics are reported in parentheses. ***, **, and * indicate statistical significances at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: *Completion*		
	(1)	(2)	(3)
VDisp_Med	**0.009****	**0.011****	**0.011****
	(2.25)	**(2.22)**	**(2.17)**
Volatility			**0.005**
			(0.89)
Premium		-0.018	-0.020
		(-0.72)	(-0.78)
Target Size		0.003	0.004
		(0.48)	(0.65)
Target MTB		0.002	0.002
		(1.39)	(1.38)
Target Leverage		-0.006	-0.006
		(-1.59)	(-1.60)
Toehold		0.028	0.029
		(1.30)	(1.34)
Tender		0.021	0.018
		(1.19)	(1.01)
Pct Stock		-0.000	-0.000
		(-1.15)	(-1.18)
Competing		-0.055	-0.054
		(-1.46)	(-1.45)
Diversify		0.004	0.004
		(0.35)	(0.30)
Friendly		0.077	0.077
		(0.77)	(0.77)
Industry & Year FE	No	Yes	Yes
Observations	462	462	462
R-squared	0.004	0.110	0.111