Winning by Losing:

Evidence on the Long-Run Effects of Mergers*

Ulrike Malmendier
UC Berkeley
NBER

Enrico Moretti
UC Berkeley
NBER

Florian Peters
U Amsterdam
DSF

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Abstract

Do acquirors profit from acquisitions, or do acquiring CEOs overbid and destroy shareholder value? We present a novel approach to estimating the long-run abnormal returns to mergers exploiting detailed data on merger contests. In the sample of close bidding contests, we use the loser's post-merger performance to construct the counterfactual performance of the winner had he not won the contest. We find that bidder returns are closely aligned in the years before the contest, but diverge afterwards: Winners underperform losers by 50 percent over the following three years. Existing methodologies, including announcement effects, fail to capture the acquirors' underperformance.

Keywords: Mergers; Acquisitions; Misvaluation; Matching; Counterfactual

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* Ulrike Malmendier: UC Berkeley and NBER. Email: ulrike@econ.berkeley.edu. Enrico Moretti: UC Berkeley and NBER. Email: moretti@econ.berkeley.edu. Florian Peters: University of Amsterdam and Duisenberg School of Finance. Email: F.S.Peters@uva.nl.

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Do acquiring companies profit from acquisitions, or do acquirors overbid and destroy shareholder value? The negative announcement effects documented for a large number of U.S. mergers and acquisitions (see, e.g., Moeller, Schlingemann, and Stulz (2005)) have attracted considerable attention to this question. Such findings have been interpreted as evidence of empire building (Jensen, 1986), other misaligned personal objectives of CEOs (Morck, Shleifer, and Vishny, 1990), or CEO overconfidence (Roll, 1986; Malmendier and Tate, 2008).

A major obstacle in the evaluation of mergers, however, is the difficulty of obtaining unbiased estimates of the value created, or destroyed. Estimates based on announcement returns may be biased due to price pressure around mergers, information revealed in the merger bid, or market inefficiencies.[1] Estimates based on long-run abnormal returns may be biased due to unobserved differences between the firms that merge and those that do not. To the extent that the returns to mergers are revealed only over time, it is hard to measure what portion of the long-run returns can be attributed to the merger rather than other corporate events or market movements. For example, Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) argue that CEOs tend to pursue takeovers when they have private information that their own firm is overvalued. Under this scenario, the acquiror's stock price may decline even when the merger is in the best interest of shareholders: The stock price would have declined even more had the merger not taken place. More generally, acquiring firms are a selected group and engage in mergers at selected points in time. This makes it difficult to find a valid control group.

In this paper, we exploit a new data set on contested mergers to measure the causal effect of mergers on acquiror returns. We identify cases in which, ex ante, at least two bidders had a significant chance of winning the bidding contest and use the post-merger

[1] See, for example, Mitchell, Pulvino, and Stafford (2004); Asquith, Bruner, and Mullins Jr (1987); and Loughran and Vijh (1997).

performance of the loser to calculate the counterfactual performance of the winner had he not undertaken the merger. Effectively, participation in a close bidding contest provides a novel matching criterion, over and above the usual market-, industry-, and firm-level observable characteristics. Our approach offers an improvement if winners are more similar to losers than to the average firm in the market or other previously used control groups, for example in terms of the strategic considerations that lead a firm to attempt a specific takeover at a specific point in time and that are hard to control for with the standard set of financial variables. Our counterfactual scenario allows for the rest of the industry to re-optimize, which includes the possibility that another firm will acquire the target.

One attractive feature of this approach is that we can probe the validity of our identifying assumption by comparing the valuation paths of winners and losers in the months and years prior to the merger contest. Any differences in expected performance between winners and losers should materialize in diverging price paths. Our approach has the disadvantage that it is restricted to merger contests. We cannot speak to the value generated in a broader set of mergers. The methodological implications of our findings, however, go beyond the sample of contests. Comparing our estimates to those based on existing methodologies, such as announcement effects, we provide evidence on the biases embedded in existing approaches and their potential magnitude.

We collect data on all U.S. mergers with concurrent bids of at least two potential acquirors from 1985 to 2009. We identify the subset of contests where all bidders had a significant ex-ante chance at winning: long-duration contests with protracted back and forth between bidders. Comparing winners' and losers' performance prior to the merger contest, we find that their abnormal returns closely track each other during the 20 months before the merger announcement. Consistent with our identifying assumption, the market appears to have similar expectations about the future profitability of winners and losers. In addition, analyst

forecasts, operating cash flows, leverage ratios and a host of other firm characteristics are also closely aligned in the two groups of bidders before the merger.

After the merger, however, losers significantly outperform winners. The effect is economically large: Depending on the measure of abnormal performance, the difference amounts to 49-54 percent over the three years following the merger. This difference in post-merger performance cannot be attributed to changes in the risk profile of winners relative to losers since our methodology adjusts for time-varying risk exposure: When calculating (risk-adjusted) cumulative abnormal returns, we estimate betas separately for the pre- and the post-merger period. We also show that the underperformance of winners does not reflect differences between hostile and friendly acquisitions, variation in acquiror Q, the number of bidders, differences between diversifying and concentrating mergers, variation in target size or acquiror size, or differences in the method of payment.

What explains the winners' underperformance? We show that it is not due to a high offer premium, and we do not detect any differences in operating performance. However, we uncover a sharp divergence in capital structure post-merger. Specifically, winners have significantly higher leverage ratios than losers, which the market may view as potentially harmful to the long-term health of the company.

Our empirical approach to estimating merger effects also allows us to evaluate existing measures of merger returns. We find that announcement returns, alphas based on four-factor portfolio regressions, and abnormal returns based on characteristics-matched portfolios fail to capture the negative long-run return implications of mergers. In fact, announcement returns display a *negative* correlation with our estimates, i.e., they fail to predict the causal effect of contested mergers even directionally. Existing methodologies to estimate long-run abnormal returns fare better. We find that long-run return estimates calculated using market-adjusted, industry-adjusted, risk-adjusted, or characteristics-adjusted abnormal returns, are all posi-

tively correlated with the corresponding winner-loser estimates, though smaller in magnitude (about half the size).

This paper relates to a large literature estimating the value created in corporate takeovers. Reviews of the empirical evidence go back to at least Roll (1986) and Jensen and Ruback (1983). More recent assessments are from Andrade, Mitchell, and Stafford (2001) and Betton, Eckbo, and Thorburn (2008). The evidence on the value effects of mergers for acquirors is mixed. Recent studies of acquiror *percentage* announcement returns find relatively small but statistically significant effects of 0.5-1 percent (Moeller, Schlingemann, and Stulz, 2004; Betton, Eckbo, and Thorburn, 2008). The analysis of *dollar* announcement returns (Moeller, Schlingemann, and Stulz, 2005) reveals that a small number of large losses swamp the majority of profitable, but smaller, acquisitions. Studies of long-run post-merger performance suggest that stock mergers and mergers by highly valued acquirors are followed by poor performance (Loughran and Vijh, 1997; Rau and Vermaelen, 1998).

Our research design is motivated by Greenstone and Moretti (2004) and Greenstone, Hornbeck, and Moretti (2010), who analyze bids by local governments to attract "million-dollar plants" to their jurisdiction. Compared to their county-level analysis, mergers allow for considerably more convincing controls of bidder heterogeneity. In contrast to measures such as firm productivity or labor earnings, stock prices incorporate not just current conditions but also expectations about future performance. Our identification strategy also relates to Savor and Lu (2009), who use a small sample of failed acquisitions to construct a counterfactual.

The paper proceeds as follows. Section I describes the data. Section II provides the details of our winner-loser matching methodology and tests of our identifying assumption. Section III explains the econometric model. Section IV describes the results, and Section V compares the winner-loser methodology with existing methodologies. Section VI concludes.

I. Data

Our merger data come from the SDC Mergers and Acquisitions database, which records all public and binding bids.[2] We include bids by public U.S. firms that take place between January 1, 1985 and December 31, 2009. We exclude privately held and government-owned firms, investor groups, joint ventures, mutually owned companies, subsidiaries, and firms whose status SDC cannot reliably identify. We also exclude white knights since they are likely to lack ex-ante similarity with other bidders in their success chances, i.e., since they do not provide a plausible hypothetical counterfactual. A detailed description of the sample construction, including the identification of merger contests, is in the Data Appendix.

For each contest and bidder, we merge the SDC data with financial and accounting information from the CRSP Monthly Stock and the CRSP/Compustat merged databases, using monthly data for stock returns, and both quarterly and yearly data for accounting items from three years before to three years after the contest. We construct an event time variable t that counts the months relative to each contest. We set $t = 0$ at the end of the month preceding the start of the contest, i.e., preceding the earliest bid. The end of the month prior to that is -1, the end of the month before that -2, etc. Going forward, we set $t = +1$ at the end of the month in which the contest ends, i.e., in which the merger is completed. The end of the following month is $+2$, the end of the month after that $+3$, etc. Hence, event-time periods before and after the merger contest are exactly one month long, but period 1 is of variable length, corresponding to the duration of the merger contest.

The construction of event time is illustrated in Figure 1(a). Figure 1(b) provides a concrete example from our data, the merger contest between Westcott Communications and Automatic Data Processing for Sandy Corporation. The final sample contains $12,384$

[2] We focus on public and binding bids, rather than the initial, non-binding bids in a typical takeover process (see Boone and Mulherin (2007)), in order to identify bidders that are most seriously interested in the acquisition and thus more likely to be similar ex ante, consistent with our identification strategy.

event-time observations and uses data from 172 bidders, 82 winners and 90 losers.

[Figure 1 approximately here]

Table I summarizes bidder and deal characteristics. The bidder statistics (Panel A) are computed from balance sheet and income data at the end of the fiscal year preceding the contest. The first three rows indicate that both winners and losers are large compared to the average Compustat firm. This is mainly due to requiring firms to be public. The table also shows that winners tend to be larger than losers though the size difference is insignificant (and small compared to the difference between the average acquiring and non-acquiring firm in Compustat). The difference between the average Tobin's Q of winners, 1.88, and losers, 1.79, is also very small, and profitability, book leverage, and market leverage are virtually identical for winners and losers. The last two rows of Panel A report the three-day announcement CARs, in percentage and dollar terms. Announcement returns are negative and large compared to those found in large-sample studies of uncontested mergers, where acquiror announcement returns are typically around +1% (Moeller, Schlingemann, and Stulz, 2004, 2005; Betton, Eckbo, and Thorburn, 2008). This suggests that the market views participation in a merger contest negatively, equally so for the ultimate winner and loser. The tests for differences in means reveal that none of the observable characteristics differ significantly between winners and losers. This is a first indication that losers might be a valid counterfactual for the winners.

[Table I approximately here]

Panel B shows that the transaction values of contested mergers are large compared to the size of the firms involved, about one quarter of the losers' market capitalization and about 16 percent of the winners' market capitalization. Deal type (tender offer or merger),

attitude (hostile or friendly), and means of payment (stock, cash, or other means) do not differ markedly from those found in uncontested mergers. About 33% of our sample involves more than two bidders, but contests with more than three bidders are rare (six cases). The average offer premium in our sample is 14 percent if expressed as a percentage of the acquiror's market capitalization and 65 percent if expressed as a percentage of the target. This is somewhat larger than in a typical sample of non-contested bids, for example, 48 percent relative to target value in a sample of 4,889 bids for US targets during 1980-2002, analyzed by Betton, Eckbo, and Thorburn (2008), and may indicate overbidding, or winner's curse, brought about by the competing offers. Below we explore this possibility in more detail.

The most striking difference between contested and non-contested acquisitions is the duration of the process. While the average time from announcement to completion in single-bidder mergers is about 65 trading days (see Betton, Eckbo, and Thorburn (2008)), the bottom row in the table shows that merger contests take three times as long, on average 9.5 months. We also observe large heterogeneity in our sample, e.g., a median of four months in the lowest-duration quartile but of 15.5 months in the longest-duration quartile. In the next section, we will exploit contest duration to identify "close" contests in which winners and losers are particularly likely to be similar along observables and unobservables and provide corroborating evidence.

II. Are Winners and Losers Comparable?

The descriptive statistics in Table I showed no significant winner-loser differences prior to the merger. The similarity of winners and losers in those observable characteristics is reassuring. But our identifying assumption requires similarity in all determinants of stock returns, observed and unobserved. In fact, the distinctive feature of our approach is that it aims at

controlling for differences in unobservables.

In our empirical analysis, we focus on the subset of mergers in which the similarity between winners and losers is maximized. Specifically, our identifying assumption is more likely to hold in merger contests where, ex ante, both bidders have a significant chance to win the contest. To distinguish those cases from contests where, ex ante, one of the bidders has an overwhelming probability of winning, we analyze in detail company and media reports of all mergers in our sample. These news wire searches of the merger negotiations reveal long contest duration to be a strong indicator of "close" contests. In short-duration mergers, one bidder typically withdraws the bid shortly after the competing bid comes in, suggesting that the withdrawing company does not see much of a chance to win. The short completion time reveals that the two potential acquirors differ too much in terms of expected synergies from the merger, and the loser is unlikely to provide a good counterfactual. By contrast, competing firms in longer-duration merger contests are more likely to have similar expected synergies from the merger. The protracted back-and-forth indicates that neither offer clearly dominates, at least initially, and that target management or target shareholders take both bids seriously. In this case, the loser performance is more likely to provide a valid counterfactual for the winner's performance.

We split our sample into duration quartiles. Merger contests in the first quartile last two to four months, which roughly corresponds to the completion time of non-contested mergers. Those in the second quartile last five to seven months; those in the third quartile eight to twelve months; and those in the fourth quartile more than a year. We will perform all empirical tests both on the full sample and on the four quartile subsamples separately. The longest-duration quartile provides the ex-ante most convincing identification, though at the cost of lower statistical power (sample size).[3]

[3] We also researched, for each merger contest, whether the loser decided voluntarily to pass on the deal.

We perform three empirical tests to assess whether winners and losers in long-duration contests are indeed comparable. While our identifying assumption—similarity in all observable and unobservable determinants of stock returns—cannot be tested directly, the tests provide indirect evidence on its validity.

1) First, we compare earnings forecasts for winners and losers. The closer the forecasts are in the months leading up to the merger, the more similar are analyst expectations regarding the future performance of winners and losers. We extract two-years-ahead earnings forecasts for the 36 months before (and, for completeness, for the 36 months after) the merger from the I/B/E/S' summary history file. We construct the forecasted-earnings-to-price ratios (FE/P ratios) as the two-year consensus (mean) forecast divided by the stock price at the end of the month.[4] Our sample includes forecasts for 106 firms, 61.6% of our total sample.[5]

Figure 2 plots the FE/P ratios for the 36 months before and after the merger contest, both for the entire sample (top graph) and separately by duration quartile (bottom graphs). For long-duration contests, analyst forecasts for winners and losers closely track each other in the 36 months before the merger fight, suggesting that analysts were expecting similar performance for winners and losers. By contrast, winners and losers do not always appear aligned in contests of shorter duration. In fact, comparing the pre-merger paths of FE/P ratios in the full sample and in all subsamples, we find that winners and losers are most closely aligned in the fourth quartile, confirming our choice of long-duration contests as the

Withdrawal shortly after the competing bid occurs in 23 percent of the merger contests, but none of these cases fall in the long-duration quartile. We also find that 25 percent of losers lost due to a higher bid by the competitor after a bidding war, and 46 percent because the target management or shareholders rejected the bid for other known or unknown reasons. In 6 percent of the cases, the losing bidder withdrew after re-evaluating the merger opportunity, but none of those latter cases fall into the long-duration quartile.

[4] As in previous literature, we drop observations with negative forecasted earnings (see, e.g., Richardson, Sloan, and You (2011)). Alternatively, we use the median forecast with very similar results.

[5] Since firms are covered by analysts at different points in time and for different periods of time, the number of available consensus forecasts varies across periods. The average number of available consensus forecasts is 75, which constitutes 43.6% of our total sample.

preferred sample.

[Figure 2 approximately here]

In our second and third test, we turn from analyst expectations to market expectations and compare abnormal stock returns of winners and losers in the months leading up to the merger. The closer abnormal stock returns are within a winner-loser match before the contest, the more similar are market expectations regarding the future performance of those matched winners and losers. We decompose stock returns into the component that is due to observables (normal returns) and the component that is due to unobservables (abnormal returns) using four standard benchmarks for normal returns:

- the market return, r_{mt};
- the value-weighted industry return, r_{ikt}, where k is the industry of bidder i based on the Fama-French 12-industry classification;
- the CAPM required return, $r_{ft} + \beta_{ij}(r_{mt} - r_{ft})$, where r_{ft} is the risk free rate;
- the value-weighted characteristics-based return, r_{ijt}^{cm}, based on a portfolio of firms matched on size, book-to-market, and twelve-month momentum (Daniel, Grinblatt, Titman, and Wermers, 1997).

We call the adjusted performance measures market-adjusted, industry-adjusted, risk-adjusted, and characteristics-adjusted CARs, respectively. For example, we can write risk-adjusted abnormal returns as $r_{ijt} - r_{ft} - \beta_{ij}(r_{mt} - r_{ft}) = \alpha_{ij} + \varepsilon_{ijt}$. The component $\beta_{ij}(r_{mt} - r_{ft})$ is explained by the exposure to market risk and the excess return of the market portfolio. By contrast, the intercept α_{ij} and the residual ε_{ijt} are due to non-systematic factors: α_{ij} is the average excess return, i.e., the part of the performance trend that cannot be explained

by market exposure and market returns, and ε_{ijt} is the monthly unexplained residual return. Since, by definition, abnormal performance captures the value effects of unobserved factors, this approach emphasizes that the winner-loser match aims at controlling for these unobserved factors, in addition to observables.

2) For our second test, we correlate winners' abnormal performance trends prior to the merger (their pre-merger alphas) with the matched losers' abnormal performance trends prior to the merger, and the winners' unexplained residual performance prior to the merger (their pre-merger residuals) with the matched losers' pre-merger residuals. We first estimate bidder-specific pre-merger alphas and residuals by regressing the pre-merger abnormal returns of each bidder on a constant. We then regress the winner alphas on matched-loser alphas, and the winner residuals on the matched-loser residuals.

Consistent with our assumption, we find that the pre-merger alphas of winners and losers are highly correlated irrespective of the adjustment method used. As shown in Table II, the correlation is typically strongest in the sample of close (long-duration) contests. In fact, with the exception of characteristics-adjusted returns, the alpha correlation is highly significant in the longest-duration quartile (Q4) but always insignificant in the subsample of the shortest contests (Q1), and the R-squared is always highest in the quartile containing the longest contests. Similarly, the residual regressions (not reported) also show a positive and highly statistically significant correlation between winners and losers, and an analogous pattern across the duration subsamples.

[Table II approximately here]

The results indicate that winning bidders who experience abnormal run-ups during the three years preceding the merger are typically challenged by rival bidders who have experienced a similar run-up. These findings confirm bidder similarity and, hence, the credibility

of the identifying assumption. In addition, they alleviate concerns that contestants differ in their acquisition motives or prospects. For example, one may worry that bidders who are motivated by overvaluation of their own stock, possibly following a pre-merger run-up, systematically differ in their post-merger performance from bidders who did not experience a recent run-up, and that winners might be particularly likely to be in the former group and losers to be in the latter group. Here, we find instead that pre-merger trends of both sets of bidders are closely aligned. Moreover, this similarity is strongest in the sample of long-duration contests, confirming our identification of the most credible comparison set.

Table II also previews our main results. In the last column, we show that, during the post-merger period, the winner-loser correlation in alphas drops substantially and becomes insignificant or marginally significant. Even more striking is the drop in R-squared, by at least half, in all four panels. Hence, the correlational evidence suggests that loser abnormal performance explains winner abnormal performance before but not after the merger.

3) In our third and key test, we apply our methodology of estimating the merger effect, winner-loser differences in post-merger abnormal returns, to the pre-merger period. Since the pre-merger and the post-merger coefficients are jointly estimated, we will present the details of the empirical specification in Section III and the details of the results in Section IV.

The main result for the pre-merger period is that, in long contests, abnormal returns of winners and losers are statistically indistinguishable. We will also show that measures of realized operating performance provide a similar picture: winners and losers in long-duration contests have very similar levels of and very similar trends in operating cash flow in the months leading up to the merger.

Overall, the analysis in this and the previous section indicates that losers represent a

plausible counterfactual for winners in long-duration contests. Before the contest, winners and losers are similar in terms of operating performance and other firm characteristics. In addition, the market expects them to perform similarly in the future. This is true both for explicit analyst forecasts and for implicit expectations capitalized into stock prices. In the next two sections, we turn to the divergence in post-merger performance.

III. Econometric Model

A. The Effect of Mergers on Acquirors

We evaluate winner-loser differences in abnormal performance over the three years prior to and the three years after the merger contest using a controlled regression framework. We compute buy-and-hold cumulative abnormal returns (CARs) for each month in the +/- three-year event window around merger contests, separately for each bidder. The CAR is calculated as the difference between the cumulated bidder stock return and a cumulated benchmark return, starting from 0 at $t = 0$. Cumulating forward, this amounts to:

$$CAR_{ijt} = \prod_{s=1}^{t}(1 + r_{ijs}) - \prod_{s=1}^{t}(1 + r_{ijs}^{bm}), \tag{1}$$

where i denotes the bidder, j the bidding contest, t and s index the period in event time, r_{ijs} is the bidder's stock return earned in event period s, i.e., over the time interval from $s-1$ to s (including all distributions), and r_{ijs}^{bm} is the benchmark return in event period s.[6] Recall that event time is defined such that $t = 0$ indicates the end of the month preceding the start of the merger contest, and $t = 1$ the end of the month of merger completion. Hence, the return at $t = 1$ captures the performance over the whole (variable-length) contest, collapsed into one event period, including the stock price reactions at the initial announcement and

[6] Cumulating backward, this corresponds to $CAR_{ijt} = \prod_{s=0}^{t+1}(1 + r_{ijs})^{-1} - \prod_{s=0}^{t+1}(1 + r_{ijs}^{bm})^{-1}$ for $t < 0$.

at contest resolution. After $t = 1$ and before $t = 0$, event time proceeds in steps of calendar months and, hence, r_{ijt} corresponds to the respective calendar-month return.

We use the four benchmarks described in Section II to adjust for systematic differences in asset prices (risk factors): market returns, industry returns, CAPM required returns, and characteristics-based portfolio returns. Notice that the benchmarks adjust not only for time-invariant winner-loser differences in observables but also for time variation in those differences. For example, the market exposure (beta) of the winner changes mechanically from that of the pre-merger, stand-alone company to the weighted average of the winner and the target after the merger, and we account for such shifts by estimating betas separately for the pre- and the post-merger periods. Similarly, the firm characteristics of the winner change because of the merger, and we account for the return implications of such changes by benchmarking against a dynamically rebalanced, characteristics-matched portfolio. Importantly, the computation of CARs also accounts for calendar time-specific shocks since we subtract the cumulated benchmark return realized over the same calendar period as the bidder return.

We evaluate the winner-loser differences in abnormal performance using the following regression equation:

$$CAR_{ijt} = \sum_{t'=\underline{T}}^{\overline{T}} \pi_{t'}^{W} W_{ijt}^{t'} + \sum_{t'=\underline{T}}^{\overline{T}} \pi_{t'}^{L} L_{ijt}^{t'} + \eta_j + \varepsilon_{ijt}. \tag{2}$$

The key independent variables are the two sets of indicators $W_{ijt}^{t'}$ and $L_{ijt}^{t'}$. $W_{ijt}^{t'}$ equals 1 if event time t equals t' and bidder i is a winner in contest j, i.e., $W_{ijt}^{t'} = 1_{\{t=t' \text{ and } i \text{ is a winner in contest } j\}}$. $L_{ijt}^{t'}$ is an equivalent set of loser event-time dummies, i.e., $L_{ijt}^{t'} = 1_{\{t=t' \text{ and } i \text{ is a loser in contest } j\}}$. Thus, our specification allows the effect of winner or loser status to vary with event time, and the coefficients $\pi_{t'}^{W}$ ($\pi_{t'}^{L}$) measure the average winner (loser) return at event time t'. For

example, π_3^W is the conditional mean of the winner CARs three months after the end of the bidding contest, and π_3^L is the conditional mean of the loser CARs three months after the merger. Note that some firms are winners and/or losers more than once, and any observation from these firms will simultaneously identify multiple π's.

The vector η_j is a full set of contest fixed effects and adjusts for case-specific differences, i.e., for all fixed characteristics in each group of contestants, and ε_{ijt} is a stochastic error term. The inclusion of case fixed effects guarantees that the π-series are identified from comparisons within a winner-loser pair. Thus, we retain the intuitive appeal of pairwise differencing in a regression framework.

Equation (2) also allows us to include calendar year-month fixed effects since merger announcements occur in multiple years and months. However, their inclusion is redundant when using abnormal returns (rather than raw returns) as they account already for period-specific shocks.[7]

We can reformulate equation (2) to directly estimate winner-loser *differences* in performance, replacing the loser-period dummies $L_{ijt}^{t'}$ with period dummies $C_{ijt}^{t'} = 1_{\{t=t'\}}$:

$$CAR_{ijt} = \sum_{t'=\underline{T}}^{\overline{T}} \pi_{t'} W_{ijt}^{t'} + \sum_{t'=\underline{T}}^{\overline{T}} \delta_{t'} C_{ijt}^{t'} + \eta_j + \varepsilon_{ijt} \tag{3}$$

Here, the coefficients $\pi_{t'}$ directly estimate the period-specific winner-loser differences while the coefficients $\delta_{t'}$ estimate the period-specific loser performance.[8]

Equation (3) yields 72 coefficients for winners and 72 for losers–one for each month in the three years prior to and after the merger. This detailed information is useful for graphically

[7] Note that abnormal returns adjust more finely than fixed effects since the shocks that are subtracted vary with the firm's exposure, e.g. with the firm's risk exposure in the case of risk-adjusted abnormal returns.

[8] Alternatively, we could use "differenced" data, i.e., the period-specific winner-loser CAR difference within a contest,ΔCAR_{jt}, as the outcome variable. For example, the OLS estimate of theπ-vector in regres-

assessing the evolution of winners' and losers' performance over time. However, in order to perform statistical tests of the merger effects, we also need a more parsimonious version with few interpretable coefficients. We estimate the following piecewise-linear approximation:

$$\begin{aligned} CAR_{ijt} = \alpha_0 + \alpha_1\, W_{ijt} + \alpha_2\, t + \alpha_3\, t \cdot W_{ijt} + \alpha_4\, Post_{ijt} + \alpha_5\, Post_{ijt} \cdot W_{ijt} \\ + \alpha_6\, t \cdot Post_{ijt} + \alpha_7\, t \cdot Post_{ijt} \cdot W_{ijt} + \eta_j + \varepsilon_{ijt}. \end{aligned} \tag{5}$$

This specification allows for different levels of performance before and after the merger (α_0 and $\alpha_4 Post$) as well as for winner-loser differences in performance levels pre- and post-merger ($\alpha_1 W_{ijt}$ and $\alpha_5 Post_{ijt} W_{ijt}$). It also accounts for two separate linear time trends in the pre-merger and post-merger periods ($\alpha_2 t$ and $\alpha_6 t Post_{ijt}$), and for winners deviating from these trends, separately in the pre-merger and in the post-merger periods ($\alpha_3 t W_{ijt}$ and $\alpha_7 t Post_{ijt} W_{ijt}$). Finally, the specification retains the contest dummies η_j. We account for possible serial correlation and correlations between winners and losers and cluster standard errors by contest.[9]

We use this parsimonious specification to perform two tests. First, we check the validity of our identifying assumption. Our identifying assumption requires that winners and losers

sion (3)is approximately equal to the estimate of the $\overline{\pi}$-vector in:

$$\Delta CAR_{jt} = \sum_{t'=\underline{T}}^{\overline{T}} \overline{\pi}_{t'} C_{jt}^{t'} + \varepsilon_{jt}. \tag{4}$$

However, while the OLS estimates of π in equation (3) and $\overline{\pi}$ in equation (4) are numerically identical in a balanced sample with only one loser per contest, they differ in unbalanced samples and in samples with multiple losers. The "level" specification of equation (3) makes more efficient use of multiple losers by including each loser separately rather than collapsing the observations into one difference.

[9] Cross-correlations due to overlapping event periods and CAR skewness (because CARs are bounded below at -100% but unbounded above) could still affect the standard errors but the optimal correction is debated, e.g., the effectiveness of Lyon, Barber, and Tsai (1999)'s bootstrapped and skewness-adjusted t-statistic, which is also problematic to implement in a regression framework (Mitchell and Stafford, 2000). See the discussion of standard errors in long-horizon event studies in Kothari and Warner (2005).

have similar trends in abnormal returns before the merger contest. Hence, we test whether $\hat{\alpha}_3 = 0$. Different winner trends prior to the merger would suggest differences in (possibly unobservable) characteristics that might affect performance even without the merger contest.[10]

Second, we use equation (5) to assess the causal effect of the merger. We estimate the value effect of mergers as the long-run performance difference between winners and losers at $t = 36$, $[\hat{\alpha}_1 + \hat{\alpha}_5 + 35 \cdot (\hat{\alpha}_3 + \hat{\alpha}_7)] = 0$. Note that the estimate of the pre-merger winner-loser difference, $\hat{\alpha}_1$, is included in the equation even though winner-loser differences are normalized to zero in period $t = 0$, because the regression does not estimate $\hat{\alpha}_1$ to be precisely equal to zero. Hence, the piecewise-linear approximation of the post-merger performance difference would be misstated if $\hat{\alpha}_1$ were not accounted for.[11]

B. Is There an Effect of Mergers on Losers?

An important consideration in assessing our identification strategy is whether the merger affects the loser's profitability directly. For example, the merger might change the loser's market power. Such "loser effects" are not necessarily a concern, though. In fact, they should be accounted for if, in the hypothetical scenario that the winner had not won the merger contest and the rest of the industry had re-optimized (i.e., the loser had acquired the target), the winner would have been subject to the same loser effects. For example, the winner might have suffered the same loss of market power as the loser, especially given that winner, loser, and target are often in the same industry. In other words, loser effects are a

[10] Alternatively, we test whether the estimated winner-loser difference at $t = -36$, $[\hat{\alpha}_1 - \#\text{ of pre-merger periods} \cdot \hat{\alpha}_3]$, is significantly different from 0. A positive (negative) difference would indicated that winners have been declining (increasing) in value relative to losers in the three years leading up to the merger. Given our normalization of CARs at $t = 0$, the two tests are identical.

[11] Also note that the parameter measuring the pre-merger trend, $\hat{\alpha}_3$, is included in the test equation, since our aim is to measure the total slope of the post-merger trend, not just the incremental trend shift, given that (as we will see) the identifying assumption is not rejected in our data.

concern only to the extent that losing the merger contest affects the loser differently than it would have affected the winner.

In our sample, loser effects are unlikely to be a major concern for three reasons. First, consider the possibility that the merger hurts the loser's performance (more than it would have hurt the winner). This consideration strengthens our main finding: our estimates of a negative merger effect would be even more negative in the absence of the loser effect and, hence, provide a conservative lower bound.[12] Second, consider the possibility that mergers are more beneficial to the loser than to the winner. Stigler (1950) first argued that, if the merged firm reduces its production below the combined output of its parts, industry prices may increase firms that did not merge may expand output and profit from the higher prices.[13] Subsequent literature has identified some of the limits of this result.[14] However, while it is certainly possible that a merger is not profitable and firms prefer not to merge, this entire class of models does not apply in our case. The bidders in our sample engage in deliberate and protracted battles to prevail in the merger.

Third, in our sample, mergers do not seem to have a discernable effect on losers. A loser effect should reveal itself in a trend break in losers' abnormal performance. We do not find such a trend break in the subsample of long contests, nor even in the contests of medium duration (quartile two and three). In contrast, we will document a highly significant but negative trend break in losers' abnormal performance in the shortest-duration subsample,

[12] Our finding of a positive effect in the case of short fights could be explained by a similar bias that overstates the effect of the merger.

[13] For example, the recent Continental-United and Delta-Northwest airline mergers are expected to benefit the non-merging airlines. Theoretically, in both a Cournot oligopoly model and a differentiated products Bertrand model, the non-merging firm could benefit if the synergy or efficiency effects of the merger are not very large. Salant, Switzer, and Reynolds (1983) conclude that in general, a merger is not profitable in a Cournot oligopoly, with the exception of two duopolists that become a monopoly.

[14] Deneckere and Davidson (1984) argue that the existence of product differentiation can result in the merged firm producing all the output of its pre-merger parts. Perry and Porter (1985) identify many circumstances in which an incentive to merge exists, even though the product is homogeneous.

which confirms again that losers in this subsample do not provide a good counterfactual.

IV. Results

A. The Effect of Mergers on Acquirors

We turn to our main results, the comparison of cumulative abnormal returns between matched winners and losers. We analyze the abnormal performance both prior to the merger contest, to test for pre-merger similarity, and after the merger contest, to estimate the returns to the merger earned by acquiring company shareholders. We first present the estimation results graphically and then discuss the regression results in more detail.

For the graphical illustration, we plot the series of winner and loser π-coefficients from regression equation (2), estimated on the sample of close (long-duration) contests. Figure 3 shows these time series for the four measures of abnormal performance in Panels (a) to (d) and, for completeness, using raw returns in Panel (e).

[Figure 3 approximately here]

Consistent with the evidence in Section II, winning and losing firms display very similar performance paths in the three years before the contest, irrespective of the measure of performance. In fact, the winner- and loser-plots are virtually on top of each other during (at least) the last 20 months prior to the merger. This result further corroborates the validity of our matching methodology.

In the three years after the merger, however, the performance of winners and losers diverge. Losers display either zero or positive abnormal performance, with an upward trend towards the end of the third year, while winners display negative abnormal performance and a downward trend throughout the post-merger period. Even in the graph showing raw returns, winner and loser plots visibly separate post-merger. This evidence suggests that, for

the sample of contested mergers, "winning means losing:" The shareholders of the acquiring company would have been better off had their company lost the merger contests.

We also find that the winner's underperformance is observed *only* in the long-duration quartile. Auxiliary plots of market-adjusted CARs for the other duration-quartiles (Appendix Figure A-2) show little post-merger divergence in the middle quartiles, Q2 and Q3. And, in the shortest-duration quartile, Q1, both winners and losers display abnormal underperformance, with losers performing even worse than winners. Given the lack of winner-loser comparability in quartiles Q1-Q3, the latter results are hard to interpret.

We now quantify the economic magnitude and statistical significance of this visual impression. Table III reports the coefficient estimates of equation (5). The sample of interest is the long-duration quartile Q4, but we also report the Q1-Q3 results for completeness. We estimate each regression for all four measures of abnormal performance. In unreported results we further find that both the economic and the statistical significance of all coefficient estimates is virtually unchanged if we also include 288 calendar time (year-month) dummies, likely because the abnormal return adjustment already controls for all return-relevant calendar-time effects in the first stage.

[Table III approximately here]

Starting with the tests of the identifying assumption, Table III shows that the coefficient α_3 is never statistically significant. Consistent with the visual evidence in Figure 3 and the additional tests in Table II, winner and loser returns are statistically undistinguishable at conventional levels during the 36 months leading up to the merger. We also find the same result when we use a broader sample, e.g., not requiring the sample to be balanced and/or not requiring it to be matched in terms of non-missing winner and loser CARs.

Turning to the effect of the merger on the acquiring firm's long-run abnormal perfor-

mance, we report the respective estimate, $\hat{\alpha}_1 + \hat{\alpha}_5 + 35(\hat{\alpha}_3 + \hat{\alpha}_7)$, in the lower part of Table III, labeled "Merger Effect." As described in Section IV.A, $\hat{\alpha}_5$ is the shift in the winner-loser performance difference from $t = 0$ to $t = 1$, i.e., during the merger contest, while $\hat{\alpha}_3 + \hat{\alpha}_7$ capture the per-period post-merger trend difference in performance. The latter term is multiplied by 35 in order to arrive at the total divergence in $t = 36$, i.e., three years after merger completion.

We find that, in our core sample of long-duration contests, winners fare significantly worse than losers. The cumulative underperformance of winners from the beginning of the contest to the end of three years after merger completion lies between 48.59 and 53.85 percent, depending on the measure of abnormal performance. Despite the small sample, the effect is statistically significant at the five- or ten-percent level for all four measures. In other words, regardless of the measure of abnormal performance used, we estimate the merger to "cost" acquiring company shareholders as much as about 50 percent underperformance over the course of the merger contest and the following three years.

In contrast, estimates for the medium-duration quartiles Q2 and Q3 uncover no significant differences in performance, and estimates for the shortest-duration subsample reveal significant underperformance of both winners and losers, with winners outperforming losers (by 31.38 to 36.98 percent). One interpretation of this reversal of the *relative* performance is that, in the case of short contests, the ultimate winner has the most to gain from the merger and thus quickly prevails. By contrast, in the case of long contests, the gains from the merger are likely to be ex-ante more balanced for winners and losers. As a result of the reversal in Q1, the Q4-Q1 difference is economically and statistically large. As noted at the bottom of Table III, the interquartile range of underperformance lies between 80 and 89 percent and, in all cases, is highly statistically significant. However, as discussed above, it is unclear what to infer from the losers' performance in quartiles Q1 to Q3 about the counterfactual

performance of the winners. Given that the losers were not "close" to winning the contest in those subsamples, these estimates do not provide an estimate of the causal effect of the merger, and the interquartile difference is affected by the different selection of winning and losing bidders.[15]

B. Alternative Explanations

The results presented above show that the post-merger returns of winners and losers differ substantially. In the subsample of long-lasting bidding contests, losing appears to be better than winning from the perspective of acquiring-company shareholders. Before interpreting the winner-loser difference causally and investigating possible mechanisms, we test whether the observed performance differences can be attributed to other differences between winners and losers that affect the returns to mergers.

Measuring differences in bidder characteristics is, of course, difficult, which is why there is an identification problem in the first place. Prior literature has identified a number of characteristics that are significantly associated with long-term post-merger performance. We test whether any of these characteristics explain our findings. That would be the case if such characteristics were correlated with long-term performance *and* also varied with contest duration.

Hostile vs. Friendly. A first possibility is that the underperformance of winners relative to losers is more pronounced in the subsample of hostile bids. For example, hostile bidders might need to bid higher than they would in a friendly takeover. This could explain our

[15] We also estimated the incremental effect of increasing contest duration by one year. In these pooled regressions, we interact all variables with contest duration, i.e., we add the independent variables Duration (α_8), Duration · Winner (α_9), Duration · Period (α_{10}), Duration · Winner · Period (α_{11}), Duration · Post Merger (α_{12}), Duration · Post Merger · Winner (α_{13}), Duration · Post Merger · Period (α_{14}), Duration · Post Merger · Period · Winner (α_{15}). We find that an increase in contest duration by one year is associated with additional value destruction of 43.45-52.17 percent, depending on the measure of abnormal returns employed. While these estimates are very similar to our estimates in the long-duration quartile, they also lack a causal interpretation due to differential sorting of winning and losing bidders into short-duration contests.

results if hostile bids are predominant among close contests.

This interpretation is unlikely since, as we will show below (in Section IV.C), our results are not explained by higher offer premia. Nevertheless, we re-estimate the effect of mergers separately for hostile and for friendly mergers. As shown in Columns (1) and (2) of Table IV, hostile acquirors tend to do somewhat worse than friendly bidders, but the difference is not statistically significant. Furthermore, hostile bids are more common in short contests than in long ones and amounts to only one tenth of the entire sample (eight out of 82 cases). Hence, deal attitude cannot explain the long-quartile result, nor can it explain the differences by duration more generally.

[Table IV approximately here]

Acquiror Q. Prior research shows that highly valued acquirors underperform in the long run relative to a characteristics-matched firm portfolio (Rau and Vermaelen, 1998). We test whether such a pattern is present in our data and might be correlated with contest duration. First, we re-estimate regression (5) separately for high-Q and low-Q acquirors, based on their Tobin's Q at the fiscal year-end preceding the beginning of the contest. As reported in Columns (3) and (4) of Table IV, we find no significant difference in the relative winner-loser performance across the two subsamples. The difference is also small in terms of economic magnitude. Second, we correlate contest duration with winner Q and with loser Q. We do not find any significant (or even economically sizeable) results. Hence, our long-duration results are not driven by the underperformance of high-Q firms.

These findings also imply that previous findings on the underperformance of highly valued acquirors may have to be interpreted with caution. Those prior results might be affected by the lack of a proper counterfactual. As discussed above, Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) suggest that high-Q acquirors may seek to attenu-

ate the reversal in their (over-)valuation by means of acquisitions. Empirically, such firms would appear to underperform post-merger when not benchmarked against the right counterfactual. In fact, in our sample of contested mergers, high-Q winners do not show the strong underperformance documented in earlier studies once they are benchmarked against the close-bidder counterfactual.

Acquiror Size. Moeller, Schlingemann, and Stulz (2004) and Harford (2005) provide evidence of poor post-acquisition performance of large acquirors. Since acquirors in long-duration contests tend to be large, size effects could explain our result.

We split our sample of mergers based on the market capitalization of the acquiror. As shown in Columns (5) and (6) of Table IV, we observe no significant differences in post-merger performance. Thus, our long-duration estimates are not mis-identifying a size effect.

Number of Bidders. Another explanation could be that contests take more time to complete when more bidders compete for the same target, and that bidders do not account for the winner's curse, leading to more severe overbidding in contests with many competing bidders. We find, however, that the number of bidders in our sample does not increase in contest duration. Moreover, as Columns (7) and (8) of Table IV show, winners do not do worse in contests with more than two bidders than in contests with exactly two bidders.

Diversification. Next, we analyze separately diversifying and concentrating mergers. We define a merger as diversifying if the winning bidder has a Fama-French 12-industry classification that is different from the target's classification, and as concentrating otherwise. Columns (9) and (10) of Table IV do not reveal any significant difference in the merger effect across these types of acquisitions.

Relative Deal Size. In our sample, target size is weakly positively associated with contest duration, and thus may explain the estimated effect of long-duration mergers. We use relative deal size, defined as the transaction value relative to the acquiror's market capitalization, as

a sorting variable. Columns (11) and (12) of Table IV show that winners do not perform significantly worse than losers even when targets are relatively large.

Form of Payment. Finally, we test whether the winner-loser comparison varies by the means of payment. Prior studies find that stock mergers exhibit poor long-run abnormal returns relative to size and market-to-book matched firms, while cash acquirors outperform the matched firms (Loughran and Vijh, 1997).

In the last two columns of Table IV, we split our sample into all-stock and all-cash deals. Consistent with prior evidence, we find that stock acquirors show poor post-merger performance (relative to losers) while the opposite is true for cash mergers. Though the out- or underperformance is not statistically significant for each subsample separately, the cross-sample difference is significant at the five percent level.

Given this difference, we test whether our main finding, the acquiror underperformance in close contests, can be explained by the means of payment. First, we investigate whether differences in the form of payment offered by winners versus that offered by losers could explain our results. This would be the case if, in long contests, winners tended to offer a higher fraction of the payment in stock than losers, but not in shorter-duration quartiles. We find, however, that the number of deals in which the winner and the loser make the same type of offer (all-cash, all-stock, or mixed) does not show a monotonic pattern across duration quartiles (twelve contests in Q1, seven in Q2, thirteen in Q3, eight in Q4). The winner-loser difference in the *percentage* of the deal value offered in stock, however, does increase with contest duration, from -16.76 percent to 18.06 percent. While both winners and losers offer increasing percentages of the deal value in stock going from short to long contests, the increase is larger for winners.

Second, we re-estimate the empirical model of Table III, but now differentiating by the percentage of the transaction value offered in stock. That is, we include as additional

independent variables the percentage offered in stock as well as a full set of interactions with all other independent variables.[16] In Table V we report the resulting test statistics for all-cash and all-stock deals.

[Table V approximately here]

The estimates indicate that, in the subsample of long-duration contests, the pattern of winner-loser underperformance is far more pronounced for cash bids. The negative estimate of the merger effect for all-cash bids more than doubles relative to all long-duration contests, e.g., -110.3% in the case of market-adjusted returns (versus -48.6% in Table III), and is statistically significant at the five percent level. Relatedly, the positive estimate in short-duration contests becomes insignificant for all-cash mergers. For all-stock mergers, we also observe lower performance in long-duration than in short-duration contests, but the quartile-specific effects are insignificantly positive, and the difference is insignificant for all but the characteristics-adjusted measure of abnormal returns and much smaller, ranging from 18 to 60 percent of the size of the all-cash coefficient.

These estimates indicate that our finding of winner-loser underperformance in close contests is not explained by systematic differences in the type of payment offered by winners versus losers, nor does it correspond to a form-of-payment effect in the direction suggested by prior research. Winners that use primarily stock do *not* underperform if performance is measured using an appropriate counterfactual (losers placing bids with a similar type of payment). Instead, it is the winners paying in cash that dramatically underperform their otherwise similar, but losing, counterparts in close contests.

This result also suggests for novel interpretation of the motives for choosing cash payments, at least in the sample of contested mergers. One view of (long) contests that are

[16] That is, we add Pct Stock (α_8), Pct Stock · Winner (α_9), Pct Stock · Period (α_{10}), Pct Stock · Winner · Period (α_{11}), Pct Stock · Post Merger (α_{12}), Pct Stock · Post Merger · Winner (α_{13}), Pct Stock · Post Merger · Period (α_{14}), Pct Stock · Post Merger · Period · Winner (α_{15}) to regression model (5).

settled in cash is that the target simply seeks to cash out at the highest possible price, irrespective of the long-run strategic fit of the merged entity. Hence, many of these deals result in poor long-run performance. By contrast, in deals settled in stock, the target has an economic interest in the subsequent performance of the merged company. Such a (more negative) view of cash deals is commonly voiced among practitioners but less discussed in the academic literature.

The finding also lends further credibility to the arguments in Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) that overvalued firms use their stock as cheap currency to buy less overvalued targets. Such mergers are predicted to "perform poorly" merely due to mean reversion of the acquiror's stand-alone valuation, not because the merger is value-destroying. In fact, the merger generates value for the acquiring company shareholders in the long-run. Our analysis reveals that stock mergers do indeed perform better than cash or mixed mergers when benchmarked against the losing contestant.

C. Possible Mechanisms

What explains the observed underperformance of acquirors? The last set of results, on the type of payment, points to one possible channel: While the underperformance result is robust to controlling for the type of payment, it is more pronounced in cash-financed mergers. We explore whether changes in the acquiring firms' capital structure (increased leverage due to the cash financing) or operating performance (possibly due to financial constraints after cash financing) can be linked to the acquirors' post-merger underperformance. Relatedly, we test whether close contests induce higher offer premia, which might constrain the acquiror financially in the post-merger period.

Offer Premia. To test whether the winner's underperformance in long-lasting contests is due to higher offer premia, we relate offer premia to contest duration. We measure offer

premia using the targets' run-up in stock prices, as described in detail in the Data Appendix. Here, we need to restrict the sample to the 66 contests for which the target stock price is available.

The left panel of Figure 4 plots offer premia against contest duration. We observe a weak positive correlation. A linear regression of offer premia on contest duration (unreported) reveals that one additional month implies a 2.16 percentage point increase in premium (p-value < 0.05). However, the scatter plot also shows that the positive correlation is driven by a single outlier.[17] Once that outlier is removed the relationship becomes insignificant and much weaker economically (0.27 ppt per additional month).

[Figure 4 approximately here]

Nevertheless, we gauge the size of the potential effect of duration-induced overpayment by re-estimating the premium as a percentage of the *acquiror's* pre-merger market valuation. Since bidder CARs are normalized to 0 in the month prior to the beginning of the contest, both the winner-loser difference in performance and the re-estimated premium are now expressed as percentage differences in bidder valuations. This allows us to directly evaluate how much of the winner's underperformance could be explained by duration-induced additional payments: the overpayment should translate into an comparable drop in the acquiror's CAR. The right panel of Figure 4 shows a scatter plot of this relationship. As expected, given the acquiror-target size differences, the correlation with contest duration becomes an order of magnitude smaller. In the corresponding linear regression, we find that the relationship between offer premium and contest duration is statistically insignificant and economically

[17] The outlier is the contest between American Home Products and Rorer Group to acquire AH Robins. It lasted from February 4, 1987 (first bid by American HP) until December 15, 1989 (completion of the merger with American HP acquiring). However, Rorer withdrew their last bid already on January 20, 1988. Hence, our main measure of contest duration (from first bid until completion) and alternative measures ("both bids are active") differ significantly in this case, with 35 versus 12 months.

weak, less than one percentage point for an additional month of contest duration, whether or not the most extreme outlier is removed. We conclude that duration-induced overbidding is unlikely to explain the underperformance of acquirors in long merger contests.

Operating Performance. We also test whether differences in operating performance could explain the post-merger divergence of winners' and losers' abnormal returns. We used several measures and display here the plots of operating cash flows of winners and losers.[18] Using again quarterly data, we calculate operating cash flow similar to Moeller, Schlingemann, and Stulz (2004) as net sales minus cost of goods sold and selling, general and administrative expenses, and express it as a percentage of total assets.[19] The top graphs in Figure 5 show the evolution of cash flows for winners and losers in the full sample and the quartile of long contest duration over the three years around the merger. From graph 5(b) we see that, in the subsample of long contests, winner and loser cash flows track each other closely, not only before but also after the contest. We find the same (non-)result with a range of other measures of operating performance: no significant deviation of winner and loser trends post-merger. The observed stock underperformance does not translate into operating underperformance.

Leverage. Finally, we consider the possibility that merger-induced changes in leverage are linked to the acquirors' post-merger underperformance. In particular in the case of cash deals, acquirors may be financing their merger activity with debt, and the market may see excessive leverage as potentially harmful to the long-term health of the company. Penman, Richardson, and Tuna (2007), for example, find that leverage is negatively associated with future stock returns.

[18] See the discussion of measures of operating performance around mergers in Healy, Palepu, and Ruback (1992).

[19] Moeller, Schlingemann, and Stulz (2004) in addition subtract the change in working capital to compute operating cash flow. Since this item is not available on a quarterly frequency and represents only a small fraction of cash flows, we do not subtract it for our analysis.

We compare winners' and losers' leverage ratios both before and after the merger. Using quarterly data, we compute market leverage as the ratio of total debt (sum of short-term and long-term debt) divided by the market value of the firm (total assets minus book equity plus market equity). Alternatively, we use book leverage and industry-adjusted book or market leverage; all measures yield very similar results.

The bottom graphs in Figure 5 show the evolution of market leverage for winners and losers in the full sample and the quartile of long contest duration. Graph graph 5(d) for the long-duration contests indicates that winners' and losers' leverage ratios diverge after the merger. Shortly before the merger, winners tend to have somewhat lower leverage ratio than losers. But this changes after completion of the merger. About six months after completion (during the second quarter post-merger), winners start to significantly increase their leverage ratios relative to losers. (We also find the pattern of pre-merger similarity and post-merger divergence in Q3 and Q2 but not in Q1.) Qualitatively, the winner-loser gap in leverage ratio appears to increase over time.

Hence, while we do not have causal evidence on the role of capital structure changes, the correlational evidence suggests a possible link to winner-loser underperformance. High leverage ratios to finance and implement the merger might be constraining the acquiror post-merger.

[Figure 5 approximately here]

V. Comparison with Existing Methodologies

Our empirical approach allows us not only to estimate the causal effect of (contested) mergers, but also to evaluate existing empirical approaches. That is, while our estimate of large negative abnormal returns, around -50 percent, are specific to our sample of close merger contests, we can use those estimates to investigate possible biases in existing approaches, such

as announcement returns, alphas based on four-factor calendar-time portfolio regressions, and abnormal returns based on characteristics-matched portfolios.

We present the estimates based on traditional methodologies in Panel A of Table VI and, for comparison, our winner-loser estimates for the four types of abnormal returns in Panel B. The first row of Panel A reports announcement returns, which are commonly viewed as the most credible measure of the causal effect of mergers, given the difficulty of identifying a valid benchmark for long-run performance. We find that the three-day announcement returns are negative and economically large, -3.77 percent in the full sample and -3.27 percent in Q4. Importantly, they do not vary systematically with the length of the contest; the difference between the first and the fourth quartile is virtually zero. Q2 has the lowest average announcement return (-5.6 percent), and Q3 has the highest (-3.1 percent).[20] Compared to our estimates in Panel B, the announcement effect significantly underestimates the loss of value induced by mergers, suggesting that the market is, on average, incorrect in its initial assessment of the causal effect of contested mergers.

[Table VI approximately here]

The second row of Panel A shows the four-factor abnormal returns, using an equally-weighted calendar-month portfolio methodology for the post-acquisition returns of the winner. Here, the pattern is qualitatively consistent with the winner-loser estimates: a positive return in the shortest-duration quartile and a negative return in the longest-duration quartile. However, the Q4 estimate is only about half as large as the winner-loser estimate and insignificant.

In the third row, we calculate the abnormal post-merger returns using characteristics-matched portfolios. We find a larger negative estimate for Q4 (and a small negative estimate

[20] The picture changes if we calculate dollar returns. In this case, Q2 features the highest average acquiror return (-9.6% if scaled by transaction value), and Q1 the lowest (-32.9%).

for Q1). However, all estimates are insignificant, even in the full sample, and the magnitude of the Q4 estimate is again less than half that of the winner-loser estimate.

In Table VII, we go one step further. Instead of simply comparing our main estimates of the merger effect with the mean of alternative estimates, we correlate estimates case by case. In Panel A, we regress the announcement effects on our winner-loser estimates and, in Panel B, we regress traditional estimates of long-run abnormal returns on our winner-loser estimates.

[Table VII approximately here]

For the announcement effect, we find a *negative* correlation, regardless of the measure of abnormal returns employed. In the sample of close (long-duration) contests, the negative correlation is significant at the five-percent level. In other words, in deals where our estimates point to a more negative effect of mergers, the announcement effect tends to be more positive (less negative), while in deals where our estimates point to a more positive (less negative) effect of mergers, the announcement effect tends to be more negative. Hence, the announcement effect fails to predict the causal effect of mergers even directionally.

Turning to the existing methodologies to estimate the long-run abnormal returns, the picture is more encouraging. In Panel B, we regress the long-run abnormal performance of the winners, calculated using market-adjusted, industry-adjusted, risk-adjusted, or characteristics-adjusted returns, on the winner-loser abnormal performance difference using the same return benchmark. The correlation is positive and (at least marginally) significant both in our core sample (Q4) and in the full sample. The R-squared is high, and always above 50% in the sample of long-duration contests. Quantitatively, however, the correlation amounts only to about 50 percent, suggesting that prior methods significantly understate merger effects in those cases.

Overall, we conclude that researchers should be cautious when using announcement returns to measure the expected returns to mergers. At least in the subsample of merger contests, the announcement effect appears to be generally uninformative about the returns generated by the merger in the long-run. Existing methodologies to assess long-run abnormal returns are better, but tend to underestimate the value destruction caused by protracted mergers.

VI. Conclusion

This paper makes two contributions. Methodologically, we argue that bidding contests help to address the identification issue in estimating the returns to mergers. In contests where at least two bidders have a significant ex-ante chance of winning, the post-merger performance of the losing bidder permits the calculation of the counterfactual performance of the winner without the merger. This logic applies to protracted merger fights, where all participating bidders have, ex ante, a reasonable chance to win. By contrast, short merger fights are more similar to uncontested fights in that one of the bidders is likely to have a decisive advantage that leads him to prevail easily.

Substantively, this paper provides credible estimates of the effect of contested mergers on stock values. We find that the stock returns of bidders are not significantly different before the merger contest, but diverge significantly post-merger. In the case of close contests, losers outperform winners by 50 percent over the three years following the merger. We also uncover an increase in the leverage of winners relative to losers after the merger, but do not detect differences in operating performance.

In interpreting our results, it is important to keep two points in mind. First, while we argue that losers provide a good counterfactual for winners in long contests, we can not rule out the presence of additional unobserved factors correlated with merger activity that

affect stock performance. In the paper, we discuss possible omitted variables and show that the empirical evidence is generally inconsistent with the alternative factors explaining our main result. Ultimately, though, the credibility of our estimates rests on the identification assumption, which, of course, can not be tested directly.

Second, the external validity of our findings is unclear. Our estimates are based on contested mergers, which are not representative of the entire population of mergers. While a non-trivial fraction of mergers are contested (and the empirical assessment of merger contests is interesting in and of itself), the size and even the direction of the effect does not generalize to mergers more broadly. At the same time, the empirical estimates do allow us to provide an evaluation of existing methodologies, which suggests caution in interpreting announcement effects as measures of the returns to mergers.

References

Andrade, Gregor, Mark Mitchell, and Erik Stafford, 2001, New evidence and perspectives on mergers, *Journal of Economic Perspectives* 15, 103–120.

Asquith, Paul, Robert F. Bruner, and David W. Mullins Jr, 1987, Merger returns and the form of financing, *Journal of Financial Economics* 11, 121–139.

Betton, Sandra, B. Espen Eckbo, and Karin Thorburn, 2008, Corporate takeovers, in *Handbook of Corporate Finance: Empirical Corporate Finance, volume 2, chapter 15* (North Holland/Elsevier).

Boone, Audra L., and J. Harold Mulherin, 2007, How are firms sold?, *The Journal of Finance* 62, 847–875.

Daniel, Kent, Mark Grinblatt, Sheridan Titman, and Russ Wermers, 1997, Measuring mutual fund performance with characteristic-based benchmarks, *The Journal of Finance* 52, 1035–1058.

Deneckere, Raymond, and Carl Davidson, 1984, Horizontal mergers and collusive behavior, *The International Journal of Industrial Organization* 2, 117–132.

Greenstone, Michael, Richard Hornbeck, and Enrico Moretti, 2010, Identifying agglomeration spillovers: Evidence from winners and losers of large plant openings, *Journal of Political Economy* 118, 536–598.

Greenstone, Michael, and Enrico Moretti, 2004, Bidding for industrial plants: Does winning a 'million dollar plant' increase welfare?, *Working Paper*.

Harford, Jarrad, 2005, What drives merger waves?, *Journal of Financial Economics* 77, 529–560.

Healy, Paul M., Krishna G. Palepu, and Richard S. Ruback, 1992, Does corporate performance improve after mergers?, *Journal of Financial Economics* 31, 135–175.

Jensen, Michael C., 1986, Agency cost of free cash flow, corporate finance, and takeovers, *American Economic Review Papers & Proceedings* 76, 323–329.

——— , and Richard S. Ruback, 1983, The market for corporate control, *Journal of Financial Economics* 11, 5–50.

Kothari, S.P., and Jerold B. Warner, 2005, The econometrics of event studies, in B. Espen Eckbo, ed.: *Handbook of Corporate Finance: Empirical Corporate Finance* (North Holland/Elsevier).

Loughran, Tim, and Anand M. Vijh, 1997, Do long-term shareholders benefit from corporate acquisitions?, *Journal of Finance* 52, 1765–1790.

Lyon, John D., Brad M. Barber, and Chih-Ling Tsai, 1999, Improved methods for tests of long-run abnormal stock returns, *The Journal of Finance* 54, 165–201.

Malmendier, Ulrike, and Geoffrey Tate, 2008, Who makes acquisitions? CEO overconfidence and the market's reaction, *Journal of Financial Economics* 89, 20–43.

Mitchell, Mark, Todd Pulvino, and Erik Stafford, 2004, Price pressure around mergers, *Journal of Finance* 59, 31–63.

Mitchell, Mark L., and Erik Stafford, 2000, Managerial decisions and long-term stock price performance, *Journal of Business* 73, 287–329.

Moeller, Sara B., Frederik P. Schlingemann, and René M. Stulz, 2004, Firm size and the gains from acquisitions, *Journal of Financial Economics* 73, 201–228.

——— , 2005, Wealth destruction on a massive scale? A study of acquiring-firm returns in the recent merger wave, *Journal of Finance* 60, 757–782.

Morck, Randall, Andrei Shleifer, and Robert Vishny, 1990, Do managerial objectives drive bad acquisitions?, *The Journal of Finance* 45, 31–48.

Penman, Stephen H., Scott Richardson, and Irem Tuna, 2007, The book-to-price effect in stock returns: Accounting for leverage, *Journal of Accounting Research* 45, 427–467.

Perry, Martin K., and Robert H. Porter, 1985, Oligopoly and the incentive for horizontal merger, *The American Economic Review* 75, 219–227.

Rau, Raghavendra, and Theo Vermaelen, 1998, Glamour, value, and the post-acquisition performance of acquiring firms, *Journal of Financial Economics* 49, 223–253.

Rhodes-Kropf, Matthew, and S. Viswanathan, 2004, Market valuation and merger waves, *The Journal of Finance* 59, 2685–2718.

Richardson, Scott, Richard Sloan, and Haifeng You, 2011, What makes stock prices move? fundamentals vs. investor recognition, *Working Paper*.

Roll, Richard, 1986, The hubris hypothesis of corporate takeovers, *Journal of Business* 59, 197–216.

Salant, Stephen W., Sheldon Switzer, and Robert J. Reynolds, 1983, Losses from horizontal merger: The effects of an exogenous change in industry structure on cournot-nash equilibrium, *Quarterly Journal of Economics* 98, 185–99.

Savor, Pavel G., and Qi Lu, 2009, Do stock mergers create value for aquirers?, *The Journal of Finance* 64, 10611097.

Shleifer, Andrei, and Robert W. Vishny, 2003, Stock market driven acquisitions, *Journal of Financial Economics* 70, 295–311.

Stigler, George J., 1950, Monopoly and oligopoly by merger, *American Economic Review Papers & Proceedings* 40, 23–34.

Data Appendix

Our data combine information on merger contests from the SDC Mergers and Acquisitions database with financial and accounting information from CRSP and Compustat as well as analyst forecast data from I/B/E/S. From the SDC database, we collect the SDC deal number of each bid, the acquiror's SDC assigned company identifier (CIDGEN), six-digit CUSIP, ticker, nation, company type, the SIC and NAICS codes, as well as the following bid characteristics: announcement date, effective or withdrawal date, the percentage of the transaction value offered in cash, stock, or other means of payment, the deal attitude (friendly or hostile), and the acquisition method (tender offer or merger). To identify contested mergers, we first use the SDC flag for competing bids. We then check that all bids classified as contested are in fact for the same target during overlapping time periods and are placed before the recorded completion date. The company that succeeds in completing a merger is classified as the winner and all other bidders as losers. We found three contests to which SDC erroneously assigns two winners. We identify the unique winner by a news wire search.

From the CRSP Monthly Stock Database we collect holding period stock return (RET), distribution event code (DISTCD), delisting code (DLSTCD), and delisting return (DLRET) as well as the CRSP value-weighted index return (VWRETD). We obtain the one-month Treasury Bill rate (RF), the Fama-French factor returns (MKTRF, SMB, HML) and the momentum factor return (UMD) from the Fama-French data library. The yearly accounting data, obtained from the CRSP-COMPUSTAT Fundamentals Annual Database, include total assets (AT), book and market value of equity, operating income (OIBDP), and property, plants and equipment (PPENT). The quarterly data, obtained from the CRSP-COMPUSTAT Fundamentals Quarterly Database include debt in current liabilities (DLCQ), long-term debt (DLTTQ), total assets (ATQ), common shares outstanding (CSHOQ), fiscal quarter closing price (PRCCQ), book value of shareholders equity (SEQQ), balance

sheet deferred taxes and investment tax credit (TXDITCQ), book value of preferred stock (PSTKQ), sales (SALEQ), cost of goods sold (COGSQ), and selling, general and administrative expenses (XSGAQ). We use the quarterly data to construct the time series of operating cash flow and leverage for each bidder.

Finally, we add analyst forecast data from I/B/E/S. For each bidder we collect the 2-year-ahead consensus forecast (i.e. the median forecast of all analysts covering the firm) of earnings per share for the entire -3/+3-year window around the merger.

We merge the SDC and CRSP data using the 6-digit CUSIP number and the permanent company and security identifiers (PERMCO and PERMNO). We match the 6-digit CUSIP provided by SDC with the first six digits of CRSP's historical CUSIP (NCUSIP). Since the CUSIP of a firm changes over time, and the reassignment of CUSIPs is particularly common following a merger, we are careful to match SDC's bidder CUSIP with CRSP's NCUSIP for the month end preceding the announcement of the specific bid and to extract the respective PERMCO. We manually check that the SDC company names correspond to the matched CRSP company names. If a firm has multiple equity securities outstanding, we use (1) the common stock if common and other types of stock are traded; (2) Class A shares if the company has Class A and Class B outstanding; and (3) the stock with the longest available time series of data if there are multiple types of common stock traded.

We draw stock return data for the period January 1, 1982 to December 31, 2009 and construct the time series of bidder returns for a window of $+/-$ three years around the merger contest (from $t = -35$ to $t = +36$). The CRSP holding period return is already adjusted for stock splits, exchanges, and cash distributions. (This adjustment is important since these events are particularly common around mergers.)

We also construct a time series of daily target returns to calculate the offer premium. We compute the offer premium as the run-up in the target stock price from from 40 trading

days prior to the beginning of the contest until completion of the merger, experessed as a percentage of either the target's or the acquirors' equity value.

In the three-year period after a merger, many bidders disappear from CRSP due to delisting. To reduce survivorship bias, we are careful to calculate the return implications of the delisting events for shareholders using all delisting information available from CRSP. The delisting code (DLSTCD) classifies delists into mergers, exchanges for other stock, liquidations, and several other categories of dropped firms; the distribution information (DIVAMT) reports to what extent target shareholders were paid in cash or stock; and the delisting return (DLRET) provides the shareholder returns from the last day the stock was traded to the earliest post-delisting date for which CRSP could ascertain the stock's value. We round the delisting return period to full months and track the performance of a delisted firm from the perspective of a buy-and-hold investor, mirroring our approach when tracking the performance of listed firms. Specifically, we assume that stock payments in takeovers are held in the stock of the acquiring firm and exchanges for other stock are held in the new stock. When shareholders receive cash payments (in mergers, liquidations, and bankruptcies) or CRSP cannot identify or does not cover the security in which payments are made, we track performance as if all proceeds were invested in the market portfolio, using the value-weighted CRSP index.

We merge the resulting panel with annual and quarterly accounting data from CRSP-COMPUSTAT. To each monthly observation, we assign the annual (quarterly) accounting data pertaining to the most recent preceding fiscal year (fiscal quarter) end.

Our initial sample contains all contested bids announced between January 1, 1985 and December 31, 2009, amounting to 416 bids in 193 takeover contests. We drop repeated bids by the same bidder, but keep the date of the first bid as the announcement date. This eliminates 14 bids. Next, we drop 42 contests that had no winner (i.e., had not been

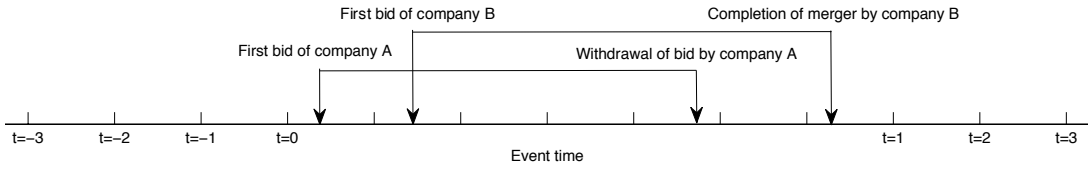
completed by December 31, 2009). We further drop 12 bidders that could not be matched to a CRSP PERMNO. We then delete 11 contests in which the winner is the ultimate parent company of the target, since ultimate parents are unlikely to provide a good comparison for other bidders. Next, we balance the sample by requiring non-missing stock return data from $t = -35$ to $t = +36$ (i.e., three years before and after the contest), which restricts our sample to merger contests that were completed by December 31, 2006, and reduces the number of contests to 117. We also eliminate five bidders who exhibit extreme stock price volatility over the event window, with the standard deviation of their prices exceeding 200.[21] These firms appear to be influenced by idiosyncratic factors and are, ex ante, a poor benchmark for their respective contestants. (Keeping them in the sample does not affect our findings; it only increases the confidence bounds in the *pre-merger* period.) Finally, we keep only those contests for which we have data for both the winner and the losers. This reduces the sample by another 32 contests. The final sample contains 82 contests with bids placed by 172 bidders: 82 winners and 90 losers. Table A-I summarizes the construction of our data set. Figure A-1 shows the frequency distribution of contests over the sample period, and illustrates the spikes in the mid-1980s and mid-1990s.

[Table A-I approximately here]

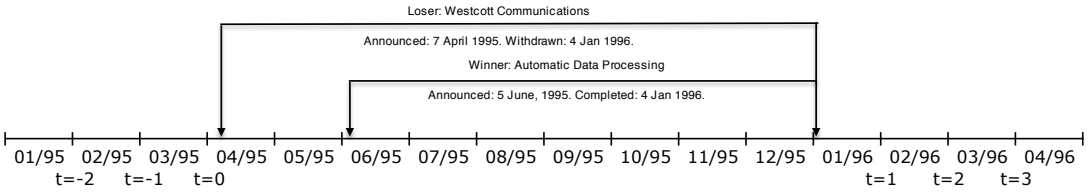
[Figure A-1 approximately here]

[21] The volatility is calculated using the full event window of +/- three years. The firms are in the high-tech sector (CTS Corp, Yahoo!, QWest Communications), healthcare (Hyseq Pharmaceuticals), and the service sector (Cannon Group). All of these firms show 10- to 20-fold increases and reversals in their stock market valuations, mostly occurring in the pre-merger period.

Figures and Tables

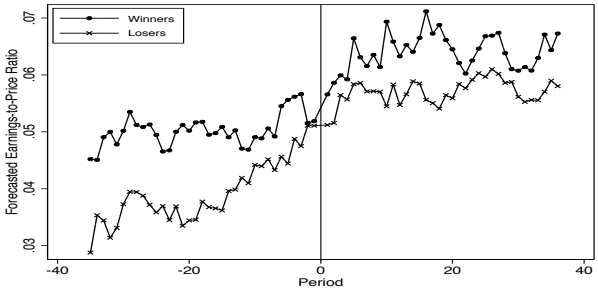


(a) Stylized Example

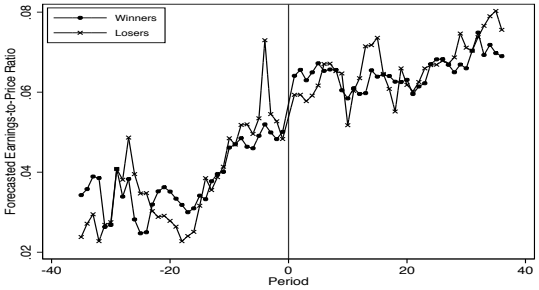


(b) Data Example

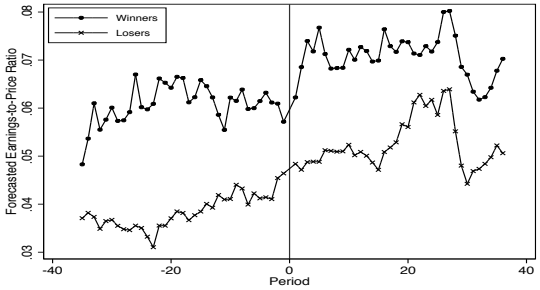
Figure 1
Construction of Event Time



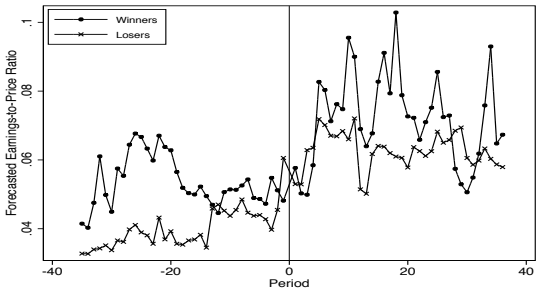
(a) Full sample



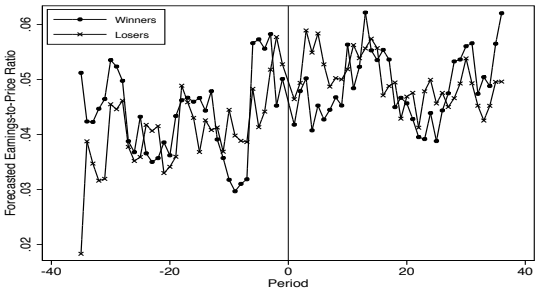
(b) Contest duration: 4th quartile



(c) Contest duration: 3rd quartile



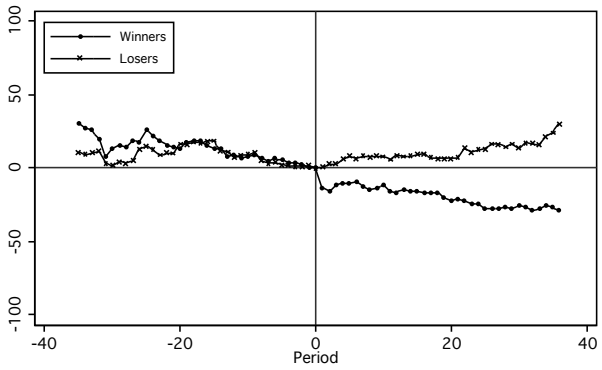
(d) Contest duration: 2nd quartile



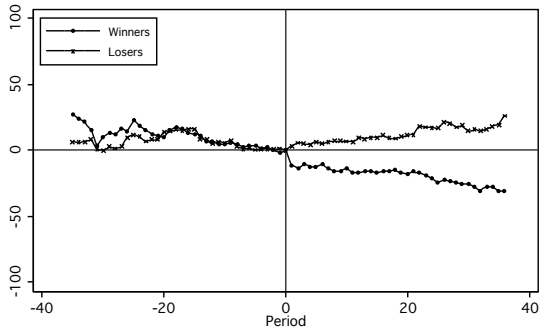
(e) Contest duration: 1st quartile

Figure 2
Forecasted Earnings-to-Price Ratio

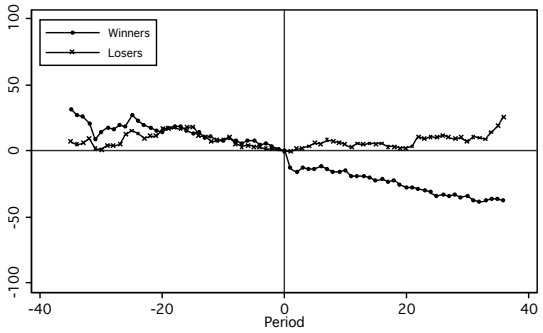
The graphs show the average forecasted earnings-to-price ratio (FE/P) of winners and losers. The top graph uses the full sample of 82 merger contests. The four graphs below show the average FE/Ps for contests of varying duration. The quartiles of contest duration are shown in descending order. The circles correspond to the average forecasts for winners, the crosses to the average forecasts for losers.



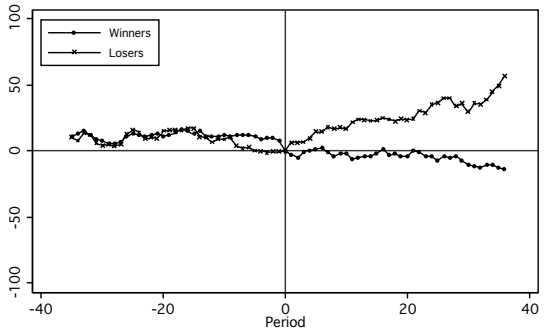
(a) Market-adjusted CARs



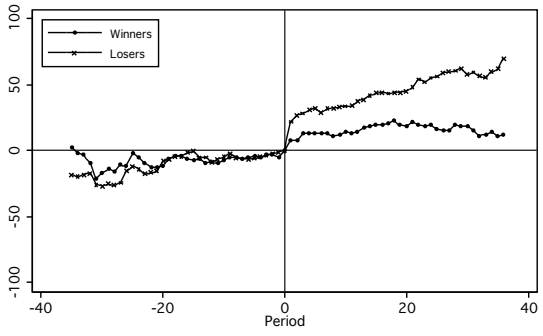
(b) Industry-adjusted CARs



(c) Risk-adjusted CARs



(d) Characteristics-adjusted CARs



(e) Cumulative raw returns

Figure 3
Winner and Loser Performance

The graphs show the average stock price performance of winners and losers in close contests, i.e., in the longest-duration quartile. The top graph shows market-adjusted cumulative abnormal returns (CARs). The graphs in the middle show industry-adjusted and risk-adjusted CARs. The bottom graphs show characteristics-adjusted CARs and cumulative raw returns. CARs are calculated as described in Table III. Cumulative raw returns are calculated using the same formula, but setting the benchmark return to zero. The circles correspond to the average winner CARs, the crosses to the average loser CARs.

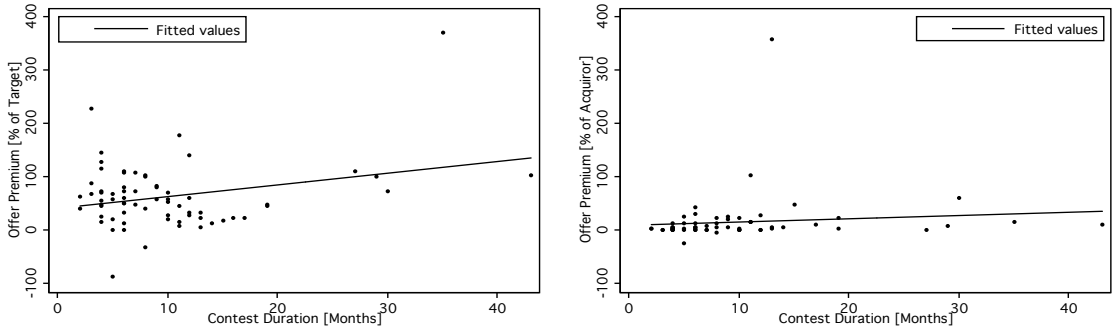
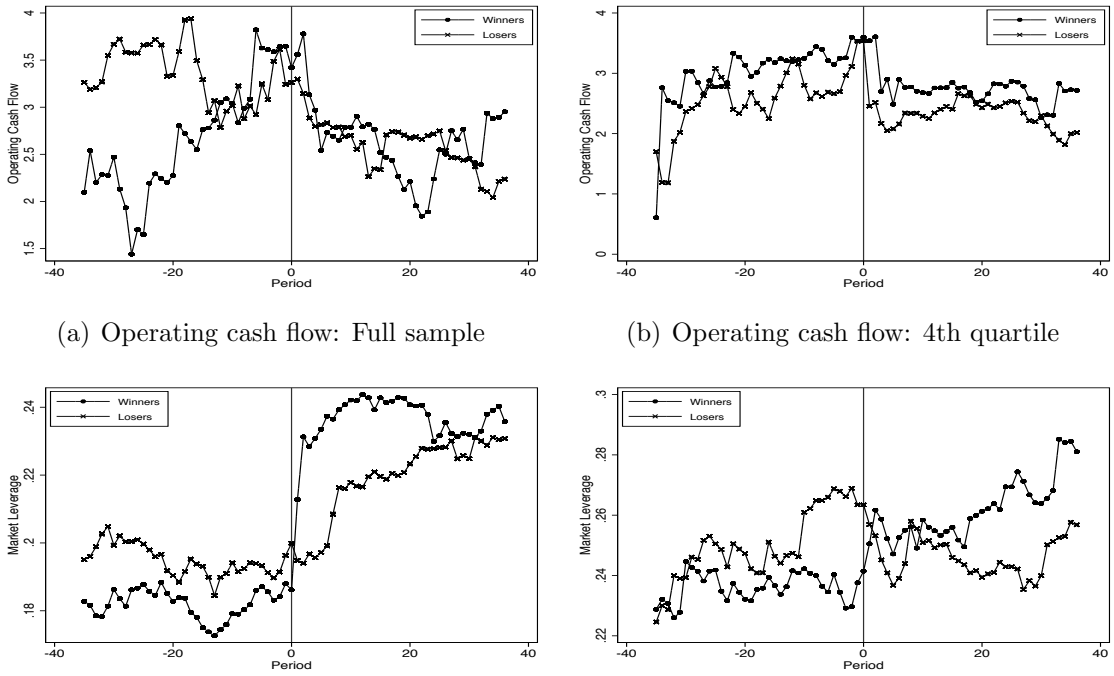


Figure 4
Offer Premia

The figure shows scatter plots of the offer premium against contest duration (in months). The offer premium is computed as the percentage run-up in the target stock price from 40 trading days prior to the beginning of the contest until completion. In the left graph, the offer premium is expressed as a percentage of the target's market capitalization, and, in the right graph, as a percentage of the acquiror's market capitalization. The fitted values are the predictions of an OLS regression of the offer premium on the contest duration.



(a) Operating cash flow: Full sample

(b) Operating cash flow: 4th quartile

(c) Market leverage: Full sample

(d) Market leverage: 4th quartile

Figure 5
Operating Performance and Market Leverage

The figure shows operating cash flow and market leverage of winners and losers around merger contests in the full sample and in long-duration contests. The top graphs depict operating cash flow, the bottom ones show market leverage. Operating cash flow is calculated as the ratio of net sales minus cost of goods sold and selling, general and administrative expenses over total assets. Market leverage is defined as debt in current liabilities plus long term debt divided by total assets minus book equity plus market equity. Both variables are computed using quarterly data. Operating cash flow is expressed as a percentage, market leverage is expressed as a decimal. The circles correspond to the event-time specific mean leverage or cash flow of winners, the crosses to those of losers.

Table I
Descriptive Statistics

In Panel A, Total assets are the book value of total assets. Market capitalization is Total assets plus market value of equity (common shares outstanding times fiscal-year closing price) minus book value of equity (book value of shareholders' equity, plus balance sheet deferred taxes and investment tax credit [if available], minus book value of preferred stock, where, depending on availability, we use redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock). Tobin's Q is the ratio of Market capitalization to book value of assets. PP&E is book value of property, plant and equipment divided by total assets. Profitability is operating income before depreciation divided by total assets. Leverage is debt in current liabilities plus long term debt, either divided by Total assets (Book leverage) or by Market capitalization (Market leverage). Announcement CAR [%] is the three-day cumulative market-adjusted return around the announcement date of winner's or loser's first bid in a given contest. Announcement CARs [$m] are three-day cumulative dollar abnormal returns of the first bid, i.e., percentage announcement CARs multiplied by the bidder's pre-merger market value of equity. P-value of difference refers to the difference in means between winners and losers. In Panel B, Deal value is the dollar value of the winning bid. Tender offer is a dummy indicating a tender offer. Hostile is a dummy indicating whether the deal attitude of the winning bid was hostile. Pct paid in stock is the percentage of the winning bid that is paid in stock. Pct paid in cash is the percentage paid in cash. Number of bidders is the total number of bidders involved in the merger contest. Offer premium [% of target] is the run-up in the target's stock price from 40 days prior to the announcement of the initial bid until completion of the merger contest. Offer premium [% of acquiror] is Offer premium [% of target] times target equity value divided by acquiror equity value. Contest duration is the number of months from the month-end preceding the first bid until the end of the month of the completion of the merger.

Panel A: Bidder Characteristics

	Winners				Losers				P-value
	Mean	Median	Std	N	Mean	Median	Std	N	of diff.
Total assets [$m]	14930.58	3326.24	38841.35	79	9078.59	2440.52	16783.93	88	0.20
Market cap. [$m]	20987.74	4676.17	49163.33	79	13022.12	2840.48	26533.84	88	0.19
Sales [$m]	5676.67	1835.20	12420.49	79	3377.21	1090.01	5863.70	87	0.12
Tobin's Q	1.88	1.34	1.50	79	1.79	1.19	1.41	88	0.67
PP&E	0.27	0.22	0.24	78	0.27	0.20	0.26	86	0.94
Profitability	0.12	0.11	0.09	78	0.13	0.12	0.12	86	0.42
Book leverage	0.25	0.21	0.21	79	0.23	0.20	0.17	84	0.57
Market leverage	0.18	0.15	0.16	79	0.18	0.14	0.16	84	0.95
Ann. CAR [%]	-3.77	-2.51	6.74	76	-3.68	-2.84	4.16	86	0.92
Ann. CAR [$m]	-288.19	-22.16	1223.93	76	-198.66	-25.85	659.08	86	0.56

Panel B: Deal Characteristics

	Mean	Median	Std	N
Deal value [$m]	3436.52	344.83	12400.92	81
Tender offer	0.34	0.00	0.48	82
Hostile	0.10	0.00	0.30	82
Pct paid in stock	36.94	8.04	43.21	82
Pct paid in cash	43.93	30.76	44.73	82
Number of bidders	2.43	2.00	0.72	82
Offer premium [% of target]	63.67	55.14	61.41	67
Offer premium [% of acquiror]	13.53	6.91	17.16	67
Contest duration [months]	9.48	7.50	7.37	82

Table II

Winner-Loser Similarities: Correlation in Pre-Merger Abnormal Returns

Winner-loser similarities in abnormal returns are estimated in two steps: In the first step (unreported), we estimate abnormal performance trends for each bidder by regressing each bidder's abnormal returns on a constant, separately for the three-year pre-merger and the three-year post-merger periods. We use four specifications of abnormal returns: market-adjusted returns $r_{ijt} - r_{mt}$; industry-adjusted returns $r_{ijt} - r_{ikt}$, where k is the bidder's Fama-French 12 industry; risk-adjusted returns $r_{ijt} - r_{ft} - \beta_i(r_{mt} - r_{ft})$; and characteristics-adjusted returns $r_{ijt} - r_{cm}$, where r_{cm} is the return of a characteristics-matched portfolio based on size, book-to-market, and twelve-month momentum (Daniel, Grinblatt, Titman, and Wermers, 1997). In the second step, we regress the abnormal performance trends of the winners on those of the losers in the same merger contest and in the same (pre- or post-merger) period. The table reports the resulting coefficients, separately for the four abnormal performance measures (Panel A to D). We show the pre-merger period results split up into quartiles of contest duration as well as the full sample for the pre-merger period. For completeness, the last column also shows the result for the post-merger period. The intercept is omitted.

Panel A: Market-Adjusted Returns

	Pre-Merger - Quartiles				Pre-Merger	Post-Merger
	Q4	Q3	Q2	Q1	Full Sample	Full Sample
Coefficient	0.475***	0.565	0.393*	0.234	0.392***	0.284**
SE	(0.162)	(0.389)	(0.190)	(0.219)	(0.113)	(0.133)
R-Squared	0.325	0.100	0.201	0.054	0.131	0.054
Observations	20	21	19	22	82	82

Panel B: Industry-Adjusted Returns

	Pre-Merger - Quartiles				Pre-Merger	Post-Merger
	Q4	Q3	Q2	Q1	Full Sample	Full Sample
Coefficient	0.551***	0.384	0.344	0.004	0.311***	0.183
SE	(0.167)	(0.356)	(0.247)	(0.196)	(0.117)	(0.125)
R-Squared	0.378	0.058	0.102	0.000	0.081	0.026
Observations	20	21	19	22	82	82

Panel C: Risk-Adjusted Returns

	Pre-Merger - Quartiles				Pre-Merger	Post-Merger
	Q4	Q3	Q2	Q1	Full Sample	Full Sample
Coefficient	0.762***	0.519	0.341	0.092	0.423***	0.208*
SE	(0.167)	(0.320)	(0.213)	(0.233)	(0.111)	(0.119)
R-Squared	0.536	0.122	0.131	0.008	0.154	0.036
Observations	20	21	19	22	82	82

Panel D: Characteristics-Adjusted Returns

	Pre-Merger - Quartiles				Pre-Merger	Post-Merger
	Q4	Q3	Q2	Q1	Full Sample	Full Sample
Coefficient	0.157	0.274	0.408*	0.230	0.291**	0.203*
SE	(0.229)	(0.353)	(0.198)	(0.168)	(0.117)	(0.119)
R-Squared	0.032	0.034	0.246	0.111	0.086	0.043
Observations	16	19	15	17	67	67

Table III
Winner-Loser Differences in Long-Run Abnormal Returns

The regression equation in all columns is: $CAR_{ijt} = \alpha_0 + \alpha_1\ W_{ijt} + \alpha_2\ Period + \alpha_3\ Period \cdot W_{ijt} + \alpha_4\ Post_{ijt} + \alpha_5\ Post_{ijt} \cdot W_{ijt} + \alpha_6\ Period \cdot Post_{ijt} + \alpha_7\ Period \cdot Post_{ijt} \cdot W_{ijt} + \eta_j + \varepsilon_{ijt}$ (equation (5)). The dependent variable is the buy-and-hold cumulative abnormal return, normalized to zero in the month preceding the start of the contest and computed as $CAR_{ijt} = \prod_{s=1}^{t}(1+r_{ijs}) - \prod_{s=1}^{t}(1+r_{ijs}^{bm})$ going forward in event time, and as $CAR_{ijt} = \prod_{s=0}^{t+1}(1+r_{ijs})^{-1} - \prod_{s=0}^{t+1}(1+r_{ijs}^{bm})^{-1}$ going backward, where i denotes the bidder, j the contest, t the event month, and bm references a benchmark portfolio. The benchmark for market-adjusted returns is the CRSP value-weighted market return; for industry-adjusted returns the return of stock i's Fama French industry portfolio (12-industry classification); for risk-adjusted returns the CAPM required return, $r_{ft} + \beta_i(r_{mt} - r_{ft})$; and for characteristics-adjusted returns the return of a characteristics-matched portfolio based on size, book-to-market, and 12-month momentum (Daniel, Grinblatt, Titman, and Wermers, 1997). Winner (W_{ijt}) is a dummy indicating whether bidder i is a winner in merger contest j. Period (t) is a variable counting event time. Post merger ($Post_{ijt}$) indicates whether period t is in the post-merger window. The lower part of the table between the two solid lines reports tests for the long-run winner-loser differences in CARs at $t = +36$ for each quartile of contest duration. Standard errors (in parentheses) are clustered by contest.

Dependent Variable:	CAR (Market-Adjusted)				CAR (Industry-Adjusted)			
Sample:	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1
Winner (α_1)	-3.662	0.858	0.803	1.973	-3.974	-4.853	0.483	2.225
	(9.986)	(4.307)	(4.000)	(3.850)	(10.01)	(7.003)	(3.566)	(3.991)
Period (α_2)	-0.183	0.0118	-0.0948	0.178	-0.125	0.175	-0.0402	0.172
	(0.367)	(0.250)	(0.329)	(0.179)	(0.394)	(0.231)	(0.262)	(0.188)
Winner x Period (α_3)	-0.456	-0.174	-0.384	0.0351	-0.456	-0.320	-0.335	-0.0110
	(0.513)	(0.312)	(0.459)	(0.188)	(0.524)	(0.336)	(0.467)	(0.208)
Post merger (α_4)	-3.900	5.473	-1.541	-7.477	-1.489	4.305	-6.710	-5.447
	(17.64)	(9.490)	(8.662)	(7.910)	(16.13)	(8.354)	(8.447)	(9.134)
Winner x Post merger (α_5)	-7.416	-7.800	-1.813	0.683	-7.796	-0.341	1.339	-0.0582
	(16.81)	(7.560)	(7.947)	(8.615)	(16.72)	(10.38)	(9.311)	(9.045)
Period x Post merger (α_6)	0.690	0.526	0.0319	-1.205**	0.631	0.346	-0.518	-1.232**
	(0.589)	(0.483)	(0.620)	(0.448)	(0.603)	(0.560)	(0.589)	(0.465)
Winner x Post merger x Period (α_7)	-0.616	0.175	0.348	0.786	-0.598	0.229	0.450	1.005*
	(0.851)	(0.477)	(0.664)	(0.562)	(0.893)	(0.497)	(0.668)	(0.547)
Contest fixed effects	X	X	X	X	X	X	X	X
Merger effect	-48.590**	-6.917	-2.278	31.380*	-48.670*	-8.360	5.864	36.960*
Merger effect: p-value	0.040	0.592	0.914	0.072	0.059	0.558	0.789	0.031
Sorting effect (Q4-Q1 difference)		-79.968***				-85.624***		
Sorting effect (Q4-Q1 difference): p-value		0.003				0.003		
Observations	3168	3168	2808	3240	3168	3168	2808	3240
R-squared	0.278	0.342	0.308	0.278	0.271	0.311	0.275	0.240

Table III - Continued

Dependent Variable:	CAR (Risk-Adjusted)				CAR (Characteristics-Adjusted)			
Sample:	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1
Winner (α_1)	-3.197	1.706	0.560	2.516	6.318	3.679	3.107	1.648
	(10.15)	(4.351)	(4.098)	(3.535)	(4.801)	(4.281)	(4.779)	(2.820)
Period (α_2)	-0.114	0.00723	-0.0734	0.0489	-0.267	-0.123	-0.180	-0.0649
	(0.413)	(0.255)	(0.311)	(0.161)	(0.312)	(0.275)	(0.335)	(0.196)
Winner x Period (α_3)	-0.513	-0.206	-0.461	0.116	0.213	0.0667	-0.237	0.267
	(0.529)	(0.311)	(0.485)	(0.201)	(0.326)	(0.314)	(0.529)	(0.263)
Post merger (α_4)	-5.469	3.563	0.539	-5.541	3.278	3.413	-1.906	-7.463
	(19.16)	(10.00)	(8.189)	(8.405)	(13.90)	(8.892)	(7.660)	(6.622)
Winner x Post merger (α_5)	-7.119	-13.01*	-3.929	1.451	-12.14	-10.11	-0.951	6.663
	(16.58)	(7.515)	(8.903)	(8.367)	(14.46)	(8.423)	(8.774)	(8.099)
Period x Post merger (α_6)	0.467	0.249	-0.0539	-1.208**	1.332*	0.634	-0.0837	-0.587
	(0.710)	(0.462)	(0.717)	(0.447)	(0.710)	(0.491)	(0.663)	(0.360)
Winner x Post merger x Period (α_7)	-0.691	0.453	0.475	0.827	-1.585*	-0.230	1.291*	0.398
	(0.944)	(0.517)	(0.773)	(0.544)	(0.817)	(0.605)	(0.700)	(0.617)
Contest fixed effects	X	X	X	X	X	X	X	X
Merger effect	-52.470*	-2.637	-2.882	36.980**	-53.850*	-12.150	39.040	31.570**
Merger effect: p-value	0.101	0.877	0.906	0.020	0.072	0.382	0.036	0.047
Sorting effect (Q4-Q1 difference)		-89.447***				-85.427***		
Sorting effect (Q4-Q1 difference): p-value		0.007				0.006		
Observations	3168	3168	2808	3240	2672	2958	2596	3033
R-squared	0.293	0.223	0.332	0.278	0.381	0.277	0.383	0.339

Table IV
Winner-Loser Differences in Various Subsamples

Estimates are based on the same empirical model as in Table III but using the various subsamples defined in the second row of the table. The dependent variables are market-adjusted CARs. For the sample split based on acquiror attitude, we use SDC's classification of hostile and friendly bids. For the acquiror's Tobin's Q (defined in Table I), for acquiror size (market capitalization as defined in Table I), and for relative deal value (the ratio of transaction value as reported by SDC over acquiror market capitalization), we split the sample into above and below median subsamples in the respective characteristic. For the sample split in diversifying and concentrating mergers, we use the Fama-French 12-industry classification, comparing the ultimate acquiror and the target industry. For the acquiror's method of payment, we compare all-stock with all-cash mergers as reported by SDC. Standard errors (reported in parentheses) are clustered by contest.

Dependent Variable:	CAR (Market-Adjusted)					
Sample Split:	Hostile	Friendly	High Acq. Q	Low Acq. Q	Large Acq.	Small Acq.
	(1)	(2)	(3)	(4)	(5)	(6)
Winner (α_1)	0.365	0.0369	2.772	-3.028	2.267	-1.871
	(6.172)	(3.238)	(3.001)	(5.291)	(2.731)	(5.601)
Period (α_2)	0.203	-0.0433	0.0475	-0.144	0.0929	-0.210
	(0.185)	(0.155)	(0.201)	(0.217)	(0.131)	(0.271)
Winner x Period (α_3)	-0.312	-0.223	0.234	-0.666**	-0.0945	-0.318
	(0.272)	(0.200)	(0.249)	(0.284)	(0.183)	(0.333)
Post merger (α_4)	1.341	-2.210	-2.764	-1.471	13.09	-17.96**
	(17.80)	(6.285)	(8.625)	(8.649)	(8.630)	(7.686)
Winner x Post merger (α_5)	-4.002	-4.102	-6.017	1.527	-9.726	5.869
	(9.440)	(5.997)	(8.754)	(7.208)	(8.307)	(7.731)
Period x Post merger (α_6)	-1.140	0.131	-0.566	0.555*	-0.0851	0.158
	(1.137)	(0.278)	(0.471)	(0.326)	(0.360)	(0.451)
Winner x Post merger x Period (α_7)	-0.374	0.225	-0.249	0.776*	0.229	0.215
	(1.216)	(0.333)	(0.526)	(0.417)	(0.368)	(0.558)
Contest fixed effects	X	X	X	X	X	X
Merger effect	-27.64	-4.011	-3.762	2.340	-2.756	0.395
Merger effect: P-value	0.450	0.687	0.815	0.829	0.813	0.979
Merger effect: Difference	-23.63		-6.101		-3.151	
P-value	0.485		0.748		0.867	
Observations	1152	11232	5688	6120	5976	5832
R-squared	0.373	0.262	0.281	0.277	0.310	0.291

Table IV - Continued

Dependent Variable:	CAR (Market-Adjusted)							
Sample Split:	2 Bidders	> 2 Bidders	Diversif.	Concentr.	Large Deal	Small Deal	All-Stock	All-Cash
	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Winner (α_1)	-1.196	1.271	-1.658	0.715	0.213	-0.358	-7.208	4.229
	(4.195)	(3.186)	(4.386)	(3.588)	(2.477)	(5.684)	(10.36)	(2.718)
Period (α_2)	-0.0627	0.0436	0.411*	-0.137	-0.0139	-0.0806	-0.371	0.0529
	(0.195)	(0.205)	(0.207)	(0.170)	(0.178)	(0.240)	(0.390)	(0.199)
Winner x Period (α_3)	-0.0966	-0.482*	-0.426*	-0.176	-0.259	-0.204	-0.516	-0.000
	(0.228)	(0.271)	(0.220)	(0.223)	(0.231)	(0.308)	(0.509)	(0.223)
Post merger (α_4)	-4.785	2.647	-10.78	0.484	-13.06*	7.712	3.891	-3.755
	(7.614)	(9.481)	(10.13)	(6.967)	(7.511)	(9.375)	(16.29)	(5.863)
Winner x Post merger (α_5)	-7.036	3.343	0.990	-5.437	2.799	-8.918	-11.04	-4.129
	(7.092)	(8.859)	(7.941)	(6.675)	(8.208)	(7.887)	(12.50)	(5.729)
Period x Post merger (α_6)	-0.115	0.226	-0.681	0.204	0.0883	-0.0219	0.613	-0.561
	(0.373)	(0.391)	(0.714)	(0.289)	(0.391)	(0.421)	(0.503)	(0.411)
Winner x Post merger x Period (α_7)	0.203	0.120	0.0216	0.186	-0.204	0.514	0.312	0.556
	(0.381)	(0.573)	(0.737)	(0.356)	(0.516)	(0.414)	(0.604)	(0.424)
Contest fixed effects	X	X	X	X	X	X	X	X
Merger effect	-4.499	-8.065	-14.83	-4.360	-13.18	1.546	-25.40	19.55
Merger effect: P-value	0.699	0.628	0.554	0.672	0.438	0.871	0.130	0.157
Merger effect: Difference	3.566		-10.47		-14.73		-44.95**	
P-value	0.858		0.686		0.440		0.029	
Observations	7920	4464	2592	9792	5904	5904	2880	5976
R-squared	0.270	0.285	0.189	0.286	0.284	0.259	0.229	0.308

Table V
Cash versus Stock Mergers

The table reports test statistics based on the full empirical model estimated in Table III with the percentage of the transaction value offered in stock (*pct stock*) and a full set of interactions of *pct stock* with all other independent variables included as additional independent variables. The first four rows report tests of the long-run winner-loser difference in abnormal returns of all-cash mergers (*pct stock* = 0) in the longest- and shortest-duration quartiles (first two rows) as well as for the Q4-Q1 difference (subsequent two rows). The bottom four rows show the same test statistics for all-stock mergers. The test statistics are computed using the interaction terms and are described in detail in Section IV.B. The column titles indicate the four different measures of abnormal performance.

Dependent Variable:	CAR							
	Market-Adjusted		Industry-Adjusted		Risk-Adjusted		Char.-Adjusted	
Sample:	Q4	Q1	Q4	Q1	Q4	Q1	Q4	Q1
Merger effect all-cash	-110.30**	18.52	-103.600**	25.290	-148.800**	21.740	-119.8**	15.90
p-value	0.015	0.377	0.030	0.193	0.040	0.242	0.022	0.397
Sorting effect all-cash (Q4-Q1)	-128.859***		-128.864***		-170.494***		-135.744***	
p-value	0.005		0.006		0.013		0.007	
Merger effect all-stock	13.987	61.067*	7.884	42.440	35.807	66.068**	7.677	88.937***
p-value	0.487	0.087	0.715	0.333	0.206	0.018	0.782	0.000
Sorting effect all-stock (Q4-Q1)	-47.080		-34.556		-30.261		-81.260**	
p-value	0.251		0.479		0.446		0.030	

Table VI
Alternative Methods to Assess the Returns to Mergers – Comparison

Panel A reports the returns to mergers estimated as the three-day market-adjusted announcement return (first row), the four-factor alpha of equally-weighted calendar-month portfolios of post-acquisition acquiror returns (second row), and the long-run cumulative return of acquirors relative to characteristics-matched portfolios (third row). The four-factor alpha is the intercept of a time-series regression of the equally weighted excess return of a post-acquisition acquiror portfolio on the excess market return, the Fama-French factors, and the momentum factor. We require at least five acquiror return observations to be available for a calendar month to be included in the regression. The four-factor alpha from the monthly return regression is multiplied by 36 to make it comparable to the 36-month post-merger returns used for all other statistics reported in the table, except for row one. Panel B summarizes the results for the winner-loser difference method based on the four different abnormal returns calculations used throughout this study. Standard errors are in parentheses.

Panel A: Traditional Methods

	Quartile of Contest Duration				Full sample	Difference
	Q4	Q3	Q2	Q1		Q4-Q1
Winners' Announcement CAR [%]	-3.266	-3.094	-5.584	-3.259	-3.768	-.007
	(1.135)***	(1.321)**	(2.590)**	(0.798)***	(0.774)***	(1.351)
Winners' 4-Factor Alpha × 36	-13.942	-21.190	-18.763	22.968	-4.088	-0.099
	(35.000)	(31.333)	(46.793)	(20.168)	(7.495)	(0.275)
Winners' Characteristics-Adjusted CARs	-21.861	2.415	23.503	-.184	.668	-21.678
	(13.796)	(18.296)	(20.514)	(17.239)	(8.861)	(22.909)

Panel B: Winner-Loser Difference Method

	Quartile of Contest Duration				Full sample	Difference
	Q4	Q3	Q2	Q1		Q4-Q1
W/L Difference (CAR - Market-Adjusted)	-48.590**	-6.917	-2.278	31.380*	-6.495	-79.968***
	0.040	0.592	0.914	0.072	0.496	0.003
W/L Difference (CAR - Industry-Adjusted)	-48.670*	-8.360	5.864	36.960*	-3.695	-85.624***
	0.059	0.558	0.789	0.031	0.713	0.003
W/L Difference (CAR - Risk-Adjusted)	-52.470*	-2.637	-2.882	36.980**	-4.950	-89.447***
	0.101	0.877	0.906	0.020	0.665	0.007
W/L Difference (CAR - Characteristics-Adjusted)	-53.850*	-12.150	39.040	31.570**	3.398	-85.427***
	0.072	0.382	0.036	0.047	0.731	0.006

Table VII
Alternative Methods to Assess the Returns to Mergers – Correlation

This table reports bivariate ordinary least squares estimates of the three-day market-adjusted announcement return on the winner-loser post-merger performance difference (Panel A) and of the winner's post-merger abnormal returns on the post-merger winner-loser performance difference (Panel B). In both panels, the independent variable is the winner-loser difference in buy-and-hold cumulative abnormal return (CAR) at $t = 36$, computed as described in Table III. Announcement returns refer to the first bid announcement of the ultimate acquiror. Each regression is reported both for the quartile of the longest-lasting contests (columns (1) to (4)) and for the full sample of merger contests (columns (5) to (8)).

Panel A: Regressions of Winner Announcement CARs

Dependent Variable:	Winner's 3-day Announcement CAR							
Sample:	Q4				Full			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
W/L Difference in CAR (Mkt.-Adj.)	-0.018**				-0.010			
	(0.006)				(0.008)			
W/L Difference in CAR (Ind.-Adj.)		-0.016**				-0.009		
		(0.006)				(0.007)		
W/L Difference in CAR (Risk-Adj.)			-0.013**				-0.005	
			(0.005)				(0.006)	
W/L Difference in CAR (Char.-Adj.)				-0.016**				-0.016*
				(0.005)				(0.009)
Constant	-4.143***	-4.053***	-3.946***	-4.055***	-3.777***	-3.780***	-3.753***	-3.469***
	(1.009)	(1.009)	(1.024)	(1.025)	(0.770)	(0.770)	(0.776)	(0.890)
Observations	17	17	17	9	76	76	76	59
R-squared	0.333	0.321	0.291	0.611	0.022	0.023	0.008	0.060

Panel B: Regressions of Long-Run Winner CARs

Dependent Variable:	Winner CAR							
Sample:	Mkt-Adj.	Ind.-Adj.	Risk-Adj.	Char.-Adj.	Mkt.-Adj.	Ind.-Adj.	Risk-Adj.	Char.-Adj.
	Q4				Full			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
W/L Difference in CAR (Mkt.-Adj.)	0.367***				0.482***			
	(0.0827)				(0.0753)			
W/L Difference in CAR (Ind.-Adj.)		0.310***				0.420***		
		(0.0513)				(0.0666)		
W/L Difference in CAR (Risk-Adj.)			0.486***				0.505***	
			(0.0839)				(0.0668)	
W/L Difference in CAR (Char.-Adj.)				0.285***				0.439***
				(0.0572)				(0.0781)
Constant	-10.68	-15.80*	-14.51	-2.207	-8.194	-12.14*	-12.67	1.354
	(12.25)	(7.995)	(16.00)	(10.47)	(7.478)	(7.100)	(8.100)	(7.902)
Observations	20	20	20	12	82	82	82	64
R-squared	0.523	0.670	0.651	0.712	0.339	0.333	0.417	0.337

Appendix: Figures and Tables

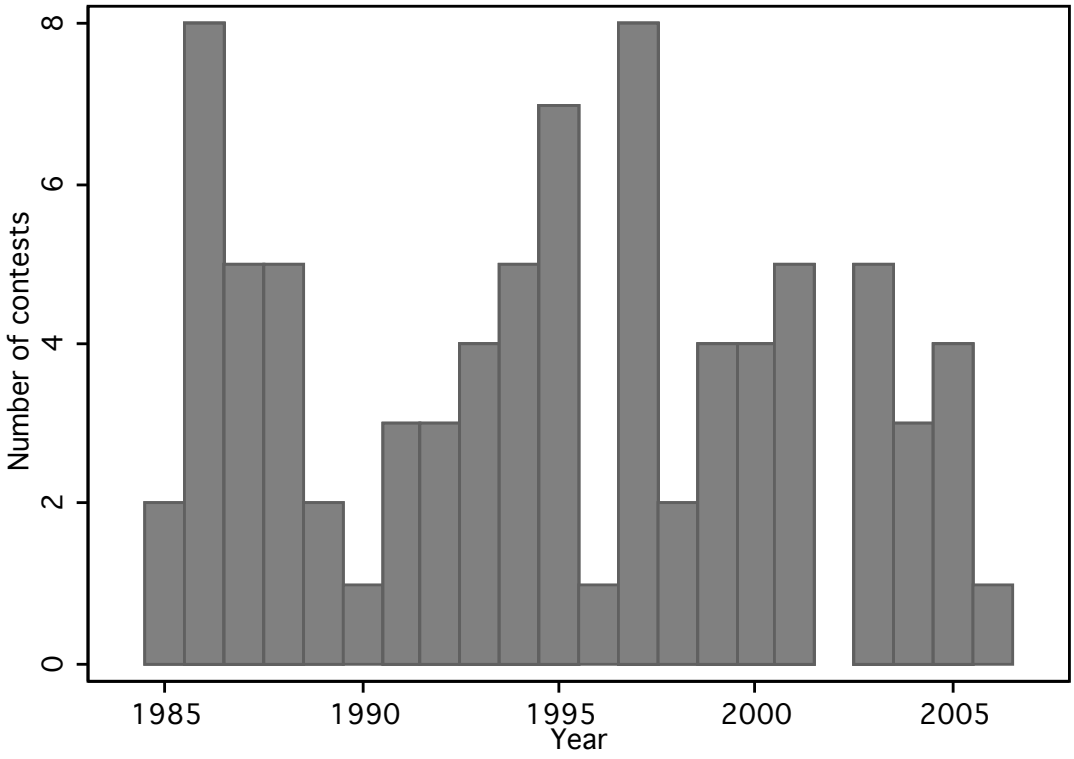
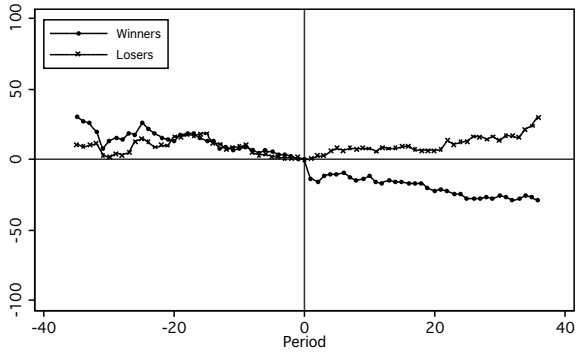
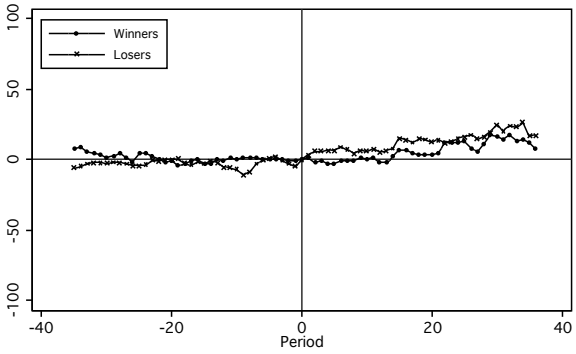


Figure A-1
Merger Contests over Time

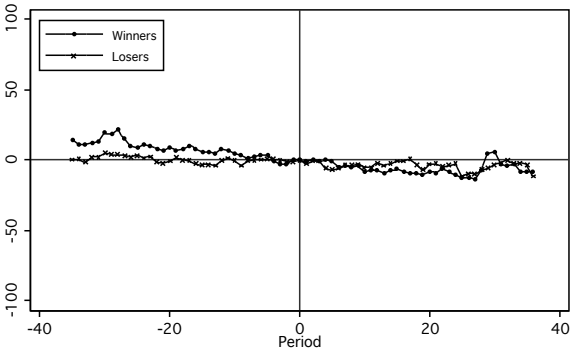
This figure shows the frequency distribution of merger contests over the sample period. Years are the calendar years in which the contests started.



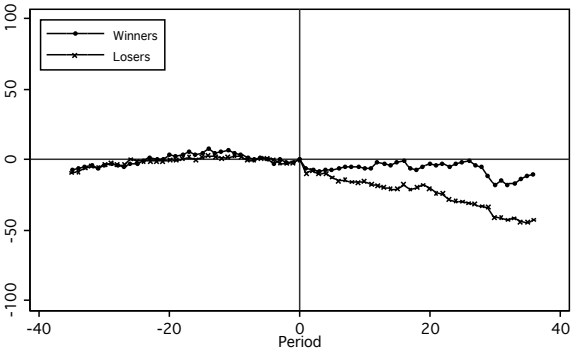
(a) Contest duration: 4th quartile



(b) Contest duration: 3rd quartile



(c) Contest duration: 2nd quartile



(d) Contest duration: 1st quartile

Figure A-2
Winner and Loser Abnormal Performance - All Quartiles

The four graphs show the stock performance of winners and losers around merger contests of varying duration. The quartiles of contest duration are shown in descending order. The performance measure is the cumulative market-adjusted return, calculated as described in Table III. The circles correspond to the average winner CARs, the crosses to the average loser CARs.

Table A-I
Sample Construction

The initial sample consists of all bids in contested mergers submitted by U.S. public companies between January 1, 1985 and December 31, 2009 and recorded in the SDC Mergers and Acquisitions database, excluding bids by White Knights. We apply the criteria below to obtain a balanced and matched sample, i.e., a sample with complete data on stock returns for both the winner and the loser(s) in the three-year periods before and after the merger contest.

Sample selection criterion	Bids	Bidders	Winners	Losers	Contests
Initial sample	416	402	151	251	193
less repeated bids of same bidder for same target	402	402	151	251	193
less contests that have not been completed	317	317	151	166	151
less bidders without CRSP PERMNO	305	305	145	160	149
less contests where winner was parent company	284	284	134	150	138
less bidders that have missing return data in the +/- three-year event window	212	212	107	105	117
less bidders with extreme price volatility (Std>200)	207	207	104	103	114
less contests with missing winner or loser	172	172	82	90	82