Merger Activity, Stock Prices, and Measuring Gains from M&A*

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Abstract

With five percent of U.S. public firms acquired in a typical year, rational expectations perpetually embed a significant portion of acquisition gains into firms' stock prices. We estimate 10% of a typical firm's stock price can be attributed to general merger anticipation. As a result, the unobserved (anticipated) portion of the merger premium is roughly one-third of the observed premium, implying M&A event studies greatly understate the gain from mergers. Consistent with this hypothesis, announced deal premiums are decreasing in the ex ante probability a firm will be acquired. Finally, we show a strong link from merger activity to stock prices, with each dollar of announced merger premiums associated with up to $44 of increased aggregate market valuation.

JEL Classifications: G14, G31, G34

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Introduction

Mergers and acquisitions (M&A) comprise an enormous and critical market in the economy, with $3.8 trillion worth of deals completed in 2015 alone (Baigorri, 2016). On the plus side, a deal not only transfers ownership of the target and its assets, but may also lead to a significant increase in the efficiency of their use (Bradley, Desai and Kim, 1988; Devos, Kadapakkam and Krishnamurthy, 2009). On the other hand, previous studies have questioned their rationale, attributing many takeovers to inefficient motives such as hubris (Roll, 1986), misvaluation (Shleifer and Vishny, 2003; Rhodes-Kropf, Robinson and Viswanathan, 2004; Dong et al., 2006) or envious CEOs (Goel and Thakor, 2010). The accurate measurement of the value created or destroyed is therefore central to assessing the benefits of mergers, and crucial to policymakers deciding whether to facilitate or attenuate activity through changes in the applicable laws and regulatory oversight.

With roughly 5% of U.S. listed firms acquired annually (see Figure 1), at an average premium of 36% over their week-prior values, we predict the market should rationally embed a significant premium over a firm's standalone value into its stock price long before any deal-specific rumors or the observation of increased activity in an industry. Given these observed acquisition rates and premiums, our main result is immediately intuitive: a five percent chance of a 36% boost this year, plus another five percent chance of a 36% bump the following year if it isn't acquired, and so on, adds up to a large unconditional average across firms.[1] Assuming rational markets incorporate acquisition probabilities and expected deal premiums into firm valuations, we estimate surprisingly large "embedded merger premiums" (EMPs) in stock prices, present across the vast majority of firms and across time.

[Insert Figure 1 Approximately Here]

We first explore the implications of this embedded premium at the firm and M&A-event (deal) level. Whereas Edmans, Goldstein and Jiang (2012) explore the effect of a firm's stock price discount on its likelihood of being acquired, we focus on how observed acquisition probabilities and premiums imply an economically large fraction of a typical firm's stock price—on the order of 10% of a firm's total value—is attributable to anticipation of its possibly

[1] Edmans, Goldstein and Jiang (2012) allude to notion that the price impact of a permanent change in takeover probability would be the discounted present value of all future years' effects. While that is the central focus of our paper, they do not pursue it beyond their general acknowledgement in footnote 19.

being acquired. The model also illustrates some basic comparative statics regarding the size of the EMP: it is increasing in the likelihood a firm will be acquired, the expected gains (premium) derived from an acquisition and the target's standalone growth rate, and decreasing in the discount rate used to estimate the present value of the firm's cash flows. Furthermore, when target acquisition likelihoods are persistent over time—a fact we later verify—the effect of a change in ex ante takeover probability on the EMP is larger and more concave.

As every dollar or percent of the premium that is already embedded should reduce the observed offer premium when a deal is reached, embedded merger premiums of these magnitudes imply that M&A event studies on average severely underestimate the gain coming from mergers. For example, if a firm has an embedded merger premium of 10% and receives an offer of 30% over its pre-announcement stock price, one-third of the gain relative to the observed premium (and one-quarter of the total gain) would be missed by the event study methodologies commonly used in the M&A literature. Applying estimations from most of our data panel to deals in the last two years of our sample, we find the median embedded merger premium to be 9.5% of the target's standalone value, and to account for 23% of the total gain from the deal (31% of the observed premium). While the intuition here is straightforward, we are not aware of any prior studies accounting for this embedded anticipation. Instead, the prevailing view is that standard event studies that ignore rational anticipation provide "the most statistically reliable evidence on whether mergers create value" (Andrade, Mitchell and Stafford, 2001). However, absent some radical breakdown in market rationality or beliefs, we show the literature to date likely consistently and dramatically understates the gains from mergers.

Empirically, we build on the existing literatures estimating the likelihood a firm gets acquired (Cremers, Nair and John, 2009) and the expected premium conditional on being acquired (i.e. Betton, Eckbo and Thorburn, 2009; Baker, Pan and Wurgler, 2012; Dimopoulos and Saccheto, 2014) to estimate the size of the embedded premium, and also to test several of the model's predictions. Consistent with the theory, we show the probability a firm is acquired has a strong negative impact on the observed premium, even when controlling for other known premium determinants. In baseline regressions, a one percent increase in the ex ante acquisition probability is associated with a 1.4 percent decrease in the offer premium. In subsequent specifications, we verify the theory's prediction that the marginal effect is decreasing in the

firm's ex ante acquisition probability. These results lend validity both to our main hypothesis of merger anticipation embedding a portion of the gain, and also to our measure of anticipation (ex ante merger probability).

In the second half of the paper, we turn our attention from firms and deals to the broader implications of merger anticipation for the aggregate market. Extrapolating our firm-level findings to the entire U.S. stock market suggests a substantial portion of the total stock market capitalization can be attributed to the option value of takeovers. An estimate near 10% of total market cap—equating to trillions of dollars of market value at today's valuations—may strike the reader as implausible. However, Figure 2 shows the annual value of merger premiums (defined as prices paid in excess of prior standalone target valuations summed across deals) relative to the two usually considered cash flow streams to stock investors: dividends and repurchases. We note that the cash flows to the aggregate market from merger premiums have rarely dropped below 10% of the total cash flows in any year, and have on average provided 24% of the cash flow to shareholders. These numbers are consistent with an extension of our firm-level findings to the market as a "representative firm," and suggest an aggregate EMP of 10% may understate the size of the effect during the larger merger waves of the last few decades.

[Insert Figure 2 Approximately Here]

It is true that some firms are simply unlikely to be acquired due to their size (i.e. Apple) or regulatory opposition to further consolidation in their industry. However, we show the odds of being acquired are fairly consistent across all ten deciles of firm size, and remain surprisingly stable even into the largest one percent of public firms. Furthermore, the aggregate cash flows in Figure 2 suggest our findings are likely more representative of the aggregate market than one might expect. To the extent that smaller, higher-growth firms tend to be acquired more frequently and at higher premiums, the embedded premium in a typical deal is likely higher than that of the median public firm in general.

At the market level, if M&A activity informs expectations about future activity, our merger anticipation channel would create a positive link between changes in deal activity and stock prices. We first confirm strong levels of persistence in annual aggregate merger activity, with coefficients on the first lag approaching 0.8 in AR(1) specifications and close to 1 in an AR(2). More importantly, we find a strong positive association between deal announcements and broader market returns. Depending upon the specification we find each dollar of announced

merger premiums is associated with $11 to $44 of increases in aggregate market value over the ensuing week. This result is consistent with our hypothesis that increases in deal activity raise the market's expectations for future deals, and the increased deal anticipation embeds more of the future gains into current prices. Additional tests confirm this result is robust to various alternate measures of merger activity, the inclusion of the standard asset pricing factors, and simultaneously controlling for the impact of stock returns on merger activity.

We attempt to rule out the most likely omitted variables by testing and rejecting alternate hypotheses that M&A activity is simply predicting higher future growth, cash flows or profitability, which might drive the observed relationship via alternate channels. Furthermore, the fact that deals are negotiated for weeks or months reduces the likelihood of a spurious correlation between the timing of their agreement and macro-level news that could also drive returns at the daily level we consider here.

Having illustrated the link between merger activity and stock prices, we next consider whether these effects are broadly felt across the market, or if they are localized to more "related" firms as in the extant literature (Song and Walkling, 2000; Cai, Song and Walkling, 2011). When our sample is split by industry, the effect of industry-level merger activity on returns is felt as strongly outside the industry as within it. This finding is robust to a variety of industry measures, and consistent with our view that deals inform expectations across the market as well as within any particular industry.

Our main contribution is the evidence that rational expectations perpetually embed a significant merger premium in firm prices long before any explicit news or deal anticipation. Lambrecht (2004) and Hackbarth and Morellec (2008) both allude to the value of "the option to merge" in theory but do not attempt to empirically estimate it. Edmans, Goldstein and Jiang (2012) look at a related converse: the effects of a firm's stock price discount on its likelihood of being acquired. However, we believe our paper is the first to measure the total size of the takeover option independent from the value of the standalone firm.

A key implication of our findings is that by measuring target gains using traditional event study methods, the extant literature misses the previously embedded portion and therefore likely dramatically understates the gains coming from M&A activity. Previous papers have looked at other measurement issues in M&A event studies, including the effects of uncertainty about deal

completion on announcement returns (Bhagat et al., 2005) and the confounding of deal returns with information regarding bidder and target standalone values (Bhagat et al., 2005; Golubov et al., 2015; Malmendier et al., 2016). Similarly, the literature addresses the run-up in a target's (Morellec and Zhdanov, 2005; Eckbo, 2009; Betton et al., 2014; Mulherin and Simsir, 2015) and bidder's (Cai et al., 2011) stock prices prior to a deal announcement. However, we believe our paper is the first to address the premium embedded more broadly by general deal anticipation long before any particular deals or rumors, which cannot be accounted for simply by expanding the event window. In contrast, Eckbo (2009) states that using a target's stock price from 2 – 3 months prior to the initial bid "is largely free of market anticipation of the pending offer."

Bradley et al. (1983) note that targets in failed deals retain elevated stock prices, and attribute this to anticipation of the next offer. However, they do not extrapolate this effect to anticipation prior to an offer, nor throughout the market more generally. Other papers examine the effect of a deal announcement on rivals within the same industry (Song and Walkling, 2000; Cai et al., 2011). Like firm-specific effects, these findings are usually linked to news about industry-specific M&A activity, and therefore only affect a narrow range of related firms during a short period of time.

Our deal-level estimation methodology offers future researchers a simple way to adjust observed deal values to better account for the portion of the gain already embedded in a firm's stock price. We believe these adjusted measures better represent the premium relative to a firm's standalone value absent any chance of being acquired, and are too large to simply be ignored. Rather than view this as an alternate interpretation of the gain from a merger, we see it as a significant but natural extension of the widely-accepted practice of expanding the event window around deal announcements to capture the gain from rumor- or peer-effects.

We note that similar intuition could be applied to anticipation and event-study returns for bidders. However, given the near-zero bidder returns typically observed (see Eckbo, 2009, for a review) we focus primarily on targets, for whom large positive merger premiums are the norm. To the extent the reader is worried that large positive gains to targets are offset by large losses to bidders, we note that bidders generally earn slightly positive returns on average (Bhagat et al., 2005; Song and Walkling, 2005; Cai and Song, 2011). Furthermore, in cases where bidder returns are negative prior papers ascribe much of the loss to information about the bidder

revealed by the offer, rather than the value inherent in the deal itself (Bhagat et al., 2005; Golubov et al., 2015). To the extent anticipation positively affects bidders as well (Cai and Song, 2011; Wang, 2017), our estimates would understate the total embedded merger premiums in firm valuations.

In addition to furthering our understanding and measurement of merger gains, our paper shows that merger anticipation—measured here as the ex ante acquisition probability—is an important new explanatory variable in explaining deal premiums. Although our calculations of the likelihood a firm is acquired closely follow the methodology of Cremers, Nair and John (2009), we believe we are the first to show the strong negative relationship between deal anticipation and the subsequent observed premium. Our findings complement, but are incremental to, the work of Betton et al. (2014) showing that price run-ups decrease the observed premium. Here, we directly link anticipation and premiums while explicitly controlling for price run-ups of the type they explore.

The second central contribution of the paper is the identification of a channel through which changes in merger activity appear to affect stock prices. While the link between the two is well known, existing papers identify various channels through which higher stock prices (and other pro-cyclical factors) induce or precede increased merger activity. The positive link from prices to merger activity has been attributed to—among other things—bidders exploiting their overvaluation (Shleifer and Vishny, 2003; Rhodes-Kropf, Robinson and Viswanathan, 2005; Ang and Chen, 2006), the pro-cyclicality of merger economies of scale (Lambrecht, 2004), the need for capital liquidity in the market (Harford, 2005), envious CEOs (Goel and Thakor, 2010), lower uncertainty regarding deal riskiness (Bhagwat, Dam and Harford, 2016) and lower discount rates (Haddad, Loualiche and Plosser, 2017).

Here, in both OLS and vector autoregressions we show that at least a portion of the causality likely runs in the other direction. As changes to deal activity are persistent, increases in merger activity positively affect the market's expectations regarding future activity, and aggregate level stock prices rationally rise in anticipation of these value-creating deals. We find the effect to be economically large and widespread, and attempt to rule out plausible alternate hypotheses in which an omitted variable predicts higher future cash flows or profitability and is correlated with merger activity.

In this regard, the closest paper to ours is that of Cremers, Nair and John (2009), who explore the connection between cross-sectional differences in acquisition likelihood and returns. We note however that a market-wide increase in merger probabilities would not load on their factor. Additionally, we show that the aggregate effects we find are robust to the inclusion of their factor, and therefore are incremental to their earlier findings.

The study proceeds as follows. Section 1 presents our data and some basic empirical evidence of the persistence and prevalence of merger activity. Section 2 motivates our notion of an embedded merger premium through a simple theory of rational merger anticipation, and provides an estimation of the size of the embedded premium across a plausible range of parameters depicting typical market conditions and deal terms. Section 3 presents our analysis and estimations of the embedded premium at the deal level, while section 4 reports evidence of market-wide effects of deal activity on stock returns. Section 5 summarizes the results of a variety of robustness tests, while Section 6 concludes.

1. Data and Overview of Merger Activity

Our data come from two main sources. First, we capture all merger announcements between 1990 and 2015 from Thomson Reuters SDC Platinum (SDC) under the restrictions that i) the target market value of equity is greater than $10M, ii) the target is traded on one of the three main US exchanges (NYSE, NASDAQ, AMEX) at the time of the announcement, and iii) the transaction involves a change of control (the acquirer goes from holding less than 50% to more than 50% of the target firm's outstanding shares). Second, we use the Center for Research in Security Prices (CRSP) database both as an alternate source of merger information (for robustness checks of the first sample) and also to obtain counts of public firms. We include firm delistings with a code of 2XX (delisting associated with an acquisition), restricted again to the firm's equity trading on one of the three main exchanges prior to delisting. For public firm counts, we use the CRSP data to count the total number of publicly-traded firms on these exchanges at the beginning of each time period. The intersection of CRSP and SDC produces a sample of 5,646 mergers, which is in line with other studies (see Cai, Song, and Walkling, 2011, for example).

Table 1, Panel A presents summary statistics on our merger data at the deal announcement frequency. Premiums at the deal level are calculated relative to the target's stock price one day,

one week and one month prior to the announcement.[2] Relative to the target's stock price seven days prior to announcement, the average premium is 36% in percent terms and the average target market value of equity (MVE) is $240M. In later tests, we look at within-industry returns and premiums using 1-digit SIC industry, Fama-French 12 industry, and Text-Based Industry Classification (TNIC) 25 industry definitions. Firms within hotel/business/personal/automotive services (SIC1 = 7) and health/legal/educational/technical services (SIC1 = 8) have the largest deal premiums (39% and 35%, respectively), while finance (SIC1 = 6) has the smallest premiums (25%).

[Insert Table 1 Approximately Here]

In later tests, we aggregate merger data to explore the connection between aggregate deal activity and stock market returns. Our primary measure of activity is merger premiums (MP) in dollars, which we define as the percent premium relative to target price one week prior to deal announcement times the target market value of equity, summed across all deals during that time period (i.e. day, week, etc.). At the daily frequency, we have 6,510 observations (see Table 1, Panel B, for summary statistics at the daily level). On average, $237 million worth of firms are acquired daily at a premium of $67M.[3]

Table 2 shows the merger activity of U.S. publicly listed firms between 1975 and 2015. Panel A reports deal activity for each year, both from our own analysis and (as an initial validation) as reported by Doidge, Karolyi and Stulz (2017), henceforth DKS. For each year, the fraction of firms delisted due to acquisition is reported as a percentage of publicly listed firms at the beginning of the year. In the average year, 5.08% of U.S. public firms are acquired (see Panel B for summary statistics),[4] which is slighter lower than the unconditional likelihood of 6.2% reported in Edmans, Goldstein and Jiang (2012). There is significant (and largely pro-cyclical) variation across the sample, with a low of 1.98% in 1991 and a high of 8.99% in 2000. There also appears to be serial correlation in merger activity, with annual activity never changing by more than 3% from one year to the next. Figure 1 provides a graph of merger activity over time, as reported both by DKS and in our own sample.

[2] Subsequent results use premiums relative to one week prior, though all results are robust to using the other measures. For details see the Internet Appendix.

[3] Results at the daily level differ from deal-level results because some days have no mergers. For these days the merger premium (MP) and premium as a percent are both recorded as zeros.

[4] We report the CRSP rather than SDC numbers here as they are also the source for the total number of firms each year. On average, smaller firms are more likely to be lost in our matching of data across sources in subsequent regressions. To the extent that smaller firms are more likely to be acquired and at higher premiums, our later tests using SDC data would then underestimate deal activity and the effects of deal anticipation.

[Insert Table 2 Approximately Here]

As we show in the next section, the anticipation effect of possible future mergers on current stock prices is driven largely by the interaction of the probabilities of being acquired and the premium at which such an acquisition is expected to occur. Thus, while the M&A literature usually focuses on measures of deal premiums as a percent of target value (Officer, 2003; Baker et al., 2012; Betton et al., 2014), or merger activity as a number of deals (Harford, 2005, Haddad et al., 2017) or the aggregate value of deals (Bhagwat et al., 2016), our primary measure of interest is often aggregate merger premiums per period as described above. Table 3 therefore presents aggregate deal activity in terms of annual merger premiums, both in dollar terms and also as a percentage of the beginning of calendar year aggregate market capitalization. For comparison, we also present annual dividends and stock repurchases in similar formats. As shown earlier in Figure 2, it is notable that aggregate cash flows from merger premiums are comparable in size to those from dividends and repurchases.

[Insert Table 3 Approximately Here]

The above information highlights the two main conclusions of the paper. First, with 5 percent of U.S. public firms being acquired each year—and at an observed premium of 36% on average—any rational market beliefs about future mergers would have to price in a significant premium to existing firm prices long before any deal-specific rumors. Second, these embedded premiums are not only significant for those firms individually, but in aggregate provide a meaningful portion of the market-wide cash flows to shareholders. The size of the merger-related cash flows relative to dividends and repurchases implies substantial market-wide embedded premiums, even if the largest firms are unlikely to be acquired.

2. Modeling Embedded Merger Premiums in Firm Values

2.1. A Model of Deal Anticipation and Its Effects on Merger Premiums

Consider a market consisting of N public firms that are potential acquisition targets. Firms have no debt, and live forever unless acquired by another firm. In each period t, firm n faces a probability $\mu_{n,t}$ of being acquired by another firm. We assume all acquisitions are for B times a target's standalone value, where it is presumed $B > 1$.[5] The premium comes from an infinitely-

[5] Nothing in the model precludes the possibility that a merger is value-destroying, i.e. the change to standalone cash flows is negative (i.e. $B < 1$). However, a long line of literature dating back at least to Jensen and Ruback (1983) finds mergers to create value on average, especially after one controls for the bidder revaluation associated with the announcement (Bhagat et al., 2005; Golubov et al., 2016; Wang, 2017). Furthermore, it is worth emphasizing this is the total value, not the value to the bidder, who may still overpay in a value-creating deal.

lived bump to firm *n*'s standalone cash flows to shareholders. In other words, an unacquired firm *n* in year *t* is expected to produce cash flows $c_{n,t}$ for its shareholders, while after a merger its operations produce $Bc_{n,t}$ for the shareholders. We abstract away from the source of the bump, but it is consistent with synergies, improved management or cost-cutting, market power, and most rational stories in the literature.

We assume the appropriate discount rate for the cash flows from the firm's assets remains unchanged whether the firm is independent or has been acquired by another firm. We denote firm *n*'s cost of capital (more specifically the cost of capital for the assets originally held by firm *n*) in any year as $r_{n,t}$. Finally, we assume being acquired is an absorbing state; i.e. a firm that is acquired is never subsequently spun off.

Before continuing, we pause briefly to discuss several implications of the assumption that bids are for B times a firm's standalone value and equivalent to the bump in cash flows from the acquisition. Importantly, by implying bidders pay full fair value, we assume away both the sharing of gains between the bidder and target (i.e. a premium less than B) and bidder hubris (bids above B). The target thus captures all of the synergy gains from the acquisition. This assumption is broadly consistent with evidence that targets make significant excess returns in mergers, while acquirer returns are on average near zero (Eckbo, 2009). It is also consistent with an assumption that the market for corporate control is competitive, such that bidders compete away any excess return. To the extent that bidders capture some of the gains (Jensen and Ruback, 1983; Eckbo, 2009; Wang, 2017), the results here understate the total embedded gains from M&A by omitting the bidder portion. To the extent a bidder overpays but the deal still creates value (i.e. the acquisition price exceeds B times standalone value, but B is still greater than 1), and the overpayment is to some extent anticipated, would require us to adjust bidder and target returns, but in aggregate the main results and implications still hold.

As we show below, these assumptions also imply the observed premium over current market stock price of the target at announcement will be strictly less than B-1 unless a deal is completely unanticipated. Thus our main interest is the extent to which the premium at deal announcement is a reasonable measure of B, or whether a substantial piece of the gain is missed by such event study measures.

Based on the setup as described, a firm *n*'s fair value at any time *t* is simply the discounted present value of its expected cash flows. This valuation must account for the expected cash flows across two possible states at each future time *s*: either the firm is still independent, in which case

it will provide $c_{n,s}$; or the firm has been acquired, in which case it will deliver $Bc_{n,s}$ as well as the higher cash flow in all future years. Normalizing the initial reference time to *t=0*, the initial market value of firm *n* (denoted as $P_{n,0}$) is then:

$$P_{n,0} = \frac{\mu_{n,1}Bc_{n,1}+(1-\mu_{n,1})c_{n,1}}{1+r_{n,1}} + \frac{\mu_{n,1}Bc_{n,1}+(1-\mu_{n,1})\mu_{n,2}Bc_{n,2}+(1-\mu_{n,1})(1-\mu_{n,2})c_{n,2}}{(1+r_{n,1})(1+r_{n,2})} + \cdots \quad (1)$$

The first term values at time zero the expectation of the firm's cash flows at *t=1*. There is a probability of $\mu_{n,1}$ (probability of 1 - $\mu_{n,1}$) the firm is acquired (is not acquired) in the first period, in which case its cash flows at the end of the period are B$c_{n,1}$ (or $c_{n,1}$ if not acquired). The second term in equation 1 covers the expected cash flows in the second period. There are two possible cash flows, but three paths to get there: the firm was acquired in the first period (probability $\mu_{n,1}$) and produces B$c_{n,2}$; the firm was not acquired in the first period but is bought in the second period (which occurs with probability $(1-\mu_{n,1})*\mu_{n,2}$ and again produces B$c_{n,2}$); or the firm is not acquired in either period (probability $(1-\mu_{n,1})*(1-\mu_{n,2})$) and produces $c_{n,2}$.

The valuation in equation 1 contains an infinite series of terms, which can be simplified somewhat by recognizing that the firm in every period produces cash flows of either $Bc_{n,s}$ or simply $c_{n,s}$. Rearranging then allows the following condensed version of Equation 1:

$$P_{n,0} = \sum_{j=1}^{\infty}\left\{\left[\prod_{k=0}^{j-1}(1-\mu_{n,k})\right]\mu_{n,j} * B\sum_{m=j}^{\infty}\frac{c_{n,m}}{\prod_{k=1}^{m}(1+r_{n,k})}\right\} + \sum_{j=1}^{\infty}\left\{\left[\prod_{k=1}^{j}\frac{(1-\mu_{n,k})}{(1+r_{n,k})}\right] * c_{n,j}\right\} \quad (2)$$

where $\mu_{n,0} = 0$.

The first term is the sum of expected present values of all future cash flows when the firm is acquired in year *j*, with each value multiplied by the likelihood the target is acquired in year *j*. The second term is the present value of all cash flows, across all years, of the firm in its unacquired states, again each adjusted by the probability of the firm still being independent in that year. Equation 2 highlights our key result: when B > 1, $\mu_{n,k} > 0$ for some k, and $c_{n,m} > 0$ for some m > k, the current market value of the firm is higher than the discounted present value of its future cash flows as a standalone entity.[6]

We denote the value of a firm based only on its standalone cash flows ($\mu_{n,t} = 0$ for all t) as $\hat{P}_0$. We then define the embedded merger premium (EMP) as the increase in the fair value today of a firm stemming from the potential to be acquired at some point in the future, measured as the premium over the firm's fair value absent any possibility of being acquired:

[6] Given the setup, we consider this result, and its proof that directly follows therein, sufficiently obvious to forego a formal presentation of either.

$$EMP = \frac{P_0 - \hat{P}_0}{\hat{P}_0} \tag{3}$$

While the EMP gives a measure of how much of a firm's value comes from the optionality of being acquired, an equally interesting number is the effect this embedded anticipation has on observed premiums announced in conjunction with an actual offer. If the market was completely caught off guard by a deal ($\mu_{n,t} = 0$ for all t) then the observed premium would be equal to the actual premium over standalone value (B-1) given our assumption that targets collect all of the gain. However, with rational anticipation some portion of the gain will already be embedded into the firm's stock price. We therefore define the percent of the premium embedded (PPE) as the percent of the total premium already embedded in the firm's stock price prior to a deal:

$$PPE = \frac{EMP}{B - 1} \tag{4}$$

The PPE provides a measure of how much of the gain is missed by a traditional event study measure, relative to the total gain from the acquisition. Alternatively, one can think of the fraction of the premium observed in the offer relative to the total implied gain from the deal as simply $1 - PPE$, or the fraction of the gain embedded relative to the observed premium: $EMP/(B - 1 - EMP)$.

2.2 Baseline Estimates of the Impact of Merger Anticipation on Deal Premiums and Stock Prices

To get an initial sense of the importance of merger anticipation, and changes therein, to deal premiums and stock prices, we add two additional assumptions to the model. First, both the cost of capital and the probability of being acquired for each firm are assumed to be time invariant: $r_{n,s} = r_{n,q}$, *and* $\mu_{n,s} = \mu_{n,q}$, *for all* $s,q \geq 0$, allowing firm n's cost of capital and per period likelihood of being acquired to be denoted as r_n and μ_n, respectively. Second, a firm's cash flows are assumed to grow at a constant rate: $c_{n,s}=c_{n,q}(1+g_n)^{s-q}$, for all $q,s \geq 0$ $s \geq q$, $r_n > g_n \geq 0$.

With these assumptions, the valuation of any firm n from equation 2 simplifies to:

$$P_{n,0} = \frac{(1-\mu_n)c_{n,1}}{r_n - g_n + \mu_n + g_n\mu_n} + \frac{\mu_n(1+r_n)Bc_{n,1}}{(r_n - g_n)(r_n - g_n + \mu_n + g_n\mu_n)} \tag{5}$$

From equation 5, it is easy to see that the value of a firm with no chance of ever being acquired ($\mu_n = 0$) further simplifies to:

$$\hat{P}_{n,0} = \frac{c_{n,1}}{r_n - g_n} \tag{6}$$

which is consistent with a basic constant growth cash flow valuation.

Using equation 5 and the definitions and assumptions above, Panel A of Table 4 reports baseline estimates of the embedded merger premium (EMP) and the percent of the premium perpetually embedded in the stock price (PPE) for a variety of parameter values. We show results for two costs of capital (8% and 10%), two growth rates (2% and 3%), and three assumptions of merger gains (20%, 40% and 60%).[7] The first set of results uses the mean annual probability of a firm being acquired from our final sample after matching with Compustat ($\mu = 3.54\%$), while the second set uses the mean probability from our CRSP sample before the loss of observations due to data matching ($\mu = 5.08\%$).[8]

[Insert Table 4 Approximately Here]

Several things are immediately clear from the results. First, regardless of data selection or assumptions about discount rates, growth rates, or acquisition premiums, acquisition anticipation drives economically meaningful merger premiums embedded in firm valuations. Across the chosen range of plausible parameter values, merger anticipation leads to embedded premiums of 7-32% over standalone values. For instance: using the average probability from our CRSP data and a discount rate of 8%, dividend growth rate of 2%, and a total acquisition premium (B-1) of 40%, the EMP is 19.63% of standalone value. In this case the already embedded (and therefore missed in current M&A event studies) percent of the premium (PPE) is just slightly smaller than the observed portion (19.63% embedded, 40% - 19.63% = 20.37% observed), and therefore nearly one-half (19.63/40 = 49.05%) of the total premium. Were these numbers for the "average" firm representative of the entire market, $4.36 trillion in aggregate market capitalization would be attributable to merger anticipation.[9] Although there are many reasons to be suspicious of attributing such a large number to the broader market, we again note that this estimate of 20% of market capitalization stemming from the present value of merger anticipation is not far from the average of 24% of total annual cash flows to stock market investors coming from merger premiums depicted in Figure 2.

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[7] We feel these choices represent reasonable estimates of the parameters, and are if anything conservative. Using the data from Robert Shiller's data website (www.econ.yale.edu/~shiller/data.htm), we compute an average annual return to the S&P Composite Stock Index since 1871 of 8.04% and annual dividend growth of 4.3%. Merger premiums—measured over prior target stock price rather than versus standalone value as proposed here—vary widely across previous studies. For example, Boone and Mulherin (2007) report an average target return of 21.6%, while Bates and Lemmon (2003) report bid premiums of 53.6% to 56.7% depending upon the inclusion of target termination fees.

[8] The question of which is more representative of a firm's acquisition likelihood is somewhat relative. To the extent that data tend to be missing for smaller firms who are more likely to be acquired, the latter is perhaps more representative in general. However, to the extent one is interested in comparing our results to extant studies using SDC data matched to Compustat, the former may be more appropriate.

[9] According to CRSP, the combined market capitalization of the NYSE, AMEX and NASDAQ on Dec 31, 2015 was $26.6T.

Second, Panel A illustrates the comparative statics of the key parameters of the model. Most importantly, we see that both the EMP and PPE are increasing in the probability a firm will be acquired. Furthermore, we see that all else equal the EMP is higher when discount rates are lower, when cash flow growth is higher, and when premiums over standalone values are higher. In each case, the change incrementally makes future cash flow increases from mergers more valuable at present. Finally, we note that the PPE reflects generally similar effects. The exception is that the percent of the premium embedded is constant across total gains from the deal (B), as by definition the PPE is scaled by B and therefore scale invariant in this particular dimension.

2.3 How Changing Merger Activity Affects Embedded Premiums, Observed Premiums and Stock Prices

The results in Section 2.2 point to economically significant embedded merger premiums, present in firms' stock prices across a wide variety of parameter values that cover typical market and deal conditions. We now look more closely at how changes to deal likelihood or activity would affect pre-deal stock prices and the premium observed upon deal announcement. As a baseline for comparison, we use the parameter values from the example in the last section: an annual discount rate of 8%, a dividend growth rate of 2%, and assume a total premium of 40% (which as we showed in the previous section leads to observed offer premiums of just over 20%, at the conservative end of prior studies and well below the average in our sample).

For an initial measure of the impact of changes to merger activity on stock returns, we assume that merger activity is initially fixed across time, and that any shock to merger activity is assumed to be permanent. Specification 1 in Panel B of Table 4 presents estimates of the effect of a one-time permanent change to merger activity. Results are presented for one- and two-standard deviation changes from the mean, where the annual mean (5.08%) and standard deviation (1.81%) are taken from our total CRSP sample as summarized in Panel B of Table 2. For a one-standard deviation increase from average (below average) levels, the model predicts a 3.25% (4.82%) increase in the EMP, which translate into 2.80% and 4.16% increases in the firm's stock price respectively. The table also reports the effects of a change of two standard deviations. We see that changes in merger probabilities of this size could drive double-digit changes in a firm's stock price.

That similar size changes in probability have substantially different effects whether starting at or below the average hints at the non-linear relationship between the annual probability of being acquired and the EMP. Figure 3 illustrates these results by showing how the embedded premium

changes across the full range of ex ante probabilities of a firm being acquired, displaying the results in terms of the fraction of the total gain from the merger embedded by rational anticipation (PPE). If the merger came as a complete surprise (i.e. the market had assigned zero probability to it), the entire gain would be reflected in the announced deal premium, and the PPE is zero. We note that in this case and this case alone would the traditional M&A event study accurately measure the gain. As the probability increases from zero, the embedded portion initially rises rapidly, with over one-quarter of the gain already embedded by the time the annual probability reaches just 2%, and over one-half is embedded before reaching 6%. By the time the probability reaches 20%, over three-quarters of the gain is already embedded. Thus the marginal effect of increasing the probability begins to taper off quickly, implying a strong non-linear relationship between merger expectations and subsequent premiums when a deal is actually made. We verify this non-linear effect holds in the actual data in the next section.

[Insert Figure 3 Approximately Here]

While qualitatively valid in any case, the marginal effect of a change in probability on the EMP presented above rests on the strong assumption that the probability is constant across years, and therefore that any change is permanent. The visible trends seen in Figure 1 suggest changes in merger activity are persistent, but mean-reverting over time. The market for corporate control has clear periods of increased activity (with waves peaking in 1988, 2000, and 2007), and unusually tepid activity (with troughs in 1975, 1991, 2002, and 2009). Table 5 shows the results of time-series regressions of merger activity in a given year on lags of the same. Columns 1 and 2 use aggregate market activity (percent of public firms acquired), as measured and reported from CRSP and as described in Table 2. In both cases the first lag is positive and highly statistically significant, with a coefficient of 0.76 in the AR(1) specification and 0.98 in the AR(2). In the AR(2) specification, the second lag is negative and weakly significant, while all subsequent lags (not reported) are not significant regardless of the number of lags included.

Columns 3 and 4 instead look at the serial correlation in the probability any particular firm will be acquired in the upcoming year. For each year, a firm is assigned a probability following the methodology of Cremers, Nair and John (2009), as discussed in greater detail in the next section. The probabilities are then regressed on lagged probabilities at the firm level (i.e. with the inclusion of firm fixed effects). The first lag is again positive and highly significant, with a coefficient near 0.6 in both specifications. The second lag is again negative and significant, albeit with a much smaller coefficient (-0.06) than in the market-wide regressions.

[Insert Table 5 Here]

The rest of Table 4's Panel B shows the estimated impact of changes to deal activity on stock prices, when the shocks to merger activity come from the AR(1) or AR(2) processes estimated in Table 5. We impose either a one- or two-standard deviation shock from the model's long-run average for only one period. Despite the high coefficients of serial correlation, we now find much weaker effects, with a one-standard deviation change in merger activity increasing a firm's stock price by 1.45%. However, we note that firm-level probabilities are much more volatile than the market as a whole, which would increase the estimates relative to these reported numbers. Furthermore, although lower serial correlation in probabilities reduces the sensitivity of a firm's stock price to probability changes, the average size of the embedded merger premium and the percent of the premium embedded are largely unaffected by the degree of serial correlation.

3. The Deal-Level Effects of Merger Anticipation

3.1 Adjusting M&A Event Studies for Merger Anticipation

The baseline estimates of the embedded merger premium in the previous section rely on simplifying assumptions to show that across a broad range of parameter assumptions the EMP is of first order importance. However, accurately adjusting an announcement premium to account for anticipation requires more careful estimation of the relevant parameters. In this section we present one approach how the estimation presented above can be refined to provide meaningful event study adjustments to account for anticipation.

Equation 2 makes clear that precise estimation is not a trivial task, as a researcher has to make estimates at the time of deal announcement not only of the ex ante probability assigned to a deal for that firm that year but in all future years. Similarly, expectations regarding discount rates, growth rates, and acquisition premiums need to again be made for all years indefinitely into the future. Baseline estimations also show that roughly 90% of the embedded value comes from anticipation of a deal beyond the first year out, such that the more difficult to estimate years are still critically important to valuing the EMP. We present one general approach here, with a belief that any alterations are likely of second order importance to having made some correction at all. We reiterate that any major "improvements" would by definition produce more accurate predictions ex ante as to which firms will in fact be acquired. To the extent that the market can better matched anticipation to deals than the exercise here, the improvement leads to larger embedded premiums in actual deals than those estimated here.

For this exercise, we use all of the deals in our sample from 1990 through 2013 to estimate the relationship between observables and deal probabilities and premiums. We then estimate the embedded merger premiums in deals in the most recent two years (2014 and 2015) of our sample as described below.

We begin with merger probabilities. For every firm-year, we broadly follow the methodology of Cremers, Nair and John (2009), henceforth CNJ, to estimate an ex ante probability each firm will be acquired in that upcoming year (Prob_Acq). The explanatory variables include a variety of firm-specific characteristics that might drive it being targeted. We include prior-year industry fixed effects knowing that recent deal activity is a key determinant of upcoming activity. Following CNJ all variables are industry adjusted. The one significant difference between our estimates and their estimates is that we substitute the E-Index as a measure of corporate governance for their G-Index, as the G-Index is not available for much of our sample period. The results are reported in Table 6. Despite covering eleven recent years not in their sample, we find broadly similar results. Across all years and firms, we find an average annual predicted likelihood of a firm being acquired of 3.54%.

[Insert Table 6 Approximately Here]

Similar to probabilities, we next estimate a premium conditional on a deal being announced controlling for the usual firm characteristics, and include both year and industry fixed effects. The results are shown in Table 7. We find that in general, the expected premium is increasing in firm size, return on assets, asset tangibility and Tobin's Q. In contrast, firm leverage has a statistically significant negative effects on the predicted premium. Consistent with Betton, Eckbo and Thorburn (2014), we find that recent changes in a firm's stock price (Return) have a strong negative effect on the announced premium. In contrast to the low predictability seen in the previous table, the high R-squared here (near 0.5 in all specifications) suggests the explanatory variables are capturing a meaningful portion of the variation.

[Insert Table 7 Approximately Here]

In our deal-specific estimations, we use the historic average market risk premium, again taken from the data on Robert Shiller's website (8.04% - 4.59% = 3.45%).[10] We adjust the risk premium for the firm's market beta calculated using daily returns during the window [-360, -30]

[10] In unreported results (available upon request) we use the estimation of the 3-year forward aggregate risk premium from Haddad, Loualiche and Plosser (2017) as the base discount rate. However, their model predicts near-zero risk premiums in recent years, including those for which we conduct our estimation. As the size of the embedded premium increases as the discount rate decreases, we use the more conservative long-run averages here.

relative to the reported announcement date. We end the estimation 30 days prior to acquisition simply to avoid the effects of any deal-related rumors on the target's stock price. We use the 10-year U.S. Treasury bond yield from the beginning of the month the deal is announced as the risk-free rate. For cash flow growth, we use the 5-year estimated EPS growth for the firm reported just prior to the deal for the first five years, and a conservative 2% thereafter.

Using the above information, we estimate the EMP in recent deals as follows. First, we use the regressions from Tables 6 and 7 to construct year-by-year estimates of a firm's acquisition probability and conditional premium, for the years leading up to its acquisition. We then run AR(1) regressions on these data series to get forward-looking estimates of the probability and acquisition premiums in future years, which are unobserved both due the deal itself and the need to project these things perpetually into the future. The projected values and the other parameter values as described above are then plugged into equation 2 to estimate the EMP.

Before discussing the broader results, we present the results from a single deal to illustrate the approach. On July 9, 2013, a deal was announced for the acquisition of Harris Teeter Supermarkets by Kroger. The deal valued Harris Teeter Supermarkets at a premium of 33% to its stock price a week prior. The deal was completed on Jan 28, 2014. Although larger than the average deal, the premium and other aspects of the deal appear fairly representative of the broader sample.

Prior to the deal, the model assigns a 2.21% probability to Harris Teeter being acquired in the upcoming year, at a predicted premium of 61%. AR(1) regressions of the annual firm-level observations prior to the deal have coefficients of 0.64 and 0.62 on the first lags of the probabilities and premiums respectively (both with t-statistics greater than 3.5), while the second lags are not significant in either case. The 5-year EPS growth estimate for Harris Teeter was 12% in the year prior to the deal announcement. A market beta of 1.36 for Harris Teeter, together with a 2.6% U.S. Treasury yield in July of 2013, produce a discount rate of 7.3%.

Using this information, general anticipation of a possible acquisition would have added 17.8% to the price of Harris Teeter, relative to its predicted standalone value without any merger anticipation. Again, we note this is prior to any deal-specific rumors, and only incorporates broader measures of industry and market-level measures of deal intensity. Any news or rumors just prior to the actual deal would only have further increased the embedding of deal value into Harris Teeter's price. The announced premium of 33% was in fact much lower than that predicted by the regressions. Nonetheless, these results suggest 35% of the gain from the deal would be missed by the usual measure of the deal premium (17.8% divided by 17.8% plus 33%).

We follow this approach for all of the deals in the most recent two years (2014 and 2015) of our sample. We limit the estimation to deals in which we can compile at least ten year's worth of data prior to their acquisition, leading to a sample of 101 deals. We plug all of the values into equation 2 for each deal, and compare the valuation to the counter-factual in which zero probability is assigned to the firm being acquired in all future years.

[Insert Table 8 Approximately Here]

Table 8 summarizes the results of this estimation. The predicted and actual merger premiums, at 37% and 38% respectively, are quite close to a total sample average of 36%. While the average probability of being acquired of 3.06% is slightly lower than the average of 3.54% in our broader sample, we note that in our broader sample (see Table 2) the fraction of firms acquired in these years is also below the historical average.

Across these deals, we estimate an average (median) embedded merger premium equal to 10.06% (9.53%). Even the lowest estimated EMP is 5%, while for the majority of the deals the estimate falls between 8.5 and 11%. In terms of the percent of the total premium embedded (PPE), we find broad anticipation suggests that on average 26% of the gain is missed by measures of the observed premium. Put another way, the previously embedded portion is just over one-third of the observed premium (26% divided by 74%).

Any changes to the modeling assumptions will of course lead to slightly different estimates. We assume a researcher focused on a particular firm, industry or time period could hone the techniques presented here to get more accurate measures of the probabilities and premiums. However, while such refinements might improve the precision of the estimates, we believe they are generally unlikely to decrease the average size of the EMP. First, any improvements to predicting takeover likelihood would by definition assign higher probabilities to the firms actually acquired relative to those reported here. However, any increase to the probabilities will increase the size of the EMP for acquired firms. Second, in several places such as the market risk premium and long-term growth rates we intentionally chose conservative parameter values, such that changes are again likely to increase the size of the EMP. Third, by focusing on deals during the most recent two years we chose a period with below-average acquisition rates.

We therefore conclude rational merger anticipation embeds a meaningful portion of the gain from being acquired—on the order of 10% of a firm's value and one-third of the size of the average observed premium—into a target's stock price long before a deal is announced or even rumored. Although a simple expansion of the event window can never truly capture this omitted

portion, the observed announcement premium can and should be adjusted by adding the EMP to get a better measure of the total gain.

3.2 The Effect of Merger Anticipation on Deal Premiums

As anticipation itself does not change the value created by a deal, every dollar of gain already embedded should on average reduce the observed premium paid when an actual deal is announced. This leads to our main deal-level testable prediction: all else equal, observed deal premiums should be decreasing in the expectation (probability) of a deal. Similar to in the last section, we adapt the methodology of Cremers, Nair and John (2009) to estimate our main independent variable of interest: the ex ante probability the firm will be acquired in that upcoming year (Prob_Acq). Using this measure of the market's expectations a firm will be acquired, we test our hypothesis that higher anticipation incorporates more of the gains into the target's prior price, thereby lowering the premium observed upon deal announcement. Table 7, column 2 repeats our earlier OLS regression of determinants of deal premium, while adding takeover probability as an explanatory variable. Prob_Acq is negative and highly statistically significant. All else equal, a one percent increase in the likelihood of an offer is associated with a 1.4 percentage point decrease in the merger premium, significant at the 1% level. Our estimate is in line with the effect Edmans, Goldstein and Jiang (2012) back out of their estimation of the impact of stock price discounts on takeover likelihoods.

While these results strongly support the basic predicted relationship, we note that as depicted in Figure 3 the model also predicts a non-linear relationship: the incremental effect of anticipation on the premium is always negative but at a decreasing rate. In column 3, we therefore re-run the regression including a probability-squared term. We find the coefficient on the linear term more than doubles, while the squared term is positive and statistically significant. Thus, starting at zero probability where the squared term is negligible, the regression predicts a one percent increase in takeover probability corresponds to a 3.6% decrease in the observed premium.

As a final test of the non-linear relationship, we split our sample either into terciles (columns 4 through 6) or simply by below and above median (columns 7 and 8) by the probability the firm will be acquired in the upcoming year. In each case we see the marginal effect of a change in probability on the observed premium is negative and statistically significant in the lowest probability group, with the point estimate much larger (more negative) than in the base regression. Moving to higher-probability sub-samples, the estimated coefficient increases (becomes less

negative) monotonically and loses its statistical significance. In each case the coefficient in the lowest probability group is significantly more negative (beyond the 1% level) than that in the highest probability group.

As the premium paid is in effect a ratio of the price paid by the acquirer relative to the target firm's stock price prior to announcement, one might wonder whether the negative effect is coming through the numerator or denominator. In the internet appendix (see Table IA1), the probability of a firm's acquisition is strongly related to its prior stock price (measured as its market-to-book ratio), but unrelated to the price paid (measured as deal value divided by either net income or EBITDA). Thus, the effect seems to be coming through the pre-offer target stock price as predicted by our merger anticipation channel.

Altogether, it appears merger anticipation plays an important role in understanding merger premiums, consistent with the model. It is important to emphasize the anticipation here is different from the deal-specific (Eckbo, 2009) or industry-specific (Song and Walkling, 2009) anticipation discussed in the literature. We are interested in the broader anticipation present simply because markets know that there is always a chance almost every firm will be acquired. In fact, consistent with Betton et al. (2014) in all specifications we control for the run-up in the target's stock price in the months prior to deal announcement (Return), which is likely to capture the type of anticipation described in Eckbo (2009) and Song and Walkling (2009). Similar to Betton et al. (2014), we find a negative effect of the stock price run-up on the announced premium. We conclude the effects of broader anticipation that we study are incremental to all of these findings.

4. The Market-Wide Effects of Merger Anticipation

4.1 The Effects of Merger Activity on Stock Prices

While our primary focus is on the connection between anticipation and premiums at the firm level, we next briefly explore the implications of rational anticipation on the broader market. We acknowledge up front that the results cannot definitively rule out alternate channels, but where possible discuss why merger anticipation might be the most plausible explanation.

Our first tests therefore examine the relationship between merger activity and broader stock returns. To the extent that deal activity is persistent, we expect that increases in deal activity predict higher subsequent activity, which in turn would lead to higher valuations for public firms, as markets embed more of the merger-related premiums into stock prices even before any deal-specific rumors.

Theoretically, the embedded premium is primarily driven by the joint effects of two merger-related parameters: the likelihood of a firm being acquired, and the premium (relative to standalone value) at which such an acquisition is completed. It is straightforward to see from equation 2 that either in the absence of the other has no effect on a firm's price. To capture their joint effect, we use per-period merger premiums (MP) as our base measure of merger activity. Merger premiums are calculated as the sum of deal premiums (offer prices minus equity value one week prior) summed across all deals in any period. We also look at the change in merger premiums relative to the previous period. Whether merger premiums or changes to merger premiums are the more appropriate explanatory variable depends upon the market's beliefs regarding predictability in deal activity. We generally report both, as our results are broadly similar between the two. Although we believe merger premiums as described are the best measure of deal activity in our setting, we note that in later tests we confirm our results are robust to a number of other measures of deal activity more traditionally found in the M&A literature.

Table 9 presents the results of OLS regressions of the effects of merger activity on stock market returns. Merger premiums (column 1) and changes in merger premiums (column 2) both have positive and significant effects on the market return. Not only are the contemporaneous premiums and changes in premiums related to market returns, but several lags of each are also significant. Lags of merger premiums beyond 3 days, and changes beyond 6 days, are not significant and are therefore omitted.

[Insert Table 9 Approximately Here]

Regardless of the specification, whenever statistically significant the market premium terms have positive coefficients, suggesting that higher merger activity is associated with positive market returns. Given the significance of several days' worth of lags, it appears that it takes up to a week for the broader market to fully incorporate the information contained in deal activity into aggregate prices. In general, we take these results as consistent with the market learning about future deal activity from current activity, and defer our discussion of alternate stories to the next subsection.

As specified, the economic impact of merger activity on the market is difficult to interpret. We therefore consider the results in dollar terms. If a merger has no effect and conveys no information about other firms, each dollar of synergy created (market premium) should add one dollar to the aggregate market capitalization of public firms. If some of the gain comes at the expense of competitors or the bidder, or if less than the entire premium is imputed into prices until

the deal is certain to be completed (Bhagat et al, 2005), the ratio could actually be less than one or even negative. Using recent aggregate market valuations (a combined $26.6 trillion on the NYSE, NASDAQ, and AMEX exchanges as of December 31st, 2015) to convert the coefficients from percent to dollar returns, our results suggest that every dollar of merger premiums (change in merger premiums) is associated with an $11.43 ($44.38) increase in subsequent market value across the three exchanges.[11] Thus, regardless of the specification, the indirect effect of a merger on stock prices appears to be at least an order of magnitude larger than the direct effect on the target's price.

In specifications 3 and 4 we add the size (SMB), value (HML) and momentum (UMD) asset-pricing factors explanatory variables. Given that we are looking at deal announcements and returns at the daily level, it seems as likely that announcements are affecting these asset pricing factors as the other way around. While slightly weaker, we find that the contemporaneous market premium (MP) and both the contemporaneous and lagged changes in market premiums are positive and significant while controlling for the three pricing factors. In dollar terms, each dollar of merger premiums (change in merger premiums) is associated with a $4.65 ($20.06) increase in aggregate market capitalization.

4.2 Merger Activity and Returns: Correlation or Causation?

One might worry the link between merger activity and returns is mere correlation rather than causation, that the effect flows from the latter to the former, or that an omitted variable is responsible for the connection. For instance, deal announcements might reveal information to the market about broader future economic strength (i.e. profits) or discount rates. In these cases the above link between deal announcements and market returns would still hold, but for very different reasons. We offer the following results as being broadly consistent with our channel.

We first explore the possibility of reverse causation. Embedded merger premiums tied to rational deal anticipation imply that at least some of the observed correlation between merger activity and stock prices runs from the former to the latter, essentially the opposite flow from what is considered in most of the extant literature (i.e. Shleifer and Vishny, 2003; Rhodes-Kropf et al., 2005; Dong et al., 2006). We first consider the effects of each on the other separately, with lags of

[11] Rather than convert market returns using recent valuations, in unreported tests we re-run these regressions using market returns (in dollars) as the dependent variable against merger premiums (still in dollars). We get very similar results: the first three lags of MP and first six lags of change(MP) are significant, and the effects are $11 and $52 respectively.

both variables simultaneously included as controls. Table 10, Panel A presents the OLS results of these tests at the daily frequency. Instead of showing the lags separately, here and in subsequent tables we group the first three lags into one term.[12] In the first column, we see that neither past market returns nor previous deal premiums are related to current deal activity. In the second column, the effect of merger premiums on market returns is positive but not significant, while lagged market returns have a negative and statistically significant association with current returns.

[Insert Table 10 Approximately Here]

Specifications 3 and 4 consider the change in merger premiums instead of the level. The results here are broadly consistent with those in specifications 1 and 2, with the exception that the changes in merger premiums are mean reverting (specification 3). Lagged returns still do not appear to have any effect on mergers, while the effect of mergers on returns is still positive and now significant at the 5% level. We take these results as weak initial support for a view that mergers are affecting returns more strongly than returns are affecting or predicting mergers.

To better establish causation, we next run a vector autoregression (VAR). Table 10, Panel B presents the VAR results of tests similar to those in Panel A except now the dependent variables are assessed simultaneously. Given the underlying structure of the VAR analysis, in this case we do not combine lags of the variables. We find that both merger premiums (specification 2) and the change in merger premiums (specification 4) have economically large effects on subsequent stock returns, significant beyond the 1% level. Once again using the market capitalization of the three exchanges at the end of 2015, we estimate that $1 of announced merger premiums (change in merger premiums) leads to $3 ($10) of increases in market capitalization over the next couple of days.

While the link from merger activity to stock prices remains strong, the evidence connecting stock returns to subsequent merger activity is weak. Columns 1 and 3 show coefficients that are near zero, and when significant actually suggest a negative effect of market returns on subsequent deal activity. In unreported tests, we also run these regressions at the weekly and monthly frequency. We again find the effect of lagged merger activity on current stock returns is generally positive, while the effect of lagged stock returns on current merger activity is generally negligible or negative.

[12] This is done merely to conserve space. In unreported results we run all tests with all lags as separate variables, and confirm our results are actually generally stronger when splitting out rather than combining lagged observations.

In sum, we find evidence of a relationship going from M&A deal activity to subsequent stock returns, even when attempting to simultaneously control for effects in the other direction. On the other hand, we find little evidence of an impact of returns on subsequent deal activity, particularly over short horizons. The negative effect of returns on mergers in some specifications goes against traditional assumptions in the literature, but is consistent with the firm-level findings in Edmans et al. (2012), who find that lower share prices increase the likelihood of a bid.

Even if upticks in merger activity are followed by positive market returns, it is still possible the cause is not anticipation of future deals but instead an omitted variable. For example, merger activity might increase when there is a positive shock to expectations regarding future earnings or dividends, which would drive contemporaneous positive market returns through a very different channel than described here. In Table 11 we therefore test a host of the most likely alternate stories. In each specification, we regress measures of aggregate profitability or corporate cash flows on two different measures of prior merger activity as our main independent variables: lagged aggregate merger premiums (specifications 1 - 7) and lagged aggregate merger deal values (specifications 8 - 14). Each regression is run at the quarterly level, as that is the most granular level for which data are available. Across fourteen specifications, only specification 9 reports statistically positive (at the 5% level) link, while two report statistically negative relationships. Thus, 13 of the 14 are inconsistent with this alternate hypothesis. In unreported tests, we perform this analysis again at the annual frequency and find similar results.

To the extent an omitted variable of the type discussed here must be connected to future firm performance, we find little evidence supporting this alternate hypothesis. We again emphasize that these analyses are being run at the daily level. With deals taking weeks or much to build, the likelihood they actually get reached and announced on days with other macroeconomic news that in fact drives returns is possible but seems implausible at best. One could still argue that the announcements themselves might reveal news about broader profits or discounts rates, and we lack a clear test to differentiate these hypotheses. However, given that markets have incredibly sophisticated alternate sources of information (i.e. futures markets, yield curves, etc.) on these market characteristics, it seems reasonable that the most important information conveyed by deal activity might in fact be about future deal activity.

[Insert Table 11 Approximately Here]

4.3 Cross-sectional Effects of Merger Activity on Stock Prices

The results above suggest that the changes in aggregate stock prices far exceed a simple increase attributable to the direct value created by the announced deals, and appear connected to increased anticipation of future deals across a wider range of firms. However, earlier studies show that rivals earn positive announcement returns when a deal is announced involving an industry peer (Mitchell and Mulherin, 1996; Song and Walking, 2000; Cai, Song and Walkling, 2011). It is plausible then that we are merely picking up this localized effect.

We therefore compare the impact of industry merger news on same-industry returns to its impact on returns outside the industry. As a broad initial measure, we identify deal activity (again as levels and then as changes) at the 1-digit SIC level. For example, if we are considering the agriculture/forestry/fishing industry (SIC1 = 0), then the dependent variable in specification 1 would be the industry return for SIC1 = 0, while the dependent variable in specification 2 would be the average industry return for the remaining nine SIC1 industries; i.e. all industries excluding agriculture/forestry/fishing.

Table 12 reports the effects of industry-level merger activity on both within-industry and outside-industry returns. Our main independent variables here include the contemporaneous merger premiums (both within and outside of the industry) and our single variable calculated by combining the first three lags of merger premiums (again both for within and outside of the industry). Consistent with previous studies, we find that industry-level merger premiums (specification 1) and changes in industry premiums (specification 3) have strong effects on subsequent returns within that industry: a one standard deviation increase in merger premiums results in a four basis point increase in stock returns. More surprising are the results across industries. Both merger activity (specification 2) and changes in merger activity (specification 4) within an industry have significant positive effects outside that particular industry, even when controlling for within-industry merger activity. In fact, we find only one specification (specification 3) where the within-industry coefficient is statistically larger than the corresponding outside of industry coefficient. Thus, the across-industry effects appear to be of comparable magnitude to the within-industry effects.

[Insert Table 12 Approximately Here]

It is possible these spillover effects are due to poor industry classification. However, we rerun the industry tests defining industries using both the Fama-French 12 industry definitions and the Text-Based Industry Classification (TNIC) instead of SIC1 (see the Internet Appendix for the

associated tables IA3 and IA4 respectively).[13] The results are consistent regardless of industry determination: outside of industry effects are always statistically significant, and in some cases are statistically larger than the effect inside the industry.[14]

It is important to note that the effects within- and outside-industry are comparable as measured by *returns*. As the vast majority of firms are outside of any industry regardless of the classification system or specific industry, in dollar terms the outside-industry effects would actually be several times larger than those within the industry. We take this as one final piece of strong evidence that—to the extent merger activity's effect on stock prices has been considered at all—it has historically been done so in far too narrow of a scope that dramatically understates its impact.

5. Robustness Tests

5.1 Cremers, Nair and John (2009) Takeover Factor

As an alternative test of how broadly deal activity affects merger anticipation across the broader market, we consider the possibility that firms might be related not only by industry but also by their general likelihood of being a target. If some firms are potential targets while others are not, it is possible that higher deal activity will only affect stock prices of the former, implying a smaller effect for the aggregate market than that predicted.

We construct a takeover factor similar to that of Cremers, Nair and John (2009), henceforth CNJ.[15] The CNJ factor is created by buying the top decile of firms predicted as the most likely to be acquired and selling the bottom decile of firms least likely to be acquired. Replicating their strategy with our sample, we find that it has an annual alpha of approximately 20%.[16] This alpha is similar to their findings, which we take as evidence that we have created a reasonably close approximation of their factor.

If the systemic impact of merger activity on returns disappeared upon inclusion of their factor, it would be possible our findings are driven by differences in the cross-sectional effects of

[13] The TNIC industry definitions are calculated by determining firm-by-firm pairwise similarity scores by parsing the qualitative/text product descriptions from the firm 10Ks and forming word vectors for each firm to compute continuous measures of product similarity. For a more complete description, see the Hoberg-Phillips website at: hobergphillips.usc.edu.

[14] Outside industry effects are statistically different and larger than within industry effects in specification 1 of both the FF12 (Table IA2) and TNIC25 (Table IA3) industry classifications.

[15] To recreate the CNJ factor we substitute the E-Index for the G-Index, as the G-Index is no longer available.

[16] Cremers, Nair and John (2009) attribute this large alpha to risk that is not adequately captured by traditional asset pricing factors. Our goal here is simply to show our results are incremental to their findings, independent of the explanation of the returns in their work.

mergers on returns. We note that even were this to be the case, the importance and validity of our conclusion that M&A event studies greatly understate merger gains would still hold. Nonetheless, to rule their factor out as a cause or source of our aggregate-level findings, we include it in some of our important tests. First, we replicate our base results from Table 9 while including our CNJ factor. Columns 5 and 6 of Table 9 show that although the coefficient on the CNJ factor is positive and significant, the coefficients (and their significance) on our measures of merger premiums are very similar to those reported previously. Next, we include the CNJ factor in our industry-based cross-sectional tests. The results are presented in columns 5 through 8 of Table 12. We find that the CNJ factor is not significant in the estimation. However, our measures of interest (merger premiums and changes in merger premiums) remain positive and significant, which is consistent with our model and hypothesis that aggregate deal activity drives (broad) market returns, even when controlling for differential probabilities of being acquired.

Lastly, in Table 13 we present tests which regress various measures of deal activity on both measures of merger activity (MP and changes in MP), the CNJ factor, and lags of each. The goal of this exercise is to rule out the CNJ factor as the dominant determinant of merger activity. We find that our measures are significantly related to merger activity, regardless of the proxy used, while the CNJ factor is not. We therefore see our findings as incremental to those in Cremer, Nair and John (2009), with important effects of changes in broad merger activity in addition to their cross-sectional effects. We do not find this surprising in the sense that their measure is cross-sectional by construction. As a result anything that increases merger probabilities more broadly will not primarily load on their factor.

[Insert Table 13 Approximately Here]

5.2 How Widespread Is Merger Anticipation?

Our results identify large embedded merger premiums for most firms, and provide strong support for a broad link between merger activity and stock returns. One might nonetheless worry that the estimated size of aggregate embedded merger premium is overstated. In particular, if some firms are simply unlikely to be acquired, the estimates from the representative firm calculations would not truly represent the aggregate or average embedded premiums. We therefore explore two dimensions in which one might expect the largest differences.

First, we look at firm size. If small firms are much more likely to be acquired than larger ones, the average would overestimate the aggregate embedded merger premium. Panel A of Table

14 shows that merger activity is not limited to firms of any particular size. In fact, we find both predicted and actual probabilities to be remarkably consistent across firm size.

[Insert Table 14 Approximately Here]

Panel B looks more closely at the largest firms to explore whether the largest firms are simply different and not likely to be acquired. Contrary to expectation, we find that the predicted and actual takeover probabilities of the largest firms are not zero. There is no discernable discontinuity or dropoff in takeover probabilities, even out to the 98th and 99th percentiles of firm size.

Lastly, we consider firms across deciles of their ex-ante likelihood of being acquired, as predicted by the CNJ methodology. As with size, if some firms—across any salient dimension or dimensions—are just unlikely to be acquired, a representative measure could overstate the portion of aggregate market capitalization coming from merger anticipation. For each firm-year, we calculate the probability a firm is acquired in the upcoming year (Prob_Acq). We then sort these observations into deciles by the predicted measure itself. Panel C of Table 14 shows the average probability for each of these deciles. While we do see variation in the probability across deciles, the difference in probabilities from least to most likely targets is quite modest. Even the decile of least-likely targets has an average predicted probability of 2.4% of being acquired in the subsequent year. We conclude that even for the least likely targets, the likelihood of being acquired is high enough for markets to anticipate and embed a meaningful premium, and therefore that our aggregate estimate of trillions of dollars is likely valid.

5.3 Other Robustness Tests

First, we confirm that our findings are robust to numerous alternate tests and specifications. While we direct the interested reader to the Internet Appendix for more details, we briefly summarize these findings. First, in Table IA2, we rerun our analysis calculating our main variables of interest, merger premium (MP) and change in merger premium (Change(MP)), using stock prices the day before the merger announcement, whereas previous tests calculate premiums and changes using the price a week before the merger announcement. The results using these newly calculated premiums are even stronger than when using our week-prior measurements.

Tables IA3 and IA4 show our industry-based tests using Fama-French 12 and TNIC 25 industry definitions. We see the out-of-industry effects of within-industry returns remain strong regardless of industry definitions. Next, we re-run our tests using the value-weighted percentage

of firms acquired as an alternate measure of deal activity. In Table IA5 the independent variable is calculated by taking the aggregate merger premiums in a given time period (day, week or month) and dividing by the total U.S. Stock Market Capitalization at the beginning of the period. Regardless of the frequency, the results are consistent with our earlier findings.

Finally, Table IA6 shows the results of numerous tests confirming that deal activity predicts subsequent activity. For Panel A, we follow Doidge, Karolyi and Stulz (2017) in calculating the percentage of public firms acquired per period. We regress this measure of deal activity on lags of itself at five different frequencies: daily, weekly, monthly, quarterly, and yearly. In each case, we find that current deal activity is significantly related to past deal activity beyond at least the 5% level.

To ensure our findings are robust to other measures of deal activity, Panel B presents results of similar tests using merger premiums, the number of deals (specification 2), and the total dollar value of announced deals (specification 3), each at the quarterly frequency. These alternate measures also have significant but weaker explanatory power in predicting future deal activity. We conclude that across various time periods and measures of deal activity, merger activity is quite persistent, such that the market can rationally infer that current changes are likely to predict future conditions in the M&A market.

6. Conclusion

In this paper, we propose that an economically significant portion of a firm's value is attributable to general merger anticipation. The embedding occurs long before any particular deal rumors or observed spikes in activity in that firm's industry, and is simply a rational reflection of the large expected premium from being acquired at some point in the future. Using historical data fit to a simple model, we estimate that the embedded portion is worth 10% of a firm's value on average, and implies one-quarter of the gain from a merger is missed in a typical event study estimate of the premium. Our findings not only suggest that the M&A literature to date severely understates the gains from a merger, but also show a fairly simple way to adjust observed premiums to account for this embedded portion.

Even if the largest firms are largely immune to takeovers (a result we do not actually observe in our data), conservative estimates still suggest trillions of dollars of U.S. market capitalization comes from rational anticipation of the possibility firms will be acquired in the future. We show substantial evidence of a channel whereby higher deal activity leads to higher

stock prices. The evidence is consistent with the model's intuition that when deal activity rises, the market rationally infers future acquisitions are also more likely, embedding a larger premium into firm values across a wide swath of the market. At the margin, each dollar of new deals is associated with up to a $44 increase in broad market capitalization. We find the result is robust to simultaneously controlling for causation in the other direction, and also across industry and firm size. We note that these findings do not preclude, nor do we suggest, that higher stock prices are not in some way simultaneously leading to increased deal activity. However, the results shown here suggest a much more nuanced view that suggests future works need to more carefully consider the link between deals and stock prices.

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Appendix A – Variable Definitions

Deal frequency

- Premium Percent (1 day/week/month) – *stock price paid by acquirer above stock price 1 day/week/month prior to announcement*
- Premium Value (1 day/week/month) – *premium percent (calculated using stock price 1 day/week/month prior to announcement) multiplied by the target firm market value of equity (MVE)*
- Premium Value (SIC0-9) – *premium value for firms in SIC 1 digit industry in industries 0 - 9*
- Premium Value (acquisitions of 100%) – *premium value paid for acquirers of 100% of target firms*

Daily Frequency

- Percent Premium (EW/VW) – *the equal (value) weighted average percent premium paid by acquirers on day (t) comparing price paid to price 1 week prior to announcement*
- Premium Value (1 day/week/month) – *premium percent (calculated using stock price 1 day/week/month prior) multiplied by the target firm market value of equity (MVE) of all mergers on day (t); abbreviated MP in the tables*
- Premium Value (acquisitions of 100%) – *premium value paid for acquirers of 100% of target firms for all mergers on day (t)*
- Daily Merger Activity – *share price paid by acquirer multiplied by the number of shares purchased for all mergers on day (t)*
- Change(Premium Value) – *aggregate premium values for day (t) less previous day's aggregate premium values (t-1)*
- Mktrf – *daily stock market return minus the risk free rate*
- SMB – *the daily return of a small capitalization portfolio minus the return on a large capitalization portfolio (Fama and French, 1993)*
- HML – *the daily return of a value portfolio minus the return of a growth portfolio (Fama and French, 1993)*
- UMD – *the daily return of a portfolio of winners minus the return of a portfolio of losers (Carhart, 1997)*

Firm Level

- Log(MVE) – *the natural log of market value of equity where the market value of equity is equal to the number of shares outstanding (csho) multiplied by the share price (prcc_f)*
- Log(Cash) – *the natural log of the firm's cash holdings (che)*
- Debt/Assets – *the sum of short (dlc) and long term debt (dltt) scaled by total book assets (at)*
- ROA – *net income (ni) scaled by book assets (at)*
- PP&E/Assets – *plant, property & equipment (ppent) scaled by book assets (at)*
- Tobin's Q - *sum of total assets (at) plus market value of equity (prcc_f * csho) minus book value of equity (ceq) divided by total assets (at)*
- Return – *annual stock return (prcc_f(t)/ajex(t) + dvpsx_f(t)/ajex(t)) / (prcc_f(t-1)/afex(t-1))*
- R&D/Assets – *research & development expenditures (xrd) scaled by book assets (at)*
- Dividend – *the sum of dividends paid to common shares (dvc) and dividends paid to preferred shares (dvp) multiplied by shares outstanding (csho)*
- Repurchases – *the change in shares outstanding (csho) from the previous fiscal year to the current fiscal year multiplied by share price (prcc_f)*

Figure 1
U.S. Aggregate Merger Activity

Figure 1 depicts annual merger activity in the United States. Activity is shown as a percentage of firms acquired, calculated as the number of public firms delisted due to acquisition in a year relative to the total number of public firms listed on one of the three main exchanges at the beginning of that year (both numbers taken from CRSP). The dotted line (DKS) uses merger activity as reported by Doidge, Karolyi and Stulz (2017), while the solid line (BD) reflects our data as described in Section 1.

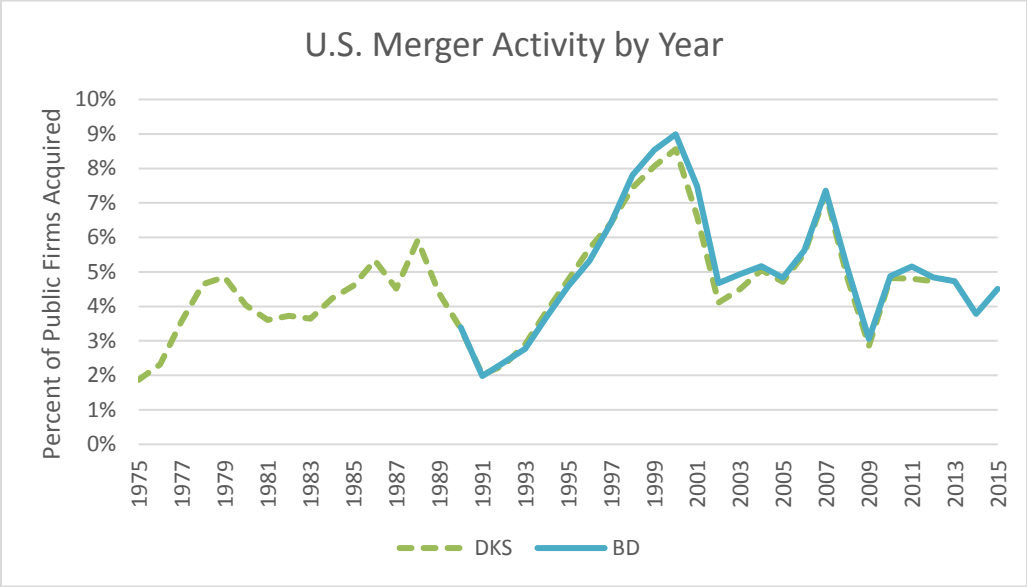

Figure 2
U.S. Aggregate Merger Activity

Figure 2 shows merger premiums (MP)—calculated as offer price less the market value of the target, summed across deals—as a percent of total cash flows to investors in the aggregate market of U.S. public firms on the three main exchanges. Total cash flows to investors include merger premiums (MP) and either just dividends (D) or dividends and repurchases (Re), as represented by the solid and dashed lines respectively.

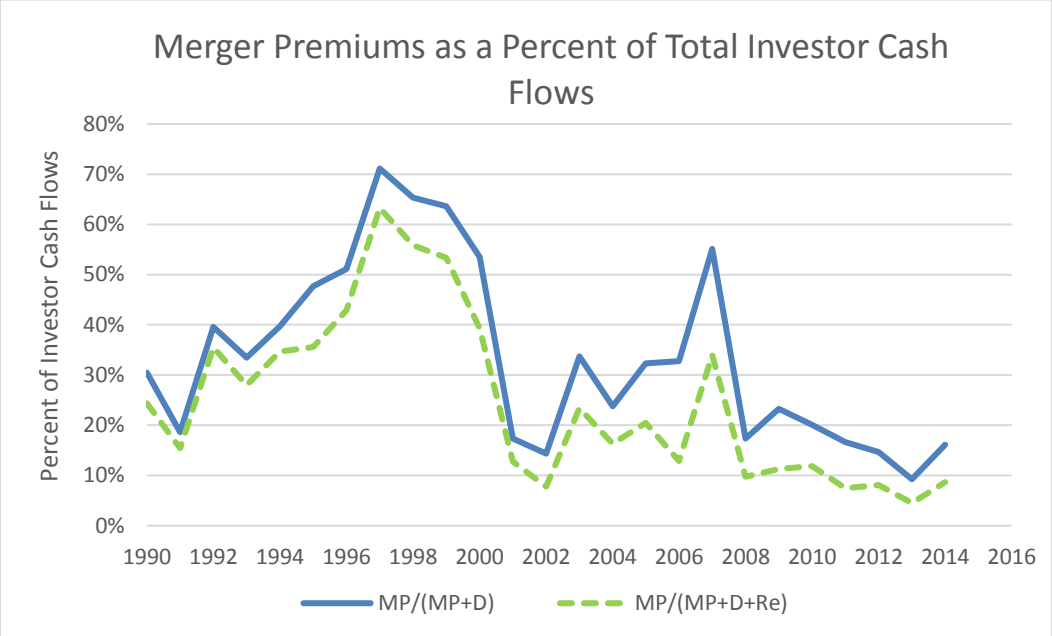

Figure 3
The Fraction of Merger Gain Anticipated by Deal Anticipation

Figure 3 shows the fraction of the merger gain embedded prior to deal announcement due to rational anticipation of the possibility of a deal. The percent of the premium embedded (PPE) is plotted as a function of the annual probability a firm could be acquired as perceived by the market. The plot is for a firm with a discount rate of 8% and dividend growth rate of 2%. As the embedded premium is reported as a percent of the total, the relationship holds across total actual premiums.

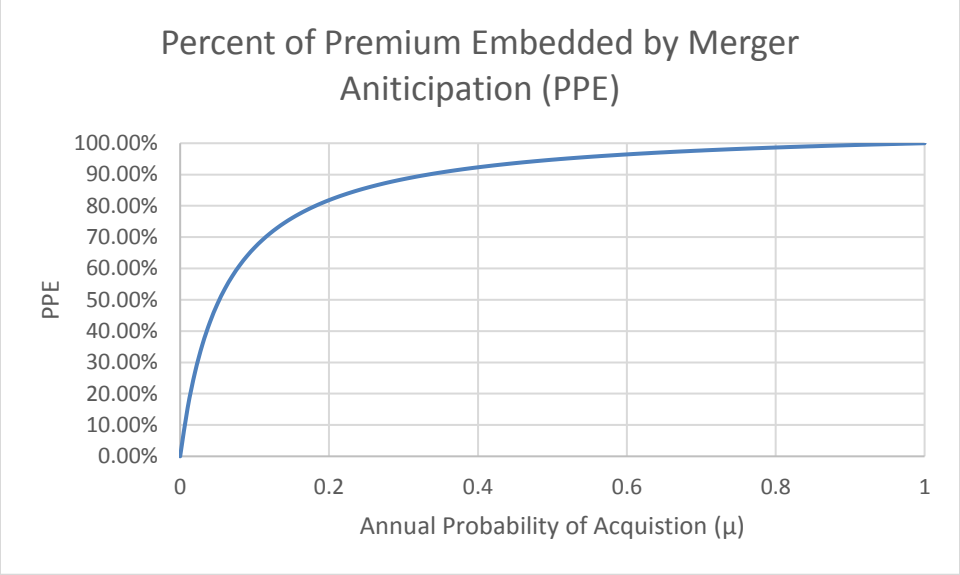

Table 1
Summary Statistics

This table presents summary statistics for our sample of mergers. The sample consists of mergers of U.S. public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. Panel A provides a summary of the data at the deal level, while Panel B reports summary statistics when deals are aggregated into daily activity.

Panel A: Deal frequency

Variable	Mean	SD	p25	p50	p75	N
Deal Premium (1 day prior)	0.324	0.496	0.082	0.228	0.417	5644
Deal Premium (1 week prior)	0.364	0.519	0.104	0.256	0.465	5646
Deal Premium (1 month prior)	0.410	0.534	0.132	0.294	0.528	5628
Target MVE ($M)	239.62	2812.22	37.30	87.90	227.80	5646

Panel B: Daily frequency

Variable	Mean	SD	p25	p50	p75	N
MP ($M)	67.56	1085.09	0.00	2.00	44.94	6510
Ch(MP)	0.16	127.87	-22.58	0.00	24.02	6509
MktRf	0.000	0.011	-0.005	0.001	0.006	6510
Merger MVE	236.85	3063.25	0.00	24.31	201.81	6510
Deals/Day	1.123	1.286	0	1	2	6510

Table 2
Historical Aggregate U.S. Merger Activity

Panel A reports the annual merger activity of U.S. publicly listed firms, both as reported by Doidge, Karolyi and Stulz (2015), denoted here as DKS, and calculated as outlined in Section 1 and denoted here as BD. Activity is reported as a percentage, calculated as the number of public firms delisted due to acquisition in a year relative to the total number of public firms at the beginning of that year. Panel B provides summary statistics regarding aggregate deal activity for each of the samples.

Panel A: Percent of U.S. Public Firms Acquired, By Year

	Percent Firms Acquired			Percent Firms Acquired	
Year	**DKS**	**BD**	**Year**	**DKS**	**BD**
1975	1.87%		1996	5.69%	5.32%
1976	2.32%		1997	6.42%	6.42%
1977	3.57%		1998	7.44%	7.80%
1978	4.65%		1999	8.06%	8.53%
1979	4.85%		2000	8.56%	8.99%
1980	4.03%		2001	6.61%	7.49%
1981	3.61%		2002	4.11%	4.67%
1982	3.73%		2003	4.50%	4.93%
1983	3.64%		2004	5.05%	5.17%
1984	4.23%		2005	4.71%	4.83%
1985	4.60%		2006	5.53%	5.62%
1986	5.33%		2007	7.27%	7.36%
1987	4.52%		2008	4.81%	5.10%
1988	5.92%		2009	2.86%	3.06%
1989	4.38%		2010	4.82%	4.88%
1990	3.35%	3.39%	2011	4.80%	5.16%
1991	2.02%	1.98%	2012	4.73%	4.84%
1992	2.29%	2.37%	2013		4.73%
1993	2.90%	2.77%	2014		3.78%
1994	3.87%	3.70%	2015		4.51%
1995	4.77%	4.58%			

Panel B: Summary Statistics, Annual Percent of U.S. Public Firms Acquired

	Mean	**SD**	**P25**	**P50**	**P75**
Full Samples					
DKS (1975-2012)	4.64%	1.58%	3.66%	4.63%	5.26%
BD (1990-2015)	5.08%	1.81%	3.96%	4.86%	5.55%
Matched Samples					
DKS (1990-2012)	5.01%	1.81%	3.87%	4.80%	6.42%
BD (1990-2012)	5.17%	1.90%	3.70%	4.93%	6.42%

Table 3
Aggregate U.S. Deal Premiums

This table reports annual cash flows from merger premiums, dividends and repurchases. Total merger premiums are measured as the target valuation at the offer price less its pre-offer valuation summed across all U.S. publicly listed firms acquired (column 2). Dividends and repurchases (also in dollars) are measured as described in the appendix. For each year, each is reported first in millions of dollars and also as a percent of beginning of the year aggregate U.S. stock market capitalization. The final column reports the value of merger premiums as the percentage of the sum of merger premiums, dividends and repurchases.

	Merger Premiums		Dividends		Repurchases		Premiums
Year	($M)	(% Mkt)	($M)	(% Mkt)	($M)	(% Mkt)	(% of total)
1990	44,574	1.59%	101,796	3.62%	36,778	1.31%	24.34%
1991	23,480	0.82%	102,572	3.56%	26,211	0.91%	15.42%
1992	71,297	1.93%	108,959	2.94%	20,478	0.55%	35.52%
1993	57,960	1.39%	115,183	2.77%	33,939	0.82%	27.99%
1994	78,139	1.62%	118,678	2.46%	28,557	0.59%	34.67%
1995	124,352	2.63%	136,457	2.89%	89,025	1.89%	35.55%
1996	148,609	2.29%	141,986	2.19%	55,727	0.86%	42.91%
1997	358,807	4.42%	145,700	1.80%	62,471	0.77%	63.28%
1998	296,651	2.94%	157,272	1.56%	77,652	0.77%	55.81%
1999	280,707	2.19%	160,672	1.26%	85,134	0.67%	53.31%
2000	187,240	1.24%	162,658	1.08%	125,968	0.83%	39.35%
2001	35,230	0.24%	167,931	1.13%	72,478	0.49%	12.78%
2002	28,228	0.23%	168,150	1.35%	164,958	1.32%	7.81%
2003	91,007	0.95%	178,823	1.86%	118,873	1.24%	23.41%
2004	66,843	0.51%	214,368	1.64%	128,857	0.98%	16.30%
2005	137,638	0.99%	287,844	2.07%	246,053	1.77%	20.50%
2006	144,134	0.95%	296,172	1.95%	677,656	4.46%	12.89%
2007	389,532	2.33%	317,049	1.90%	439,161	2.63%	34.00%
2008	61,817	0.40%	294,356	1.91%	278,546	1.81%	9.74%
2009	86,099	0.94%	283,684	3.10%	393,731	4.31%	11.28%
2010	72,584	0.60%	288,533	2.38%	250,025	2.07%	11.88%
2011	62,468	0.42%	312,919	2.11%	458,899	3.10%	7.49%
2012	64,365	0.44%	373,715	2.54%	356,943	2.43%	8.10%
2013	41,250	0.25%	404,939	2.44%	467,962	2.82%	4.51%
2014	84,480	0.42%	439,986	2.21%	448,214	2.25%	8.69%
2015	312,000	1.20%	486,232	1.87%	483,240	1.86%	8.69%
Avg	128,827	1.31%	229,486	2.17%	216,444	1.67%	24.01%

Table 4
Estimates of the Embedded Merger Premium

This table shows the effects of general merger anticipation on stock prices. Panel A reports the estimated "embedded merger premium" (EMP) and the "percent of premium embedded" (PPE) prior to deal announcement for a mix of parameter values. The EMP is reported as a percent over standalone values absent a chance of being acquired, while the PPE is the fraction of the total merger gain embedded prior to the announcement of an actual deal. Panel B estimates the impact of changes to annual deal likelihood on observed stock prices, assuming changers are permanent or follow AR(1) or AR(2) processes respectively.

Panel A: Embedded Merger Premium (EMP) and Percent of Premium Embedded (PPE)

Probability Acquired	Discount Rate	Dividend Growth Rate	EMP			PPE
			Deal Premium over Standalone Value			
(μ)	(r)	(g)	20%	40%	60%	
3.54%	8%	2%	7.96%	15.91%	23.87%	39.78%
		3%	8.84%	17.69%	26.53%	44.22%
	10%	2%	6.71%	13.42%	20.12%	33.53%
		3%	7.32%	14.63%	21.95%	36.58%
5.08%	8%	2%	9.81%	19.63%	29.44%	49.05%
		3%	10.72%	21.44%	32.17%	53.60%
	10%	2%	8.48%	16.96%	25.44%	42.40%
		3%	9.14%	18.27%	27.41%	45.70%

Panel B: Change in Embedded Merger Premium Resulting from Merger Activity Changes

Change in Merger Activity		(1)	(2)	(3)
			Fitted	Fitted
From:	To:	Permanent	AR(1)	AR(2)
-1σ	Average	4.82%		
Average	+1σ	3.25%	1.45%	1.38%
-1σ	+1σ	8.07%		
-2σ	Average	12.69%		
Average	+2σ	5.59%	2.78%	2.68%
-2σ	+2σ	18.29%		

Table 5
Time Series Regressions of Merger Activity

This table shows time-series regressions of merger activity on lagged observations of merger activity. In the first two columns merger activity is defined as the number of public firms acquired in a given year divided by the number of public firms at the beginning of that year, as reported by CRSP. Columns 3 and 4 use firm-level probabilities a firm is acquired in the upcoming year based on observable characteristics, adapting the methodology of Cremers, Nair and John (2009) as described in the paper. T-statistics based on Newey-West standard errors are reported in brackets. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

VARIABLES	(1) % Firms Acq(t)	(2) % Firms Acq(t)	(3) Prob Firm Acq(t)	(4) Prob Firm Acq(t)
% Firms Acq(t-1)	0.759***	0.976***		
	[5.050]	[4.438]		
% Firms Acq(t-2)		-0.334**		
		[-2.211]		
Prob Firm Acq(t-1)			0.583***	0.585***
			[161.807]	[107.695]
Prob Firm Acq(t-2)				-0.063***
				[-13.724]
Firm FE	N	N	Y	Y
Observations	25	24	75,550	67,376
R-squared	0.594	0.641	0.622	0.608

Table 6
Determinants of Takeover Probability

This table presents estimates of logistic regressions of takeover on firm characteristics. The dependent variable is equal to one if the company is the target of an acquisition (friendly, hostile or neutral) in a given year. Each specification includes year fixed effects. Following Cremers, Nair and John (2009) all independent variables are industry-adjusted. T-statistics are reported in parentheses using robust standard errors (clustered at the industry level). Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Prob_Acq	Prob_Acq	Prob_Acq	Prob_Acq	Prob_Acq	Prob_Acq
Sample	1990-2013	1990-2003	2004-2015	All	All	All
Tobins Q	0.000	-0.001	0.000**	-0.000	0.000	-0.000
	[1.391]	[-1.608]	[2.048]	[-0.419]	[0.781]	[-0.541]
PP&E/Assets	0.016**	0.003	0.023**	0.037**	0.021**	0.041**
	[1.961]	[0.229]	[2.273]	[2.087]	[2.082]	[2.030]
Log(Cash)	0.002	0.001	0.006	0.009	0.035***	0.025
	[0.306]	[0.065]	[0.629]	[0.619]	[3.807]	[1.557]
Log(MVE)	-0.025***	-0.020**	-0.027***	-0.090***	-0.090***	-0.105***
	[-3.874]	[-2.505]	[-2.762]	[-5.370]	[-9.616]	[-5.518]
% Takeovers Same Ind(t-1)	3.898***	4.352***	3.356***	2.326*	3.947***	1.980
	[7.661]	[6.413]	[4.095]	[1.938]	[5.269]	[1.515]
Debt/Assets	-0.037***	-0.016	-0.045***	-0.043***	-0.039***	-0.044***
	[-5.952]	[-1.421]	[-6.023]	[-3.651]	[-5.256]	[-3.626]
ROA	-0.000	-0.006	0.000	0.004	0.002	0.005
	[-0.039]	[-1.337]	[0.180]	[1.096]	[0.806]	[1.387]
E-index				0.036**		0.039**
				[2.430]		[2.405]
Blockholder					0.281***	0.208**
					[8.054]	[2.031]
Observations	90,537	55,818	41,597	20,383	43,713	18,073
R-squared	0.03297	0.0374	0.0213	0.0441	0.0268	0.0417

Table 7
The Effect of Merger Anticipation on Deal Premiums

This table presents the results of OLS regressions of merger premiums on a measure of the market's expectation a firm will be acquired in the upcoming year (Prob_Acq) and other variables cited by previous papers as affecting deal premiums. Variable definitions can be found in the Appendix. All regressions include industry and year fixed effects. T-statistics are reported in parentheses. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Premium	Premium	Premium	Premium	Premium	Premium	Premium	Premium
				Bottom 33%	Middle 33%	Top 33%	Bottom 50%	Top 50%
Prob_Acq	-1.401***		-3.557***	-7.672***	-0.959	-0.177	-5.325***	-0.664
	[-4.437]		[-3.258]	[-4.143]	[-0.931]	[-0.331]	[-4.609]	[-1.534]
Prob_Acq^2		-9.819***	19.174**					
		[-3.648]	[2.062]					
Log(Assets)	0.059***	0.060***	0.059***	0.054***	0.059***	0.058***	0.057***	0.056***
	[34.463]	[35.496]	[33.819]	[13.742]	[18.884]	[21.464]	[18.445]	[24.455]
ROA	0.073***	0.074***	0.073***	0.053***	0.074***	0.098***	0.055***	0.099***
	[7.186]	[7.216]	[7.158]	[3.604]	[3.436]	[4.930]	[4.065]	[5.968]
Cash/Assets	0.002	0.002	0.002	0.002	-0.042*	-0.007	-0.012	0.000
	[0.134]	[0.135]	[0.141]	[0.076]	[-1.673]	[-0.296]	[-0.608]	[0.024]
Debt/Assets	-0.094***	-0.095***	-0.093***	-0.088***	-0.100***	-0.095***	-0.094***	-0.090***
	[-8.348]	[-8.413]	[-8.309]	[-3.783]	[-4.813]	[-4.720]	[-4.830]	[-5.691]
PP&E/Assets	0.058***	0.059***	0.057***	0.081***	0.067**	0.064***	0.066**	0.063***
	[3.615]	[3.694]	[3.561]	[2.721]	[2.341]	[2.619]	[2.505]	[3.002]
Tobins Q	0.026***	0.027***	0.025***	0.013***	0.043***	0.047***	0.015***	0.046***
	[16.890]	[18.263]	[15.743]	[3.417]	[10.707]	[10.888]	[4.393]	[14.649]
Return	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.002	-0.004***	-0.002**
	[-5.488]	[-5.486]	[-5.489]	[-3.504]	[-2.949]	[-1.348]	[-4.274]	[-2.323]
R&D/Assets	-0.032	-0.030	-0.033	-0.042	-0.028	-0.001	-0.035	-0.034
	[-1.119]	[-1.067]	[-1.149]	[-0.840]	[-0.540]	[-0.013]	[-0.840]	[-0.847]
Ind FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3,331	3,331	3,331	1,111	1,110	1,110	1,666	1,665
R-squared	0.477	0.476	0.478	0.530	0.534	0.541	0.500	0.524

Table 8
Deal-Level Estimations of the Effect of Merger Anticipation

This table summarizes key parameter values and results for an estimation of the embedded merger premium (EMP), for deals completed between January 1, 2014 and December 31st, 2015. The probability a firm is acquired (Prob_Acq) is estimated using the sample from 1990 through 2013 and firm characteristics, as reported in Table 6. Deal premiums are estimated in similar fashion as reported in Table 7. The embedded merger premium (EMP) And percent of premium embedded (PPE) come from an estimation of the general model described in Section 2, with the estimation process described in detail in Section 3.1.

	Mean	SD	Min	P25	P50	P75	Max
Prob_Acq (%)	3.06	0.80	1.64	2.35	3.10	3.68	4.88
Premium (Predicted, %)	37.01	4.39	27.63	34.26	36.64	39.86	52.49
Premium (Actual,%)	37.99	25.59	1.67	21.51	30.64	47.87	146.34
Embedded Merger Premium (%)	10.06	2.34	4.99	8.56	9.53	11.03	18.69
Percent of Premium Embedded	26.13	13.54	6.08	16.96	23.04	30.89	80.48

Table 9
Merger Premiums and Market Returns

This table presents estimates of OLS regressions of the market return less the risk free rate (Mkt Return) on aggregate merger premiums (MP), and the change in aggregate premiums (Change(MP)). Columns 3 and 4 add the HML, SMB, UMD asset pricing factors as controls. Specifications 5 and 6 also include the CNJ Factor from Cremers, Nair and John (2009) and are discussed in Section 5.1. Merger premium and change in merger premium are calculated using stock price 1 week before merger announcement. The sample consists of all mergers of all US public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. All regressions include day of the week, month and year fixed effects T-statistics are reported in parentheses using robust standard errors (clustered at the year level).Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Mkt Ret	Mkt Ret	Mkt Ret	Mkt Ret	Mkt Ret	Mkt Ret
MP(t)	0.416***		0.331***		0.276***	
	[10.220]		[3.314]		[3.334]	
MP(t-1)	0.359***		0.221**		0.178*	
	[7.530]		[2.085]		[1.937]	
MP(t-2)	0.056		-0.139		-0.110	
	[0.347]		[-1.147]		[-1.215]	
MP(t-3)	0.157**		-0.002		-0.028	
	[2.651]		[-0.009]		[-0.198]	
Change(MP(t))		0.411***		0.379***		0.326***
		[8.755]		[3.913]		[4.361]
Change(MP(t-1))		0.755***		0.642***		0.551***
		[7.318]		[3.999]		[4.187]
Change(MP(t-2))		0.797***		0.545***		0.487***
		[4.629]		[3.059]		[3.392]
Change(MP(t-3))		0.940***		0.588**		0.508**
		[5.576]		[2.149]		[2.305]
Change(MP(t-4))		0.366*		0.113		0.087
		[2.053]		[0.402]		[0.358]
Change(MP(t-5))		0.469***		0.272		0.230
		[4.944]		[1.481]		[1.562]
Change(MP(t-6))		0.312***		0.165		0.143
		[3.134]		[1.420]		[1.206]
CNJ Factor					0.205**	0.207**
					[2.301]	[2.355]
SMB			0.018	0.016	0.114	0.114
			[0.103]	[0.094]	[0.576]	[0.573]
HML			-0.465*	-0.469*	-0.258	-0.262
			[-1.855]	[-1.871]	[-1.122]	[-1.139]
UMD			-0.382**	-0.377**	-0.398**	-0.392**
			[-2.358]	[-2.352]	[-2.630]	[-2.622]
Observations	6,507	6,503	6,507	6,503	6,005	6,005
R-squared	0.008	0.012	0.110	0.113	0.125	0.128

Table 10
Causation between Merger Activity and Stock Returns

This table presents estimates of OLS and vector regressions of aggregate merger premiums (MP) and the market return less the risk free rate (Mkt Return) on lags of the same and the SMB, HML and UMD pricing factors. Merger Premium (MP) and Change(MP) are calculated using stock prices 1 week before merger announcement. The sample consists of all acquisitions of U.S. public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. All regressions include day of the week, month and year fixed effects. T-statistics are reported in parentheses: in Panel A based on robust standard errors (clustered at the year level), and in Panel B based on Newey-West standard errors. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: OLS Regression

VARIABLES	(1) MP(t)	(2) Mkt Return(t)	(3) Change(MP(t))	(4) Mkt Return(t)
MP(t-1 to t-3)	-0.005	0.053		
	[-0.904]	[0.457]		
Change(MP(t-1 to t-3))			-0.502***	0.367**
			[-127.253]	[2.208]
Mkt Return(t-1 to t-3)	0.000	-0.034**	-0.002	-0.033**
	[0.220]	[-2.216]	[-1.625]	[-2.183]
3 Pricing Factors	Y	Y	Y	Y
Observations	6,507	6,507	6,506	6,506
R-squared	0.012	0.112	0.259	0.114

Panel B: Vector Autoregression

VARIABLES	(1) MP(t)	(2) Mkt Return(t)	(3) Change(MP(t))	(4) Mkt Return(t)
MP(t-1)	-0.004	0.257***		
	[-0.964]	[4.574]		
MP(t-2)	-0.005	-0.103		
	[-1.261]	[-0.922]		
MP(t-3)	-0.006	0.016		
	[-1.188]	[0.179]		
Change(MP(t-1))			-0.750***	0.340***
			[-4.776]	[4.038]
Change(MP(t-2))			-0.500**	0.318*
			[-2.425]	[1.922]
Change(MP(t-3))			-0.251	0.418*
			[-1.589]	[1.870]
Mkt Return(t-1)	0.004	-0.046**	0.002	-0.046**
	[1.454]	[-2.327]	[0.584]	[-2.324]
Mkt Return(t-2)	-0.002	-0.043*	-0.005*	-0.043*
	[-1.086]	[-1.677]	[-1.785]	[-1.702]
Mkt Return(t-3)	-0.002	-0.011	-0.004*	-0.010
	[-0.808]	[-0.546]	[-1.821]	[-0.488]
3 Pricing Factors	Y	Y	Y	Y
Observations	6,507	6,507	6,506	6,506

Table 11
Are Merger Activity and Stock Prices Linked by Changes to Expected Future Cash Flows?

This table reports the results of OLS regressions of various measures of aggregate corporate profitability on lagged measures of merger activity. Data is aggregated at the quarterly level. Specifications 1 through 7 use mergers premiums, defined as the value paid less market value one week prior to deal announcement summed across all deals. Specifications 8 through 14 use merger value, which is the total value paid in all acquisitions summed across all deals within a quarter. T-statistics are reported in parentheses using robust standard errors (clustered at the year level). Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

VARIABLES	(1) Avg ROA(t)	(2) Avg ROE(t)	(3) Avg Cashflow(t)	(4) Avg CF/Assets(t)	(5) Total(Net Income(t))	(6) Total(Oper Income(t))	(7) Total(Cashflow(t))
Merger Premium(t-1)	4.478	-43.001	152.789	16.602	-261,728.786	-2,883,320.498	658,153.456
	[0.272]	[-0.104]	[0.186]	[0.135]	[-0.130]	[-0.849]	[0.094]
Mkt Ret(t-1)	0.974	-35.525	1.553	6.607	534,452.724**	-37,440.580	-36,795.931
	[0.481]	[-0.702]	[0.015]	[0.438]	[2.168]	[-0.090]	[-0.043]
Observations	103	103	103	103	103	103	103
R-squared	0.002	0.005	0.000	0.002	0.052	0.007	0.000

VARIABLES	(8) Avg ROA(t)	(9) Avg ROE(t)	(10) Avg Cashflow(t)	(11) Avg CF/Assets(t)	(12) Total(Net Income(t))	(13) Total(Oper Income(t))	(14) Total(Cashflow(t))
Merger Value(t-1)	0.000	0.002**	-0.005***	-0.000	-3.282	-7.783	-36.026***
	[0.388]	[2.501]	[-3.712]	[-0.017]	[-0.938]	[-1.316]	[-3.068]
Mkt Ret(t-1)	0.698	-49.904	41.590	6.000	574,622.008**	145,108.530	267,961.275
	[0.360]	[-1.060]	[0.458]	[0.415]	[2.443]	[0.365]	[0.339]
Observations	103	103	103	103	103	103	103
R-squared	0.003	0.064	0.121	0.002	0.060	0.017	0.086

Table 12
The Cross-Industry Spillover Effects of Merger News on Stock Returns

This table presents estimates of OLS regressions of industry returns on aggregate industry-level merger premiums (MP), split by both returns within and outside a given industry. Industry classification is at the 1-digit SIC level. Merger premiums and changes in merger premiums are calculated using stock prices 1 week before merger announcement. The sample consists of all acquisitions of U.S. public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. All regressions include day of the week, month and year fixed effects, and the HML, SMB and UMD pricing factors. T-statistics are reported in parentheses using robust standard errors (clustered at the year level). Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Ind Ret (IN)	Ind Ret (OUT)	Ind Ret (IN)	Ind Ret (OUT)	Ind Ret (IN)	Ind Ret (OUT)	Ind Ret (IN)	Ind Ret (OUT)
MP-IN(t)	0.378***	0.290***			0.330***	0.236***		
	[4.986]	[4.208]			[4.388]	[3.299]		
MP-IN(t-1 to t-3)	0.152	0.292***			0.170*	0.306***		
	[1.693]	[4.979]			[1.845]	[4.798]		
MP-OUT(t)	0.290***	0.300***			0.236***	0.246***		
	[4.207]	[4.312]			[3.299]	[3.433]		
MP-OUT(t-1 to t-3)	0.291***	0.276***			0.306***	0.291***		
	[4.971]	[4.542]			[4.795]	[4.434]		
Ch(MP-IN(t))			0.322**	0.223			0.288*	0.197
			[2.307]	[1.440]			[2.028]	[1.280]
Ch(MP-IN(t-1 to t-3))			0.486**	0.520***			0.458**	0.494***
			[2.358]	[4.529]			[2.411]	[4.784]
Ch(MP-OUT(t))			0.223	0.234			0.197	0.208
			[1.440]	[1.528]			[1.281]	[1.358]
Ch(MP-OUT(t-1 to t-3))			0.521***	0.517***			0.495***	0.491***
			[4.520]	[4.161]			[4.777]	[4.391]
CNJ Factor					0.053	0.053	0.051	0.051
					[0.514]	[0.514]	[0.490]	[0.490]
Observations	62,510	62,550	62,500	62,540	60,010	60,050	60,010	60,050
R-squared	0.113	0.218	0.113	0.219	0.118	0.226	0.118	0.227

Table 13
Deal Activity, Merger Premium, and CNJ Factor (Daily Frequency)

This table presents estimates of OLS regressions of different measures of merger activity (aggregate merger value, mergers per day and the percent of firms acquired per day) on the CNJ factor (discussed in section III.D), aggregate merger premiums (MP), the change in aggregate premiums and lags of the same. Merger premium is calculated using stock price 1 week before merger announcement. The sample consists of all mergers of all US public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. All regressions include day of the week, month and year fixed effects. T-statistics are reported in parentheses using robust standard errors (clustered at the year level). Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Merger Value(t)	Deals/Day(t)	% Firms Acq(t)	Merger Value(t)	Deals/Day(t)	% Firms Acq(t)
CNJ Factor(t)	333.344	-0.562	-0.000	336.243	-0.555	-0.000
	[0.986]	[-0.253]	[-0.508]	[1.005]	[-0.251]	[-0.507]
CNJ Factor(t-1)	-586.733	-0.194	-0.000	-578.063	-0.128	-0.000
	[-1.210]	[-0.064]	[-0.131]	[-1.203]	[-0.042]	[-0.108]
MP(t)				12,108.737*	92.926*	0.014*
				[1.746]	[1.913]	[2.068]
MP(t-1)				-1,048.803	6.303**	0.001**
				[-0.924]	[2.504]	[2.375]
Observations	6,003	6,003	6,003	6,003	6,003	6,003
R-squared	0.135	0.318	0.193	0.136	0.321	0.198

	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Ch(Merger Value(t))	Ch(Deals/Day(t))	Ch(% Firms Acq(t))	Ch(Merger Value(t))	Ch(Deals/Day(t))	Ch(% Firms Acq(t))
CNJ Factor(t)	-877.639*	0.223	0.000	-865.726*	0.308	0.000
	[-1.934]	[0.060]	[0.123]	[-1.916]	[0.080]	[0.142]
CNJ Factor(t-1)	-919.002	-3.583	-0.000	-911.915	-3.533	-0.000
	[-0.985]	[-0.710]	[-0.616]	[-0.985]	[-0.697]	[-0.597]
Change(MP(t))				14,337.578**	99.919***	0.015***
				[2.721]	[2.937]	[3.256]
Change(MP(t-1))				1,481.193	11.429	0.002
				[0.422]	[0.374]	[0.372]
Observations	6,002	6,002	6,002	6,002	6,002	6,002
R-squared	0.031	0.049	0.051	0.033	0.055	0.058

Table 14: Takeover Likelihood and Firm Size

This table presents probabilities of being acquired broken out by size decile (Panel A), size percentile within the largest decile of firms (Panel B) or probability of being acquired decile (Panel C). Acquisition probabilities (Prob_Acq) are calculated using the methodology from Cremers, Nair and John (2009). Prob_Acq predicts the likelihood a firm will be acquired in the upcoming year based on a variety of ex ante observable characteristics, and is discussed in greater detail in Section 3.1. The sample consists of all US public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015.

Panel A: Probabilities by Size Decile

Size Decile	Predicted Probability	Actual Probability
1	0.042	0.022
2	0.040	0.041
3	0.039	0.046
4	0.038	0.046
5	0.037	0.040
6	0.035	0.039
7	0.034	0.036
8	0.033	0.034
9	0.032	0.031
10	0.030	0.018

Panel B: Probabilities within Largest Decile

Size Percentile	Predicted Probability	Actual Probability
90	0.032	0.024
91	0.031	0.028
92	0.031	0.018
93	0.031	0.018
94	0.030	0.015
95	0.030	0.019
96	0.030	0.016
97	0.030	0.023
98	0.029	0.020
99	0.029	0.019

Panel C: Probabilities by Decile

Probability Decile	Predicted Probability	Actual Probability
1	0.024	0.023
2	0.029	0.026
3	0.032	0.029
4	0.033	0.030
5	0.035	0.034
6	0.036	0.038
7	0.038	0.044
8	0.039	0.043
9	0.041	0.046
10	0.046	0.041

Table IA1
The Effects of Merger Anticipation on Target Stock Price and Offer Price

This table presents the results of OLS regressions of several firm and merger deal valuation ratios on a measure of the market's expectation a firm will be acquired in the upcoming year (Prob_Acq) and other variables cited by previous papers as affecting valuations. Columns 1 and 2 show that Prob_Acq does not appear to affect the price a bidder pays, while column 3 shows evidence is does affect the target firm's price prior to the offer. Variable definitions can be found in the Appendix. All regressions include industry and year fixed effects. T-statistics are reported in parentheses. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level. T-statistics are reported in parentheses using robust standard errors (clustered at the year level).Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

VARIABLES	(1) Deal Value / Net Income	(2) Deal Value / EBITDA	(3) Market-Book
Prob_CNJ	-0.317	0.270	0.400***
	[-0.604]	[0.480]	[4.616]
Log(MVE)	0.001	0.004	-0.000
	[0.313]	[1.381]	[-0.285]
Cash/Assets	0.013	-0.013	0.000
	[0.504]	[-0.504]	[0.032]
Debt/Assets	0.038**	0.015	-0.016***
	[1.969]	[0.720]	[-6.077]
Tobins Q	-0.001	-0.002	0.008***
	[-0.244]	[-0.586]	[42.422]
Return	-0.001	-0.001	0.000***
	[-0.444]	[-0.877]	[2.611]
Observations	3,332	3,315	91,496
R-squared	0.043	0.014	0.025

Table IA2
Merger Premiums and Market Returns

This table presents estimates of OLS regressions of the market return less the risk free rate (Mkt Return) on aggregate merger premiums (MP), the change in aggregate premiums (Change (MP)), and the HML, SMB and UMD pricing factors. Daily premium and change in daily premium are calculated using stock prices 1 day before merger announcement. The sample consists of all mergers of all US public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. All regressions include day of the week, month and year fixed effects. T-statistics are reported in parentheses using robust standard errors (clustered at the year level).Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
VARIABLES	Mkt Return	Mkt Return	Mkt Return	Mkt Return
MP(t)	0.222***		0.162***	
	[3.236]		[2.984]	
MP(t-1 to t-3)	0.063		0.042	
	[1.505]		[1.251]	
Change(MP(t))		0.243***		0.206***
		[5.007]		[4.957]
Change(MP(t-1 to t-3))		0.333***		0.281***
		[5.150]		[5.446]
CNJ Factor			0.203**	0.201**
			[2.283]	[2.263]
SMB	0.020	0.016	0.120	0.116
	[0.120]	[0.095]	[0.611]	[0.580]
HML	-0.468*	-0.478*	-0.264	-0.275
	[-1.873]	[-1.932]	[-1.139]	[-1.196]
UMD	-0.369**	-0.365**	-0.386**	-0.381**
	[-2.302]	[-2.319]	[-2.568]	[-2.582]
Observations	6,507	6,506	6,005	6,005
R-squared	0.112	0.120	0.125	0.132

Table IA3
The Spillover Effects of Merger News on Stock Returns

Panel A presents estimates of OLS regressions of industry returns on aggregate industry-level merger premiums (MP) and the HML, SMB and UMD pricing factors. Industry differentiation is calculated using the Fama-French 12 Industry classification definitions. Panel B presents estimates of OLS regressions of market returns on other market returns, where *other* markets are the two markets other than the dependent variable market. Merger premiums and changes in merger premiums are calculated using stock price 1 week before merger announcement. The sample consists of all mergers of US public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. All regressions include day of the week, month, year fixed effects. T-statistics are reported in parentheses using robust standard errors (clustered at the year level). Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
VARIABLES	Industry Return	Other Industry Return	Industry Return	Other Industry Return
MP-IN(t)	0.249***	0.351***		
	[3.535]	[4.427]		
MP-IN(t-1 to t-3)	0.081	0.243***		
	[0.894]	[3.054]		
MP-OUT(t)	0.351***	0.342***		
	[4.427]	[4.443]		
MP-OUT(t-1 to t-3)	0.243***	0.229***		
	[3.054]	[2.861]		
Ch(MP-IN(t))			0.196*	0.250
			[1.788]	[1.212]
Ch(MP-IN(t-1 to t-3))			0.331**	0.494**
			[2.449]	[2.556]
Ch(MP-OUT(t))			0.250	0.245
			[1.212]	[1.243]
Ch(MP-OUT(t-1 to t-3))			0.494**	0.479**
			[2.556]	[2.555]
3 Pricing Factors	Y	Y	Y	Y
Observations	75,060	75,060	75,048	75,048
R-squared	0.175	0.216	0.176	0.217

Table IA4
The Spillover Effects of Merger News on Stock Returns

Panel A presents estimates of OLS regressions of industry returns on aggregate industry-level merger premiums (MP) and the HML, SMB and UMD pricing factors. Industry differentiation is calculated using the Hoberg-Phillips TNIC 25 Industry classification definitions. Panel B presents estimates of OLS regressions of market returns on other market returns, where *other* markets are the two markets other than the dependent variable market. Merger premiums and changes in merger premiums are calculated using stock price 1 week before merger announcement. The sample consists of all mergers of US public firms traded on NYSE, NASDAQ, and AMEX from 1996-2013. Variable definitions can be found in the Appendix. All regressions include day of the week, month, year fixed effects. T-statistics are reported in parentheses using robust standard errors (clustered at the year level).Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)
VARIABLES	Industry Return	Other Industry Return	Industry Return	Other Industry Return
MP-IN(t)	0.240***	0.334***		
	[2.976]	[4.295]		
MP-IN(t-1 to t-3)	-0.039	0.151*		
	[-0.458]	[1.751]		
MP-OUT(t)	0.324***	0.319***		
	[4.176]	[4.033]		
MP-OUT(t-1 to t-3)	0.160	0.155		
	[1.745]	[1.670]		
Ch(MP-IN(t))			0.242**	0.251
			[2.322]	[1.339]
Ch(MP-IN(t-1 to t-3))			0.386**	0.465**
			[2.199]	[2.207]
Ch(MP-OUT(t))			0.248	0.248
			[1.390]	[1.415]
Ch(MP-OUT(t-1 to t-3))			0.450**	0.447**
			[2.338]	[2.338]
3 Pricing Factors	Y	Y	Y	Y
Observations	89,880	89,880	89,855	89,855
R-squared	0.243	0.309	0.244	0.310

Table IA5
Premiums Scaled by US Market Cap

This table presents estimates of OLS regressions of the market return (Mkt Return) on aggregate merger premiums (MP) scaled by aggregate US market capitalization, and the HML, SMB, UMD pricing factors. Merger premium (MP) and change in merger premiums are calculated using stock price 1 week before merger announcement. The sample consists of all mergers of all US public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Variable definitions can be found in the Appendix. T-statistics are reported in parentheses using robust standard errors (clustered at the year level).Each specification includes year fixed effects. Specification 1 also includes day of the week and month fixed effects. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)
VARIABLES	Mkt Return	Mkt Return	Mkt Return
Frequency	Day	Week	Month
MP/US Mkt Cap(t)	0.040***	0.059***	0.0354*
	[3.108]	[10.203]	[1.944]
MP/US Mkt Cap(t-1)	0.026**	-0.031	
	[2.144]	[-1.026]	
MP/US Mkt Cap(t-2)	-0.015	-0.034	
	[-0.973]	[-0.463]	
SMB	0.018	0.304*	0.262*
	[0.105]	[1.756]	[1.897]
HML	-0.465*	-0.350	-0.292
	[-1.857]	[-1.445]	[-1.562]
UMD	-0.382**	-0.253**	-0.237***
	[-2.372]	[-2.166]	[-4.031]
Observations	6,508	1,342	309
R-squared	0.110	0.129	0.268

Table IA6
Deal Activity and Past Deal Activity

Panel A presents estimates of OLS regressions of aggregate merger premiums (MP) and the change in aggregate premiums on lags of the same at different frequencies. Panel B presents other proxies of merger activity regressed on lags of themselves at the quarterly frequency. Proxies include: merger premium, aggregate merger value and merger announcements per quarter. Merger premium is calculated using stock price 1 week before merger announcement. The sample consists of all acquisitions of U.S. public firms traded on NYSE, NASDAQ, and AMEX from 1990-2015. Specification 1 (Panel A) includes day of the week, month and year fixed effects while specifications 2-4 (Panel A) and both specifications in Panel B include year fixed effects. Variable definitions can be found in the Appendix. All regressions include year fixed effects. T-statistics based on Newey-West standard errors are reported in brackets. Asterisks indicate statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: Percent of Firms Acquired

	(1)	(2)	(3)	(4)	(5)
VARIABLES	% Firms Acq(t) Day	% Firms Acq(t) Week	% Firms Acq(t) Month	% Firms Acq(t) Qtr	% Firms Acq(t) Year
% Firms Acq(t-1)	0.098***	0.247***	0.165**	0.700***	1.090***
	[6.699]	[8.040]	[2.429]	[7.053]	[5.319]
% Firms Acq(t-2)	0.001	0.193***	0.108	-0.071	-0.414**
	[0.052]	[6.124]	[1.640]	[-0.695]	[-2.794]
Observations	6,508	1,248	288	96	24

Panel B: Other Proxies of Merger Activity

	(1)	(2)	(3)
VARIABLES	MP(t)	Acq/Qtr(t)	Merger Value(t)
MP(t-1)	0.075**		
	[2.235]		
MP(t-2)	0.023		
	[0.769]		
Acq/Qtr(t-1)		0.332***	
		[3.960]	
Acq/Qtr(t-2)		-0.159*	
		[-1.797]	
Merger Value(t-1)			0.063
			[0.624]
Merger Value(t-2)			0.170*
			[1.876]
Observations	102	102	102