Regression Discontinuity and Shareholder Approval in M&As[*]

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Abstract

This paper provides one of the first large sample studies documenting a positive causal effect of shareholder approval in corporate decision-making. Using a hand-collected sample of U.S. mergers and acquisitions (M&As) that involve stock payment over the period 1995-2015, we examine whether and how the requirement of shareholder approval affects deal outcome. The challenge faced by many corporate finance studies is the endogeneity of a firm's governance structure. Our identification strategy relies on listing rules of the NYSE, AMEX, and NASDAQ that shareholder approval is ***required*** when an acquirer *intends* to issue more than 20% new shares to finance a deal. We examine acquirer price reaction to deals in which acquirers *intend* to issue either above or below the 20% threshold by a small margin. This regression discontinuity design provides a clean causal estimate of the effect of shareholder approval on M&As. We find a large and significant 5.6% jump in acquirer announcement returns at the 20% threshold. We further show that this positive value effect is larger for acquirers with better corporate governance practices as measured by high institutional ownership, particularly high quasi-indexer ownership, and for acquirers buying targets with more severe information asymmetry as measured by listing status (public vs. private targets) and by analyst coverage (high- vs. low-coverage targets). We then provide suggestive evidence on the underlying mechanisms behind this positive value effect: Shareholder approval is associated with acquirers making deals with larger synergies and with acquirers getting a bigger share of those synergies. Finally, we show that shareholder approval leads to better post-merger operating performance in well-governed acquirers. We conclude that the requirement of shareholder approval is effective in addressing agency problems.

Keywords: shareholder approval; mergers and acquisitions; wealth effects; listing rules; regression discontinuity designs

JEL Classification: G32; G34; G38

I. Introduction

Modern corporations are characterized by the separation of ownership and control. Shareholder engagement in important corporate decisions is fundamental to the governance process. Despite its importance, evidence on the role of shareholder engagement in one of the most important corporate decisions—mergers and acquisitions (M&As) is limited and mixed. This paper provides one of the first large sample studies documenting a positive causal effect of shareholder approval on corporate M&As.

In general, it is difficult to find a setting in which a firm's governance structure changes exogenously (with the exceptions of regulation- and legislation-induced changes, see, for example, the adoption of SOX and various state-level antitakeover laws). The challenge faced by many corporate finance studies is the endogeneity of a firm's governance structure. For example, acquirers whose deals require shareholder approval may be fundamentally different from those whose deals do not require shareholder approval. A simple comparison of these two groups of acquirers only suggests possible association between shareholder approval and deal outcome, but does not establish causality.

In this paper, our identification strategy relies on listing rules of the NYSE, AMEX, and NASDAQ that shareholder approval is ***required*** when an acquirer *intends* to issue more than 20% new shares to finance a deal.[1] We examine acquirer price reaction to deals in which acquirers *intend* to issue either above (i.e., the treatment group) or below the 20% threshold (i.e., the control group) by a small margin. The regression discontinuity (RD) design on the M&A outcome (e.g., acquirer price reaction to the merger announcement) of shareholder approval allows us to overcome the limitations of standard regressions of M&A outcome variables on the requirement of shareholder approval. Our empirical strategy essentially compares acquirer price reactions to deals where acquirers intend to issue either above

[1] See in Appendix IA1 in the Internet Appendix, the New York Stock Exchange (NYSE) Listed Company Manual, Section 312.00 Shareholder Approval Policy; the American Stock Exchange (AMEX) Company Guide, Section 712 Acquisitions; and the NASDAQ Manual: Marketplace Rules, Section 4350 Qualitative Listing Requirements for NASDAQ National Market and NASDAQ SmallCap Market Issuers Except for Limited Partnerships. According to Karmel (2001), these listing rules were first implemented by the NYSE in 1955, followed by the AMEX in 1968, and by the NASDAQ in 1985. See in Appendix IA2, an example of Form S-4 where the requirement of acquirer shareholder approval is specified.

or below the 20% threshold by a small margin. For these "close-call" deals, the requirement of shareholder approval is akin to an independent *random* event (i.e., it is "locally" exogenous) and therefore uncorrelated with (either observed or unobserved) firm and deal characteristics. Intuitively, the average characteristics of acquirers in deals where acquirers intend to issue 20.1% new shares are similar to those where acquirers intend to issue 19.9% new shares. However, this small difference in the percent of new shares to be issued leads to a discrete change in the requirement of shareholder approval as imposed by the three major exchanges. The RD estimates employed in this paper capture the treatment effect of this discrete change in the requirement of shareholder approval at the 20% threshold. Importantly, these estimates do not incorporate any observed or unobserved confounding factors as long as their effect is continuous around the threshold. In a nutshell, the RD estimates are able to provide a clean causal estimate of the effect of shareholder approval on M&As.

The key identification assumption of valid RD designs is that firms cannot *precisely* manipulate the "assignment variable." (also called the "forcing variable," or the "running variable" in the literature, see, for example, Imbens and Lemieux (2008), McCrary (2008), Lee and Lemieux (2010), and Roberts and Whited (2013)). In our setting, the assignment variable is the percent of new shares an acquirer *intends* to issue to finance a deal. If acquirers—even while having *some* influence—are unable to *precisely* manipulate the assignment variable, a consequence of this is that the variation in treatment near the 20% threshold is randomized as though from a *randomized* experiment.

We start by checking whether the key identification assumption of RD designs is satisfied in our context. It is true that acquirers have some control over methods of payment—all stock (i.e., the entire purchase price is paid in stock), all cash, or a combination of stock and cash payment—and in the last case, over the faction of payment in stock. However, it is highly unlikely that *all-stock* acquirers could have perfect control over the percent of new shares to be issued due to a large number of (unforeseen) uncertainties associated with M&As: the length of time it takes to complete a deal (Boone and Mulherin (2007)), the relative bargaining power of merging parties (Ahern (2012)), acquirer financial flexibility including any restrictions from debt covenants (Nini, Smith, and Sufi (2009)), and the outcome of fairness

opinions (Kisgen, Qian, and Song (2009)). Moreover, career concerns (Fama (1980), and Brickley, Linck, and Coles (1999)) and potential litigations from shareholders also help rein in acquirer management's urge to perfectly manipulate the percent of new shares to be issued (i.e., to stay exactly below the 20% threshold) in order to avoid the requirement of shareholder approval.[2] We show that the frequency distribution of the assignment variable reveals no evidence of manipulation by acquirers around the 20% threshold. A formal test of manipulation regarding continuity in the assignment variable density function (McCrary (2008)) further confirms the validity of our RD designs.[3]

We hand collect information on the assignment variable via the SEC disclosures for M&A deals involving stock payment. Under RD designs, it is important to have accurate data on the assignment variable. We note that the standard database on U.S. M&A deals—the Thomson One Banker SDC database—is generally accurate about whether a particular deal is financed by stock (including cases with mixed payment), but sometimes do not have the information on the *ex-ante* number of new shares to be issued for deals financed by stock (particularly for private or subsidiary target firms), or sometimes provide the *ex-post* actual number of new shares issued (particularly for public targets).

Using a hand-collected sample of U.S. M&A deals that involve stock payment over the period 1995-2015, we examine whether and how the requirement of shareholder approval affects deal outcome. We find a large and significant 5.6% jump in acquirer announcement returns at the 20% threshold. Given that the average acquirer in our sample has a market capitalization of $3.05 billion, a 5.6% jump in stock price around the merger announcement indicates value creation of $171 million for acquirer shareholders. We further show that this positive value effect is larger for acquirers with better corporate governance practices as measured by high institutional ownership, particularly high quasi-indexer ownership, and for acquirers buying targets with more severe information asymmetry as measured by listing status (public

[2] Cornerstone Research (2014) reports that shareholder litigation in M&As have been increasing over time.
[3] Another test for the validity of the RD design is to examine whether observed baseline firm and deal characteristics are "locally" balanced on either side of the threshold, which should be the case if the treatment is locally randomized (Lee and Lemieux (2010), and Roberts and Whited (2013)). We find that none of those variables exhibits any sharp discontinuity at the 20% threshold.

vs. private targets) and by analyst coverage (high- vs. low-coverage targets). We then provide suggestive evidence on the underlying mechanisms behind this positive value effect: The prospect of requiring shareholder approval makes acquirers to do deals with larger synergies and to extract a bigger share of those synergies. Finally, we show that shareholder approval leads to better post-merger operating performance in well-governed acquirers.

We conduct a large number of robustness checks on our main findings. First, we implement the RD analysis using the rule-of-thumb bandwidth together with more robust confidence interval estimators for the average treatment effect at the 20% threshold as suggested by Calonico, Cattaneo, and Titiunik (2014a, 2014b). Our main findings remain. Second, we employ local quadratic polynomial models on both sides of the threshold to estimate the average treatment effect. Our main findings remain. Third, we incorporate pre-determined baseline characteristics (also called "covariates" in the literature) in estimation in order to reduce the sampling variability in the RD estimates (Lee and Lemieux (2010)). Our main findings remain. Finally, we conduct falsification tests as recommended by Lee and Lemieux (2010) and Roberts and Whited (2013), estimating the treatment effects around alternative thresholds other than the regulatory threshold of 20%, say 10% and 30% new shares to be issued. We find that using alternative thresholds does not generate the same significant treatment effects as that with the 20% threshold.

Our paper contributes to the literature in a number of dimensions. First, our paper contributes to the growing finance literature that studies the efficacy of shareholder voting. Some studies find that shareholder voting is not effective in improving firm performance (e.g., Karpoff, Malatesta, and Walkling (1996), Cai, Garner, and Walkling (2011), and Kamar (2011)), while others find shareholder voting is beneficial in various contexts (e.g., Black (1992), Gordon and Pound (1993), Hsieh and Wang (2008), Balachandran, Joos, and Weber (2012), and Cuňat, Gine, and Guadalupe (2012)). Our paper conducts one of the first large sample studies that establish a positive causal effect of shareholder voting in M&As.

Second, our paper contributes to the literature on acquisitions of non-public targets. The question of why we observe positive acquirer announcement returns in acquisitions of private or subsidiary targets is still not fully answered. Possible explanations include information uncertainty (Officer, Poulsen, and

Stegemoller (2009)), liquidity provision (Fuller, Netter, and Stegemoller (2002), Officer (2007), and Green (2015)), and block formation in the acquirer due to stock payment (Chang (1998)). Complementary to prior studies, we show that another important channel of value creation in acquisitions of non-public target is through acquirer shareholder approval.

Finally, our paper contributes to the nascent literature on the monitoring role of quasi-indexer institutional investors. Boone and White (2015) find that higher institutional ownership by quasi-indexers (based on the classification of Bushee (2001)) is associated with an increased propensity for firms to provide voluntary disclosure via management forecasts and 8-K filings. Moreover, management earnings forecasts are more timely and precise. Firms with higher quasi-indexer ownership have lower information asymmetries and greater liquidity. Appel, Gormley, and Keim (2016) show that quasi-indexers become an increasingly important component of U.S. stock ownership, and that these passive investors influence firms' governance choices, resulting in more independent directors, removal of takeover defenses, more equal voting rights, and improvements in firms' longer-term performance. They identify the main channel of these influences is through quasi-indexers' large voting blocs. Complementary to the above papers, we show that the positive treatment effect of shareholder approval is larger for acquirers with high institutional ownership, especially with high quasi-indexer ownership. Moreover, we show that shareholder approval leads to better post-merger operating performance only in acquirers with high quasi-indexer ownership. Our paper sheds new insight into how quasi-indexer institutional investors help create firm value—pressing their portfolio firms to make value-creating deals.

Our paper is closely related to a number of prior studies focusing on the role of shareholder voting in M&As. Using a sample of 2,205 M&A deals made by public acquirers for public target firms over the period 1990-2005, Hsieh and Wang (2008) show that acquirers with higher M/B ratios and higher institutional ownership are less likely to be associated with shareholder voting rights, and that deals requiring acquirer shareholder approval are associated with higher synergistic gains and outperform in the long run, while bids requiring shareholder approval are associated with a lower probability of completion. They conclude that shareholder voting rights in M&As provide an important monitoring and

control mechanism. Using a sample of 2,249 M&A deals made by public acquirers for public/private target firms over the period 1995-2006, Kamar (2011) shows that there is no significant association between the requirement of shareholder approval and announcement returns, premiums, or deal completion. He concludes that there is no justification for the requirement of shareholder approval in M&As. Using a sample of 1,264 U.K. M&A deals over the period 1992-2010 where shareholder approval is mandatory for large deals, Becht, Polo, and Rossi (2015) show that shareholders gain eight cents per dollar at the announcement of deals with mandatory voting, and that mandatory voting prevents bad deals from being initiated (or being completed), and is associated with lower offer premiums. They conclude that mandatory voting imposes a binding constraint on acquirer CEOs. Using a sample of non-U.S. firms from 43 countries, Iliev, Lins, Miller, and Roth (2015) find that greater dissent voting from U.S. institutional investors is associated with higher director turnover and more M&A withdrawals. They conclude that shareholder voting is an effective mechanism for exercising governance around the world.

Different from these prior studies, we compile one of the largest samples of U.S. M&A deals that involve stock payment over the period 1995-2015, and we pay particular attention to obtain accurate information on the number of new shares to be issued and the requirement of shareholder approval through comprehensive searches of SEC filings (including S-4, S-4/A, 8-K, DEFM 14, DEFM 14/A, DEF 14A, 425, DEFS14A, PRES14A, PRER14A, 10-K, and 10-Q). We find that more than a fifth of stock deals covered by SDC have missing information on the number of new shares an acquirer intends to issue in connection with a merger, and that sometimes SDC reports the *ex-post* actual number of new shares issued (particularly for public targets) rather than the *ex-ante* number of new shares an acquirer intends to issue. More importantly, the RD analysis used in this study helps identify a positive causal effect of shareholder approval in M&As. Further, our sample of deals include public, private, and subsidiary targets, and we find that the larger value impact of shareholder approval comes from deals involving private or subsidiary targets. Finally, we provide fresh evidence on the heterogeneity in the treatment effect of shareholder approval.

The remainder of the paper is organized as follows. In Section II we discuss sample formation and provide a sample overview. We examine the treatment effect of shareholder approval on acquirer announcement returns in Section III, and explore cross-sectional variations in that effect in Section IV. In Section V we investigate the underlying mechanisms. We provide suggestive evidence on post-merger operating performance in Section VI, and conclude in Section VII.

II. Sample Formation and Overview

A. Sample formation

We start with all announced M&A transactions from the Thomson One Banker SDC database for the period from January, 1, 1995 to December 31, 2015. We impose the following filters to obtain our final sample: 1) the deal is classified as "Acquisition of Assets (AA)", "Merger (M)," or "Acquisition of Majority Interest (AM)" by the data provider;[4] 2) the acquirer is a U.S. public firm listed on the NYSE, AMEX, or NASDAQ; 3) the acquirer holds less than 50% of the shares of the target firm before deal announcement and ends up owning 100% of the shares of the target firm through the deal; 4) the target firm is a public firm, a private firm, or a subsidiary; 5) the deal value is at least $1 million (in 1995 dollar value); 6) basic financial and stock return information is available for the acquirer (such as CAR(-1, +1));[5] 7) the relative size of the deal (i.e., the ratio of transaction value over book value of acquirer total assets), is at least 10%;[6] 8) the number of new shares to be issued is greater than zero; and 9) Limited Partnerships are excluded as the requirement of shareholder approval does not apply to them. We end up with an initial sample of 2,780 deals.

[4] According to Netter, Stegemoller, and Wintoki (2011), these three deal forms capture about 98% of M&A deals covered by the Thomson One Banker SDC database during the period 1992-2009.

[5] CAR (-1, 1) is the abnormal percentage return in a three-day window surrounding the merger announcement using market-adjusted returns from the CRSP value-weighted index. Our main findings are unchanged if we use the pre-event window (-250, -11) to estimate the market model and calculate abnormal returns for acquirers following Chen, Harford, and Li (2007).

[6] The rationale for this filter is that for deals with a very small relative size, acquirer shareholder approval is clearly not required as per the listing rules (i.e., the percent of new shares to be issued is very unlikely to be above the 20% threshold).

We note that the Thomson One Banker SDC database is generally accurate about whether a particular deal is financed by stock (including cases with mixed payment), but sometimes do not have the information on the *ex-ante* number of new shares to be issued for deals financed by stock (particularly for private or subsidiary target firms),[7] or sometimes provide the *ex-post* actual number of new shares issued (particularly for public targets).[8] We identify a total of 753 such deals and add them back to our initial sample. We then collect share issuance information for these 3,533 deals via searches of SEC filings on EDGAR. The percent of new shares to be issued is computed as the number of new shares to be issued divided by the number of shares outstanding one day prior to the merger announcement. We further remove deals where the percent of new shares to be issued exceeds 100% because in these cases, the acquirer is de facto the target after consummation of the deal. We note that there are cases where acquirers intend to issue less than 20% of the shares outstanding but shareholder approval is required; and there are also few cases where acquirers intend to issue more than 20% of the shares outstanding but shareholder approval is not required because they have requested exemption from the exchange.[9] We exclude those deals from our sample.[10]

Table 1 lists the steps taken to form our sample of stock deals. Appendix IA3 in the Internet Appendix provides detailed description of our data collection effort to obtain information on the number of new shares to be issued and the requirement of shareholder approval. Our sample consists of 3,292 stock deals involving public, private, and subsidiary targets (going forward, for simplicity, we will lump private and subsidiary targets as "private" targets).[11] To the best of our knowledge, this is one of the largest samples to study shareholder approval in M&As.

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[7] A majority (about 80%) of these deals involve non-public targets, confirming our conjecture that SDC is more likely to miss deals with less news media coverage, i.e., private or subsidiary targets.
[8] For three quarters of stock deals involving public targets, the percent of new shares to be issued that we collected via various SEC disclosures is higher than the actual percent of new shares issued as reported by SDC.
[9] For example, we note that a few short-form merger cases where acquirers have a small number of insiders with highly concentrated ownership requested exemption.
[10] These two cases account for 1.6% of the sample. It is worth noting that when we apply a fuzzy RD analysis to include these deals in the sample, our main findings remain unchanged.
[11] Over half of the sample (53%) involves private target firms, and about a tenth of the sample (12%) involves subsidiary target firms.

B. Sample overview

Table 2 presents sample distribution by year. Panel A is based on the full sample of 3,292 stock deals. We see a large merger wave around the time of the Internet bubble, a smaller wave in the period leading to the 2007-2008 financial crisis, and drastically declining M&A activities during the most recent economic recession towards the end of our sample period. Slightly over a third of the sample (35%) requires acquirer shareholder approval.

Panel B separates the sample by target status: public versus private target firms. Consistent with prior findings (see, for example, Fuller, Netter, and Stegemoller (2002), and Moeller, Schlingemann, and Stulz (2004)), we first show that about two-thirds of the sample (65%) involve private targets. We then show that among deals involving public targets, close to two-thirds of those deals (63%) require acquirer shareholder approval; in contrast, among deals involving private targets, slightly less than a fifth of those deals (19%) require acquirer shareholder approval. The reason for the difference in the fraction of deals requiring shareholder approval between the two groups of deals is that private targets are usually much smaller than public targets relative to their acquirers (the mean/median relative size ratio for deals involving private targets is 0.61/0.31, while the mean/median relative size ratio for deals involving public targets is 0.92/0.43). As a result, acquirers of private targets are much less likely to require their shareholder approval as compared to acquirers of public targets.

Panel C separates the sample by methods of payment: all stock versus mixed payment. We first note that over the sample period, the decline in all-stock deals is far more drastic than the decline in mixed-payment deals. One possible explanation for the observed pattern is rising cash holdings by U.S. firms as documented by Bates, Kahle, and Stulz (2009). As a result, acquirers are far more likely to use cash as part of the payment or the entire payment for targets in more recent years during our sample period. We further show that about half the sample (49%) use all-stock payment. Finally, among deals using all-stock payment, about two-fifths of those deals (43%) require acquirer shareholder approval; in

contrast, among deals using mixed payment, about a quarter of those deals (26%) require acquirer shareholder approval.

Table 2 Panel D separates the sample of all-stock deals by target status: public versus private targets. We show that less than half the sample (43%) involve public targets. Among deals involving public targets, about two-thirds of those deals (67%) require acquirer shareholder approval; in contrast, among deals involving private targets, about a quarter of those deals (24%) require acquirer shareholder approval.

Table 3 Panel A presents summary statistics for the all-stock deal sample. We note that the three-day announcement return, CAR(-1, 1), has a mean of 0.3% and a median of -0.8%. Not surprisingly, the mean/median M/B ratio for stock acquirers is 7.9/4.4, much higher than an average firm in the Compustat population. The mean/median leverage ratio for stock acquirers is 7.5%/0.7%, both are much lower than comparable values for the Compustat population. The mean/median size of stock acquirers, in terms of book value of total assets is \$2 billion/\$151 million (in 1995 dollars), representing the $8^{th}/4^{th}$ decile among the Compustat population of firms. In terms of deal characteristics, about a third of all-stock deals are diversifying with acquirers and targets from different industries (as measured by two-digit SIC codes). The mean/median relative size ratio is 79%/36%, suggesting that using stock payment allows acquirers to buy large targets. Finally, about 60% of the deals involve private targets, suggesting that all-stock payment is more frequently used to buy private targets.

Panel B presents summary statistics for the subsample of all-stock deals that require acquirer shareholder approval (i.e., the assignment variable $\geq 20\%$) and the subsample without requiring acquirer shareholder approval (i.e., the assignment variable $< 20\%$). We find that except for acquirer announcement returns (in means) and the frequency of tender offers, the two subsamples are statistically significantly different from each other. It is worth noting that when using the Wilcoxon test, we show that acquirer announcement returns for the subsample requiring shareholder approval are significantly lower than those for the subsample without requiring shareholder approval, suggesting a negative correlation

between the requirement of shareholder approval and acquirer announcement returns. We conclude that there are systematic differences between the two subsamples of all-stock deals.

Panel C presents the correlation matrix for the all-stock deal sample. None of the correlations warrants any concern for multicollinearity.

III. The Effect of Shareholder Approval in M&As

The challenge faced by many corporate finance studies is the endogeneity of a firm's governance structure. In our setting, the requirement of acquirer shareholder approval might be correlated with unobservable firm and deal characteristics that also drive acquirer announcement returns, leading to a spurious association between shareholder approval and acquirer announcement returns. Our identification strategy relies on listing rules of the NYSE, AMEX, and NASDAQ that shareholder approval is required when an acquirer intends to issue more than 20% new shares to finance a deal. We examine acquirer price reaction to deals in which acquirers intend to issue either above or below the 20% threshold by a small margin. This regression discontinuity design provides a clean causal estimate of the effect of shareholder approval on acquirer announcement returns.[12]

A. Methodology

We employ RD designs to study the effect of shareholder approval on acquirer shareholder value measured by announcement returns (i.e., CAR(-1, 1)). In general, RD designs can be used to evaluate causal effects of interventions, where assignment to the intervention is determined by the value of an observed variable exceeding a known threshold. Firms whose assignment variable is above the threshold are assigned to one group (i.e., treatment), those below assigned to the other (i.e., control).

We adopt a sharp RD analysis for our purpose. In a sharp RD analysis, firms are assigned to treatment solely on the basis of a threshold value of an observed variable. In our setting, the observable

[12] A partial list of recent studies using this technique to examine various corporate decisions includes Chava and Roberts (2008), Nini, Smith, and Sufi (2009), Roberts and Sufi (2009), Cuňat et al. (2012), and Boone and White (2015).

threshold, *c*, is 20% new shares that an acquirer intends to issue to finance a deal, leading to the requirement of shareholder approval as per exchange listing rules. This exchange requirement provides a deterministic assignment rule separating the treatment (i.e., requiring shareholder approval) and control (i.e., without requiring shareholder approval).

Specifically, the sharp RD analysis is specified as follows:

$$Shareholder\ approval = \begin{cases} 1 & if\ the\ assignment\ variable\ \geq c \\ 0 & if\ the\ assignment\ variable < c \end{cases} \quad (1)$$

where the percent of new shares to be issued is the assignment variable and 20% is the threshold *c*. We then fit linear regression functions to observations within a distance *h* (i.e., the bandwidth) on either side of the threshold (Imbens and Lemieux (2008)):

$$\min_{\alpha_l:\beta_l} = \sum_{i:c-h<x_i<c} (Y_i - \alpha_l - \beta_l(X_i - c))^2,$$

and

$$\min_{\alpha_r:\beta_r} = \sum_{i:c-h<x_i<c} (Y_i - \alpha_r - \beta_r(X_i - c))^2. \quad (2)$$

The regression function on the left side of the threshold is estimated as

$$\widehat{\mu_l(c)} = \hat{\alpha}_l + \hat{\beta}_l \cdot (c - c) = \hat{\alpha}_l, \quad (3)$$

and the regression function on the right side of the threshold is estimated as

$$\widehat{\mu_r(c)} = \hat{\alpha}_r + \hat{\beta}_r \cdot (c - c) = \hat{\alpha}_r. \quad (4)$$

Given these estimates, the average treatment effect is estimated as

$$\hat{\tau}_{RD} = \hat{\alpha}_r - \hat{\alpha}_l. \quad (5)$$

B. Testing for a quasi-random assignment

The key assumption of valid RD designs is that firms cannot ***precisely*** manipulate the "assignment variable." If acquirers—even while having *some* influence—are unable to ***precisely*** manipulate the assignment variable, consequently, the variation in treatment—the requirement of shareholder approval—near the 20% threshold is randomized as though from a *randomized* experiment.

Given that acquirers have some control over methods of payment—all stock, all cash, or a combination of stock and cash payment—and in the last case, over the faction of payment in stock, we need to check if the identification assumption of RD designs is met in our setting.

Figure 1 Panel A plots the frequency distribution of the assignment variable for the stock deal sample. Visual analysis of the histogram suggests some evidence of manipulation by acquirers at the 20% threshold. Panel B plots the frequency distribution of the assignment variable for the sample of 1,682 stock deals using mixed payment. Visual analysis of the histogram suggests stronger evidence of manipulation by acquirers at the 20% threshold when the method of payment is a combination of cash and stock. We further conduct a Wald test of the null hypothesis that the discontinuity in the density function of the assignment variable is zero at the 20% threshold (McCrary (2008)). The test finds a statistically significant drop in the density function of the assignment variable. We conclude that RD designs are not valid for the sample of stock deals using mixed payment.

Figure 2 Panel A plots the global frequency distribution of the assignment variable for the sample of 1,610 all-stock deals. Panels B and C plot the local frequency distributions around the 20% threshold with the number of bins equal to 10, and 20, respectively. Visual analysis of the histograms suggests little evidence of manipulation by acquirers at the 20% threshold when the method of payment is all stock. We further conduct the statistical test recommended by McCrary (2008). The tests fail to find a statistically significant drop in the density function of the assignment variable. The finding that there is no perfect manipulation of the assignment variable in deals using all-stock payment makes sense. Given that a deal is financed entirely by stock, precise manipulation of the number of new shares to be issued is very unlikely due to valuation uncertainties such as the length of time it takes to complete the deal and the relative bargaining power of merging parties. Moreover, career concerns (Fama (1980), and Brickley, Linck, and Coles (1999)) and potential litigations from shareholders also help rein in acquirer management's urge to perfectly manipulate the percent of new shares to be issued in order to avoid the requirement of shareholder approval. We conclude that RD designs are valid for the sample of all-stock deals which we use in the rest of the analyses.

C. Inspecting pre-determined firm and deal characteristics

Another test for the validity of the RD design is to examine whether observed baseline firm and deal characteristics are "locally" balanced on either side of the threshold, which should be the case if the treatment is locally randomized. We conduct balancing tests to further validate our RD design (Lee and Lemieux (2010), and Roberts and Whited (2013)). If variation in the treatment near the threshold is approximately randomized, then it follows that all baseline firm and deal characteristics—all those characteristics determined prior to the realization of the assignment variable—should have the same distribution just above and below the threshold (Lee and Lemieux (2010)). Specifically, we conduct the RD analysis on firm and deal observable characteristics one at a time. If these baseline firm and deal characteristics have an estimated treatment effect indistinguishable from zero, then deals around the threshold are deemed similar on these dimensions and we are more confident that the treatment effect of shareholder approval is not driven by differences in these firm and deal characteristics.

Table 4 reports the balancing tests for all baseline firm and deal characteristics.[13] It is evident that that none of these variables exhibits any sharp discontinuity at the 20% threshold. In other words, acquirers at the immediate left side of the threshold are comparable to those at the immediate right side of the threshold in various dimensions. We conclude that acquirers whose percent of new shares to be issued around the 20% threshold are indistinguishable in their firm and deal characteristics and thus any observed discontinuity in acquirer CARs is unlikely driven by these firm and deal characteristics.

D. Main results

We start our main analyses with some plots to help visualize the presence of a discontinuity in the outcome variable—acquirer CAR (-1, 1). Figure 3 plots local sample means (i.e., the dots in the graph) of acquirer announcement returns using non-overlapping evenly spaced bins on each side of the 20%

[13] In the balancing tests, the bandwidth employed varies from variable to variable as the optimal choice is made to minimize the asymptotic mean squared error (Calonico et al. (2014a, 2014b)). The optimal bandwidth from Imbens and Kalyanaraman (2011) ranges from 10% to 15%. The rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (2014a, 2014b) ranges from 6% to 10%.

threshold following the methodology described in Calonico et al. (2014a, 2014b). The vertical dotted line represents the 20% threshold. The lines are smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold.[14] Panel A plots the all-stock deal sample with the number of bins = 10 and bin width = 2%, and Panel B plots the same sample with the number of bins = 20 and bin width = 1%. Both graphs show a striking discontinuous jump in acquirer announcement returns, right at the 20% threshold. For example, Panel B shows that acquirers that intend to issue just above the 20% threshold have a mean CAR (-1, 1) of 5.53%. In contrast, acquirers that intend to issue just below the threshold have a mean CAR (-1, 1) of 1.12%.[15] These patterns strongly suggest a clear discontinuity in acquirer announcement returns around the 20% threshold.

Table 5 Panel A presents RD estimates of the treatment effect using local linear regression models on both sides of the threshold, with a triangular kernel and different choices of the bandwidth.[16] Given that the RD estimate of the treatment effect is only applicable to the subsample of acquirers at the discontinuity threshold, and uninformative about the effect anywhere else, larger bandwidths are penalized for introducing an estimation bias but are rewarded for improving precision of the estimate. Put differently, there is a real tradeoff between precision and bias, and it is important to experiment with different choices of the bandwidth. In Panel A, we employ both the optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) to minimize the mean squared error, and the rule-of-thumb bandwidth recommended by Calonico et al. (CCT, 2014a, 2014b).[17,18] The average treatment effect ranges from

[14] It is worth noting that using local linear regressions to fit the data gives similar plots.
[15] There are 28 observations in the bin with share issuance just below 20% (i.e., the percent of new shares to be issued is between 18.99% and 19.975%), and there are 16 observations in the bin with share issuance just above 20% (i.e., the percent of new shares to be issued between 20% and 20.99%).
[16] It is worth noting that the positive treatment effect remains if we employ a rectangular kernel (untabulated).
[17] In a recent study, Calonico et al. (2014a) show that traditional bandwidth often leads to bias in the distributional approximation of the estimator, resulting in confidence intervals for RD treatment effects that may also be biased. They argue that the conventional confidence intervals may over-reject the null hypothesis of no treatment effects. To address the potential concern of conventional RD inference, we also estimate and report robust confidence intervals that are constructed using a bias-corrected RD estimator together with a standard error estimator proposed in Calonico et al.). Specifically, we first re-center the usual t-statistic with an estimate of the leading bias and then re-scale the bias-corrected t-statistic with a standard error formula proposed by Calonico et al. (2014a).
[18] Based on the IK optimal bandwidth of 15%, 632 deals are used as the control group (i.e., the number of deals to the left of the threshold), and 198 deals are used as the treatment group (i.e., the number of deals to the right of the threshold with shareholder approval required). So effectively deals with the percent of new shares to be issued

5.6% to 6.7% based on the IK optimal bandwidth, and from 9.2% to 8.6% based on the CCT rule-of-thumb bandwidth, and is positive and significant. Note that the average acquirer CAR(-1, 1) is 1.1%, the median is -0.4%, and the 10th and 90th percentile of acquirer CAR(-1, 1) are -11.2% and 14.5%, respectively. In terms of economic significance, a 5.6% price increase around the merger announcement, for an average acquirer with a market capitalization of $3.05 billion, indicates value creation of $171 million for acquirer shareholders. [19]

Next, we run OLS regressions using various subsamples to provide further evidence on the effect of shareholder approval following Chava and Roberts (2008), Cuňat et al. (2012), and Krishnan et al. (2015), Panel B of Appendix IA4 in the Internet Appendix presents the results.

Column (1) presents the results from the OLS regression using a sample of deals in which the percent of new shares to be issued falls within the band of [17.5%, 22.5%] centered at the threshold. The coefficient on *Shareholder approval* is positive and significant at 0.092, suggesting that shareholder approval is associated with an increase in acquirer announcement returns by 9.2%. Column (2) presents the regression results using a sample of deals in which the percent of new shares to be issued falls within the band of [15%, 25%] centered at the threshold. The coefficient on *Shareholder approval* is positive and significant at 0.053, with a smaller standard error than that in column (2). As the band grows, more and more deals in which the percent of new shares to be issued is farther away from the 20% threshold are included in the estimation, the effect of shareholder approval becomes smaller. The effect disappears in Column (4) when 40% of all-stock deals are included. These results highlight the importance of using RD designs to uncover the causal effect of shareholder approval on acquirer announcement returns. These results also provide one possible explanation

between 5% and 35% are used for estimation. Given that the bandwidth is the same (15%) on both sides of the threshold while the frequencies of occurrence are different, we end up having different numbers of deals on each side of the threshold for estimation. The triangular kernel assigns more weights to deals closer to the threshold and less weights to deals further away from the threshold. CCT propose to use a narrower bandwidth to implement local RD estimates. Based on the CCT optimal bandwidth of 7.1%, 192 deals are used as the control group (i.e., the number of deals to the left of the threshold), and 101 deals are used as the treatment group (i.e., the number of deals to the right of the threshold with shareholder approval required). So effectively deals with the percent of new shares to be issued between 12.9% and 27.1% are used for estimation.

[19] Panel A of Appendix IA4 in the Internet Appendix provide summary statistics for the sample employed in the RD analysis based on the IK optimal bandwidth.

for why prior studies fail to find any significant value effect of shareholder approval is that they fail to properly account for the sharp discontinuity around the 20% threshold; instead, they tend to employ the full sample of stock-financed deals with equal weight assigned to every observation (see, for example, Hsieh and Wang (2008), and Kamar (2011)).

Panel B presents RD estimates of the treatment effect using local quadratic polynomial models on both sides of the threshold, with a triangular kernel and different choices of the bandwidth. Again, we see significant positive treatment effect, suggesting that the treatment effect is robust.

We implement another robustness check on our main findings by controlling for all observable baseline firm and deal characteristics. If the local continuity assumption is satisfied (as shown in Table 4), then using the residuals from regressing acquirer CAR(-1, 1) on the baseline firm and deal characteristics as the new outcome variable should yield similar results (Lee (2008), and Lee and Lemieux (2010)).

We first regress acquirer CAR(-1, 1) on the pre-determined baseline characteristics as used in the balancing tests, as well as year and industry fixed effects, and then repeat the RD analysis using the residual CAR(-1, 1) as the outcome variable. Specifically, we run the following OLS regression:

$$CAR(-1,1)_{i,t} = \alpha + \beta_1 X + Industry\ FEs + Year\ FEs + \varepsilon_{i,t} \quad (6)$$

where *CAR (-1,1)* is acquirer abnormal returns at the merger announcement, and *X* is a vector of control variables included in the balancing tests.

Table 5 Panel C shows a discontinuity in the residual CAR(-1, 1). In fact, the statistical and economic significance remains large and significant: Acquirers with the assignment variable just above the 20% threshold have the residual CAR(-1, 1) that is 6% higher than those with the assignment variable just below the threshold using the IK optimal bandwidth.

So far, we show that the requirement of shareholder approval has a large and positive effect on acquirer shareholder wealth. How does it happen? We expect such value creation to be achieved via shareholder active participation in the following aspects of the merger process. First, deals that require shareholder approval due to the exchange listing rules, by construction, are large and important deals to acquirers, and hence have greater value implications for acquirer shareholders. For example, the average

relative size ratio is 0.70 for the sample of deals used in the RD analysis. These large and important deals motivate acquirer shareholders to collect information and to be more involved in the decision-making process. We thus expect that shareholder approval is more impactful in cases where there is high institutional ownership. We also expect that the need for shareholder scrutiny is greater in deals involving more opaque targets, such as unlisted targets or targets with low analyst coverage. Second, despite the fact that most shareholder votes are supportive of management proposals, the threat of acquirer shareholders voting down a proposal is real and costly to management because a defeated merger proposal may signal shareholders' lack of confidence in management and could potentially result in management turnover. Knowing that proposing a large deal requires shareholder approval, acquirer management may be discriminative by choosing value-enhancing deals that are more likely to get support from shareholders. In other words, deals that require shareholder approval could be inherently better than those without such a requirement. Importantly, it is the very requirement for shareholder approval that disciplines acquirer management from making bad deals. Later, we will explore some of our conjectures above.[20]

E. Falsification tests

To make sure that the estimated treatment effect is indeed due to exchange listing rules of the 20% threshold rather than a coincidental discontinuity or discontinuity in unobservables, we conduct falsification tests as recommended by Lee and Lemieux (2010) and Roberts and Whited (2013), using other arbitrary thresholds instead of the true threshold. If no similar treatment effects are observed at these other thresholds, it reinforces the assumption that the estimated treatment effect is not due to a coincidental discontinuity or discontinuity in unobservables. If the listing requirement of the 20%

[20] Our analysis employs a sharp RD design because we remove cases where acquirers intend to issue less than 20% of the shares outstanding but shareholder approval is required, and where acquirers intend to issue more than 20% of the shares outstanding but shareholder approval is not required because they have requested exemption from the exchange. Those exceptions represent about 1.6% of the sample. Our findings are unchanged if we include those deals and apply a fuzzy RD analysis to estimate the treatment effect of the requirement of shareholder approval on acquirer announcement returns (untabulated).

threshold is the only driver of our results, then the treatment effects associated with alternative thresholds should be indistinguishable from zero.

Table 6 presents the RD estimation results using alternative thresholds of 10% and 30% new shares to be issued. It is clear that no discontinuity in the outcome variable is present at these alternative thresholds. These results provide further support that the requirement of shareholder approval at the 20% threshold leads to economically and statistically significant value creation to acquirer shareholders.

IV. Heterogeneity in the Treatment Effect

So far, we have established that there is a positive and significant treatment effect of shareholder approval on acquirer price reaction at the merger announcement. In this section, we explore possible cross-sectional variations in this treatment effect.

A. Corporate governance

We first examine whether the effect of shareholder approval is different in acquirers with different corporate governance practices. On the one hand, because the requirement of shareholder approval empowers shareholders in corporate decision-making, the treatment effect is expected to be stronger in firms with better governance practices. On the other hand, shareholder approval is a governance mechanism that might be a substitute for other governance practices, the treatment effect is expected to be stronger in firms with worse governance practices. Ultimately, it is an empirical question.

Prior literature has shown that institutional investors as a group are quite active in improving corporate governance and mitigating agency problems (see, for example, Gillan and Starks (2002), and Chen, Harford and Li (2007)), we thus use institutional ownership to proxy for the quality of corporate governance practices. Further, several recent studies show that quasi-indexer institutional investors play a key role in influencing firms' governance choices (Boone and White (2015), and Appel, Gormley, and

Keim (2016)). We thus also use institutional ownership by quasi-indexers (as classified by Bushee (2001)) to proxy for the quality of corporate governance practices.[21] Table 7 presents the results.

Panel A presents summary statistics of institutional ownership and ownership by three types of institutional investors: transient, quasi-indexer, and dedicated investors (Bushee (2001)) in all-stock deals during our sample period. We first show that on average, institutional ownership is about 50%, and increasing over time. More importantly, over time, quasi-indexers have gained importance in all-stock acquirers, with mean/median ownership in the range of 20%/15%. In contrast, over time, transient and dedicated institutional investors reduce their holdings in all-stock acquirers.

Figure 4 plots local sample means (i.e., the dots in the graph) of acquirer announcement returns using non-overlapping evenly spaced bins on each side of the 20% threshold as well as smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold, for the subsample of acquirers with high institutional ownership and high ownership by quasi-indexers. All these plots reveal large jumps at the 20% threshold.

More formally, Table 7 conducts RD analysis to detect any cross-sectional variations in the treatment effect. Panel B compares two subsamples of all-stock acquirers based on their institutional ownership in the most recent quarter prior to the merger announcement. In the high institutional ownership subsample (i.e., institutional ownership is above the sample median), we show a positive and economically significant treatment effect: Shareholder approval is associated with a 10% increase in acquirer value compared to those without shareholder approval. In contrast, in the low institutional ownership subsample, we show no significant treatment effect of shareholder approval. The results are consistent with the argument that shareholder approval is more effective in acquirers with better governance practices.

[21] Unfortunately, the commonly used G-index and E-index are not applicable in our setting because these indices are only available for the S&P 1500 firms. We would end up with a very small discontinuity sample for any sensible analysis.

Anecdotal evidence as well as a number of recent studies show that quasi-indexes are not passive investors but active owners with close attention to good governance for investment purposes (Appel et al. (2016)).[22] Panel C reports the RD estimates for acquirers with high and low ownership by quasi-indexers. We show that acquirers with high quasi-indexer ownership experience a statistically significant jump in their stock prices in the range of 7-11% around the merger announcement. In contrast, acquirers with low quasi-indexer ownership experience no significant jump around the merger announcement.

Overall, we present evidence suggesting that the value effect of shareholder approval is stronger in well-governed acquirers.

B. Information asymmetry

We next examine whether the effect of shareholder approval is different in deals with different degrees of information asymmetry about target firms. *A priori*, target firms that are more opaque, present acquirer shareholders a more valuable opportunity to access and analyze otherwise hard-to-obtain information about the target and the deal, are expected to have a stronger treatment effect of shareholder approval.

We employ two different proxies for information asymmetry regarding the target. The first is target listing status. Officer, Poulsen and Stegemoller (2009) show that private targets have higher information asymmetry and valuation uncertainty. Acquirer shareholders have very limited information regarding private targets due to lack of public filings and little media coverage. Further, acquirer shareholders face higher uncertainty in valuing private targets as there are no alternative valuation metrics such as stock prices, analyst forecasts, and management guidance. The second is analyst coverage. Hong, Lim, and Stein (2000) show that firms with low analyst coverage have less firm-specific information available to the market.

[22] F. William McNabb III, Chairman and CEO of the Vanguard funds, at Lazard's 2015 Director Event, states that "We're big, we don't make a lot of noise, and we're focused on the long term. …..That is precisely why we care so much about good governance."

Figure 5 plots local sample means (i.e., the dots in the graph) of acquirer announcement returns using non-overlapping evenly spaced bins on each side of the 20% threshold as well as smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold, for the subsample of acquirers buying private targets and for the subsample of acquirers buying low-coverage targets. All these plots reveal large jumps at the 20% threshold.

Table 8 Panel A presents the RD estimates for the subsample of acquirers buying private targets and for the subsample of acquirers buying public targets. We show that the treatment effect of shareholder approval is large and statistically significant for acquirers buying private targets. The average treatment effect ranges from 10% to 18%, and is economically large. Given that the average market value of acquirers buying private targets is $2.07 billion, a 10% price increase indicates a value creation of $207 million for acquirer shareholders. In contrast, we show that the treatment effect is small and statistically insignificant for acquirers buying public targets. Panel B presents the RD estimates for the subsample of acquirers buying low-coverage targets and for the subsample of acquirers buying high-coverage targets. We show that the treatment effect of shareholder approval is large and statistically significant for acquirers buying low-coverage targets. The average treatment effect ranges from 8% to 13%. In contrast, we show that the treatment effect is small and statistically insignificant for acquirers buying high-coverage targets.

In summary, we show that there is large heterogeneity in the treatment effect of shareholder approval on acquirer firm value. Shareholder approval has more significant impact when acquirers are better governed and/or when there are higher information asymmetry and valuation uncertainties about target firms.

V. Underlying Mechanisms

We have shown that shareholder approval positively impact acquirer shareholder wealth. In this section, we conduct analyses that help understand the mechanisms behind such value creation.

A. Synergistic gains

Following Bradley, Desai, and Kim (1988), we estimate synergistic gains as the weighted average of acquirer and target announcement CAR (-1, 1), weighted by their respective market capitalization one month prior to the merger announcement—combined CAR. We expect that the requirement of shareholder approval leads acquirer management to pick deals with greater synergistic gains. To implement this analysis, we employ a sample of deals with public targets.

Table 9 Panel A presents the RD estimates of synergistic gains separated by acquirers buying low-coverage targets and acquirers buying high-coverage targets. We show that the average treatment effect of shareholder approval on synergistic gains ranges from 8% to 12%, and is both statistically and economically significant only in the sample of acquirers buying low-coverage targets. These results suggest that one possible channel for shareholder value creation is that acquirer management picks deals with larger synergies when shareholder approval is required.

B. The acquirer's share of gains

We next examine the share of synergistic gains to acquirers. Following Ahern (2012), the acquirer's share of gains is the difference in dollar gains between the acquirer and target, divided by the sum of the acquirer's and target's market value of equity one month prior to the merger announcement (i.e., day -22). The dollar gain is the acquirer's (target's) CAR (-1, 1) times the firm's market capitalization two days prior to the merger announcement (i.e., day -2). This measure captures acquirer management's effort to extract a bigger share of total synergies to their shareholders in the transaction.

Table 9 Panel B presents the RD estimates of the acquirer's share of gains separated by acquirers buying low-coverage targets and acquirers buying high-coverage targets. We show that the average treatment effect of shareholder approval on the acquirer's share of gains ranges from 11% to 18%, and is both statistically and economically significant only in the sample of acquirers buying low-coverage targets. These results suggest that another possible channel for shareholder value creation is that acquirer

management works hard to extract a bigger share of synergistic gains when shareholder approval is required.

Taken together, results in Table 9 provide some suggestive evidence that shareholder approval adds value because it leads acquirers to make deals with larger synergies and to extract a bigger share of those synergies.

VI. Post-merger performance

Our analyses thus far show that shareholder approval contributes to large positive acquirer announcement returns. This analysis assumes that the market is semi-strong efficient in that acquirer price reaction to the merger announcement is an unbiased assessment of the wealth effect to acquirer shareholders (Fama (1991)).

Alternative indicators of deal performance are measures of post-merger operating performance. In Section IV.A, we show that shareholder approval has a larger positive valuation effect in acquirers with good corporate governance practices proxied by high institutional ownership, especially high quasi-indexer ownership. Prior work has also shown that these institutional investors tend to stay long-term to improve long-run performance (see, for example, Appel, Gormley, and Keim (2016)). We thus expect significantly positive improvement in post-merger long-run performance of acquirers with high quasi-indexer ownership.

To test this prediction, we use *ex post* performance measures as suggested by Heron and Lie (2002), and Boone and Mulherin (2008): return on assets (ROA, net income scaled by total assets), operating margin (operating cash flows scaled by sales), and free cash flow (FCF, free cash flow scaled by total assets). These measures help shed some light on long-run performance implications of shareholder approval.

Figure 6 local sample means (i.e., the dots in the graph) of acquirer operating performance measures using non-overlapping evenly spaced bins on each side of the 20% threshold as well as smoothed regression lines based on polynomial models estimated separately on the two sides of the 20%

threshold, for acquirers with high institutional ownership and high quasi-indexer ownership. We observe jumps at the 20% threshold in these performance measures.

We then formally estimate local linear regression models on both sides of the threshold, using a triangular kernel. Table 10 presents the results. Panels A, B, and C present the treatment effects on ROA, operating margin, and FCF three years after the deal completion, respectively, separated by the level of institutional ownership and quasi-indexer ownership.

We show that across all measures of operating performance, we only observe significant positive treatment effects among acquirers with high institutional ownership and high quasi-indexer ownership. In contrast, there are no statistically significant positive jumps for acquirers with low institutional ownership or low quasi-indexer ownership. These patterns suggest that well-governed acquirers whose deals require shareholder approval experience significantly better post-merger performance than those whose deals do not. For example, ROA three years after the merger is over 10% higher for the treatment group than the control group when acquirers have high institutional ownership.[23]

Overall, these results corroborate our announcement return analysis as well as prior work, highlighting that the positive value effect of shareholder approval only present in acquirers with a stronger presence of institutional investors, particularly quasi-indexers.[24]

VII. Conclusions

This paper provides one of the first large sample studies documenting a positive causal effect of shareholder approval in corporate decision-making. Using a hand-collected sample of U.S. mergers and acquisitions (M&As) that involve stock payment over the period 1995-2015, we examine whether and how the requirement of shareholder approval affects deal outcome.

[23] In untabulated analysis, we find that there are no abnormal long-run returns for deals that require shareholder approval, as acquirer price reaction at the merger announcement has incorporated future performance improvement.
[24] In untabulated results, we implement balancing tests on these performance measures in the year prior to the merger announcement to make sure that our findings are not driven by differences in performance before the merger, but due to the treatment effect. We find no significant jumps in these pre-merger performance measures around the 20% threshold, suggesting that these acquirers have similar performance before the merger.

Our identification strategy relies on listing rules of the NYSE, AMEX, and NASDAQ that shareholder approval is required when an acquirer intends to issue more than 20% new shares to finance a deal. We examine acquirer price reaction to deals that intend to issue either above or below the 20% threshold by a small margin. This regression discontinuity design provides a clean causal estimate of the effect of shareholder approval on M&As. We find a large and significant 5.6% jump in acquirer announcement returns at the 20% threshold. Given that the average acquirer in our sample has a market capitalization of $3.05 billion, a 5.6% jump in stock price around the merger announcement indicates value creation of $171 million for acquirer shareholders. We further show that this positive value effect is larger for acquirers with better corporate governance practices as measured by high institutional ownership, particularly high quasi-indexer ownership, and for acquirers buying targets with more severe information asymmetry as measured by listing status (public vs. private targets) and by analyst coverage (high- vs. low-coverage targets). We then provide suggestive evidence on the underlying mechanisms behind this positive value effect: Shareholder approval is associated with acquirers making deals with larger synergies and with acquirers getting a bigger share of those synergies. Finally, we show that shareholder approval leads to better post-merger operating performance in well-governed acquirers. We conclude that the requirement of shareholder approval is effective in addressing agency problems.

Our findings have important implications for policy makers and self-regulatory exchanges. The 20% rule for listed firms was first introduced by the NYSE to improve corporate governance practices (Karmel (1992)). Our results suggest that this listing requirement indeed achieves its intended effect. It empowers shareholders and encourage their participation in the M&A process. Although there are costs associated with shareholder approval such as causing delay in completing a deal (e.g., Becht et al. (2015)), the benefits of acquirer value creation justify shareholder approval required by the exchanges.

Appendix A.
Variable definitions

All Compustat firm characteristics are measured as of the fiscal year-end before the merger announcement, and all continuous variables are winsorized at the 1st and 99th percentiles. All dollar values are in 1995 dollars.

Variable	Definition
Shareholder approval	A dummy variable that takes a value of one if an acquirer plans to issue 20% or more new equity to finance the deal, and zero otherwise.
CAR(-1, 1)	Abnormal percentage return in a three-day window surrounding the merger announcement using market-adjusted returns from the CRSP value-weighted index.
Market cap	The stock price one month prior to the merger announcement (i.e., day -22) times the number of shares outstanding.
M/B	Market value of equity divided by book value of equity.
Leverage	Book value of debt divided by the sum of book value of debt and market value of equity.
Deal value	Deal value of the transaction as reported by SDC.
Relative size	Deal value dividend by the acquirer's book value of assets.
Diversifying	An indicator variable that takes a value of one if the acquirer is not from the same two-digit SIC industry as the target firm, and zero otherwise.
Tender offer	A dummy variable that takes a value of one if SDC reports the deal is a tender offer, and zero otherwise.
Public target	A dummy variable that takes a value of one if target public status reported by SDC is 'Public,' and zero otherwise.
Private target	A dummy variable that takes a value of one if target public status reported by SDC is either 'Private' or 'Subsidiary,' and zero otherwise.
Institutional ownership	Percentage of institutional ownership reported in 13F, measured at the most recent quarter prior to the merger announcement.
Transient ownership	Percentage of shares owned by institutional investors classified as transient investors with high turnover and highly diversified portfolios (Bushee (2001)).
Quasi-indexer ownership	Percentage of shares owned by institutional investors classified as quasi-indexers with low turnover and highly diversified portfolios (Bushee (2001)).
Dedicated ownership	Percentage of shares owned by institutional investors classified as dedicated investors with low turnover and less diversified portfolios (Bushee (2001)).
Return on assets (ROA)	The ratio of net income to total assets.
Operating margin	The ratio of operating cash flow to total sales.
Free cash flow (FCF)	The ratio of free cash flow to total assets
Analyst coverage	The number of analysts following a firm as reported by the Institutional Brokers Estimate System (I/B/E/S) one month prior to the merger announcement.
Combined CAR	Weighted average of the acquirer's CAR (-1, 1) and the target's CAR (-1, 1) with the weight being their respective market capitalization.
Acquirer's share of gains	The difference in dollar gains between the acquirer and target, divided by the sum of the acquirer's and target's market value of equity one month prior to the merger announcement (i.e., day -22). The dollar gain is the acquirer's (target's) CAR (-1, 1) times the firm's market capitalization two days prior to the merger announcement (i.e., day -2) (Ahern (2012)).

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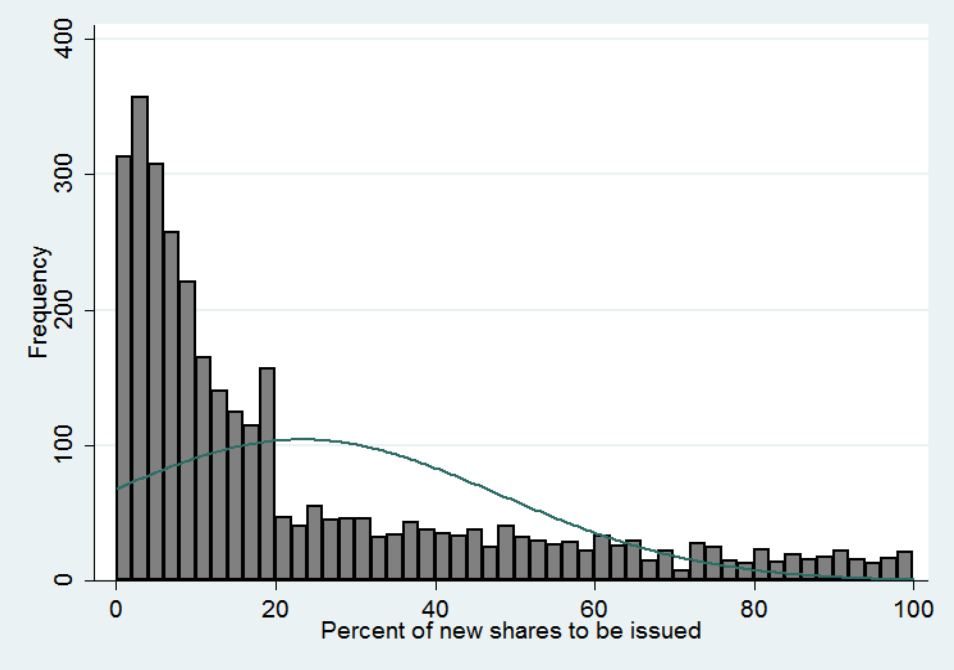
Figure 1. Frequency distribution of the assignment variable: all deals and mixed-payment deals

The sample consists of 3,292 deals involving stock payment announced between 1995 and 2015 from the Thomson One Banker SDC database. The line in each graph represents the density distribution of the percent of new shares to be issued—the assignment variable. Panel A plots the full sample of stock deals. Panel B plots the subsample of 1,682 deals involving mixed payment.

Panel A: Frequency distribution for the full sample of stock deals



Panel B: Frequency distribution for the sample of mixed-payment deals

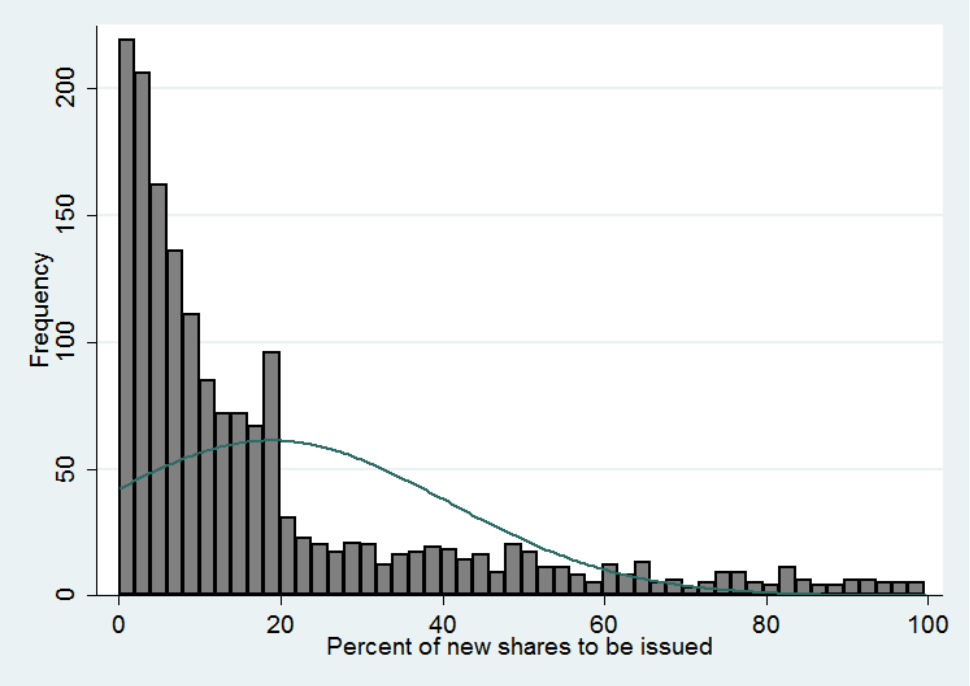
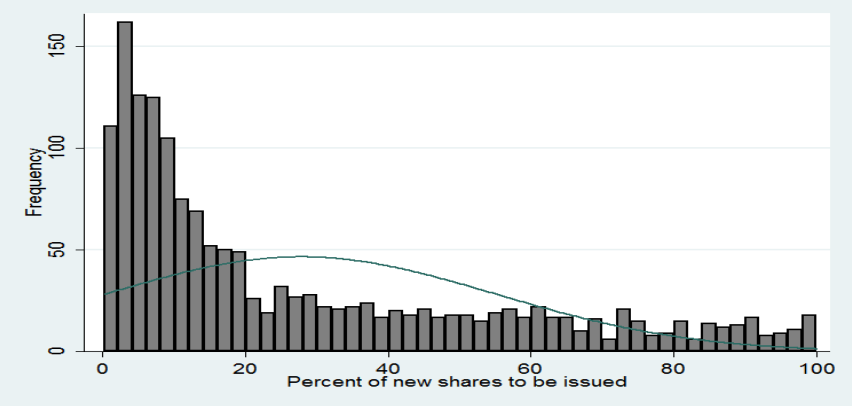


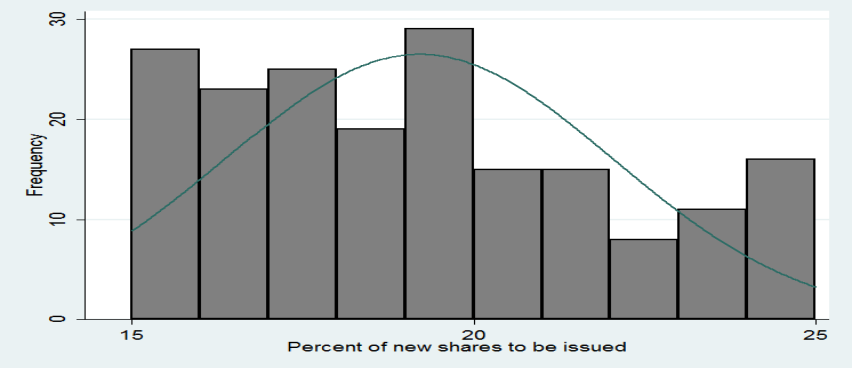
Figure 2. Frequency distribution of the assignment variable: all-stock deals

The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The line in each graph represents the density distribution of the percent of new shares to be issued—the assignment variable. Panel A plots the sample of all-stock deals. Panel B plots the local frequency distribution centered at the 20% threshold with the number of bins = 10. Panel C plots the local frequency distribution centered at the 20% threshold with the number of bins = 20.

Panel A: Frequency distribution for the sample of all-stock deals



Panel B: Frequency distribution around the 20% threshold (# bins = 10; bin width = 1%)



Panel C: Frequency distribution around the 20% threshold (# bins = 20; bin width = 0.5%)

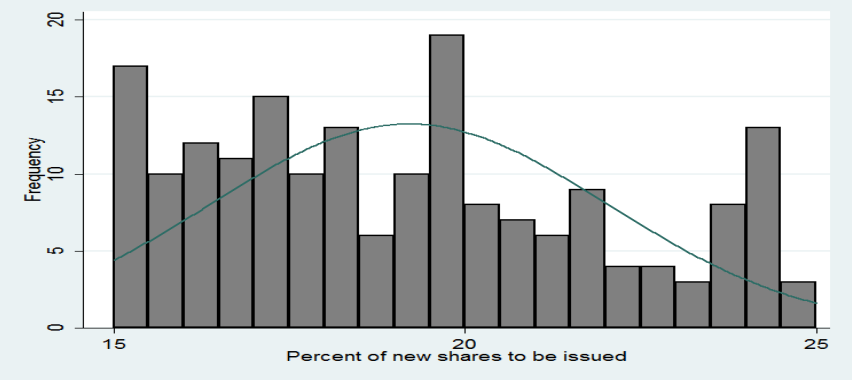
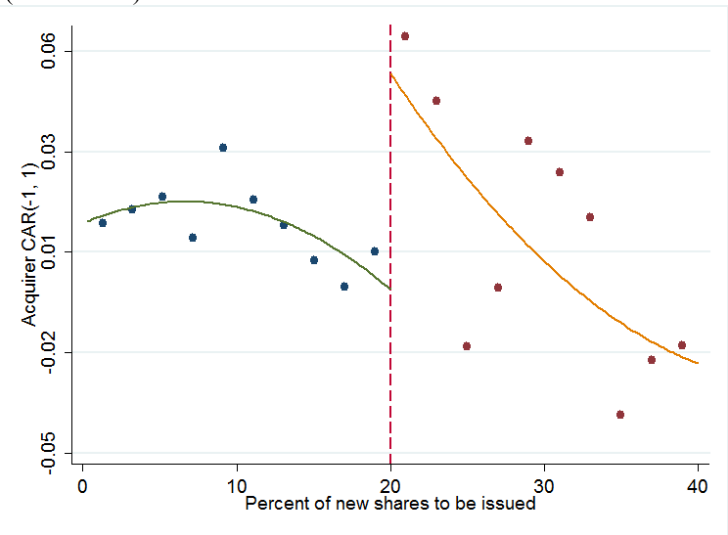


Figure 3. Acquirer announcement returns around the 20% threshold

The dots represent local sample means of acquirer announcement returns using non-overlapping evenly spaced bins on each side of the 20% threshold. The lines are smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold. Panel A (B) plots acquirer announcement returns of all-stock deals whose percent of new shares to be issued is less than 40% with the number of bins = 10 (20). Definitions of all variables are provided in Appendix A.

Panel A: All stock deals (# bins = 10)



Panel B: All stock deals (# bins = 20)

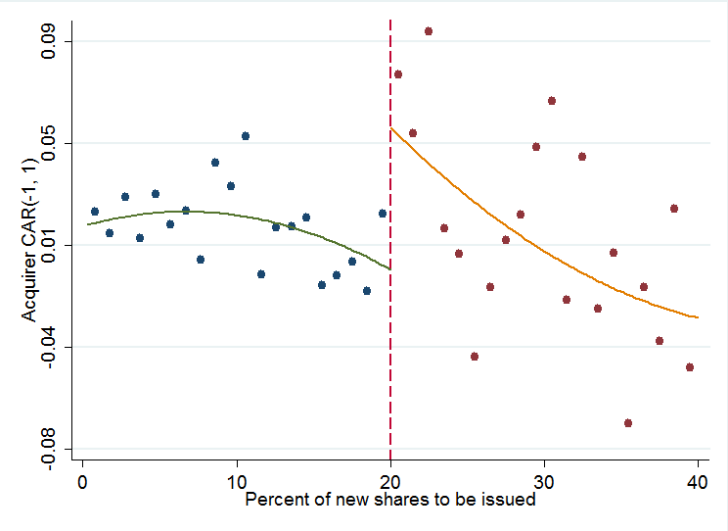
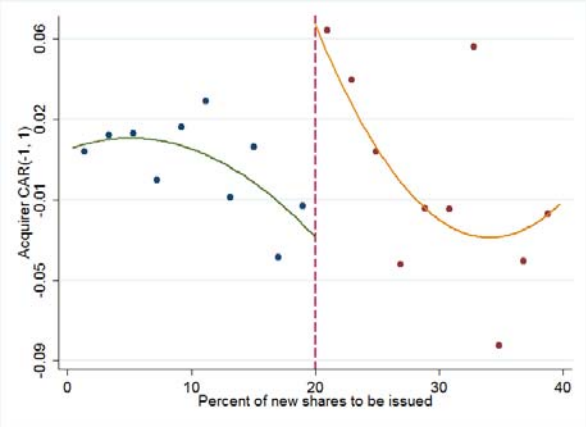


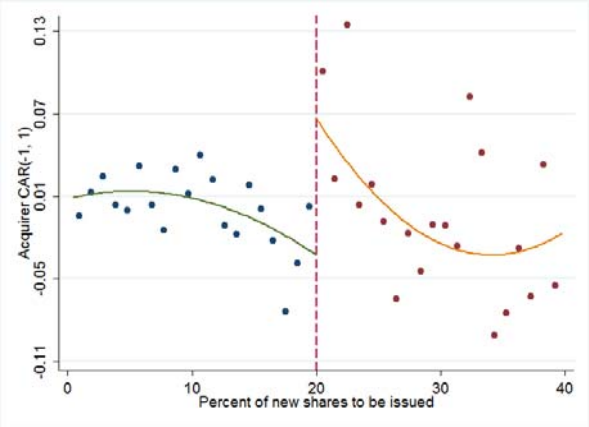
Figure 4. Acquirer announcement returns around the 20% threshold: high institutional ownership and high quasi-indexer ownership

The dots represent local sample means of acquirer announcement returns using non-overlapping evenly spaced bins on each side of the 20% threshold. The lines are smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold. Panel A (B) plots acquirer announcement returns of all-stock deals whose acquirers have high institutional ownership (i.e., above the sample median) with the number of bins = 10 (20). Panel C (D) plots acquirer announcement returns of all-stock deals whose acquirers have high quasi-indexer ownership (i.e., above the sample median) with the number of bins = 10 (20). Definitions of all variables are provided in Appendix A.

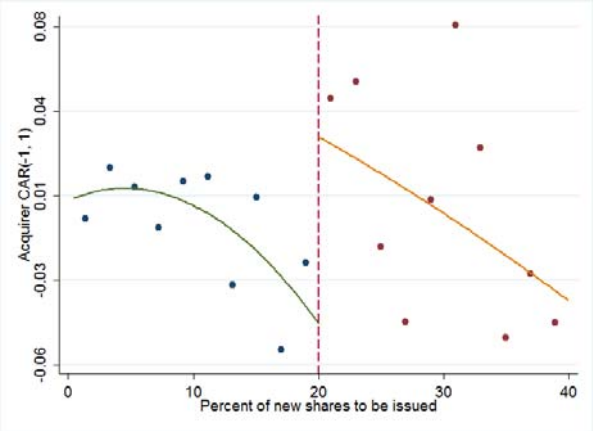
Panel A: High institutional ownership (# bins = 10)



Panel B: High institutional ownership (# bins = 20)



Panel C: High quasi-indexer ownership (# bins = 10)



Panel D: High quasi-indexer ownership (# bins = 20)

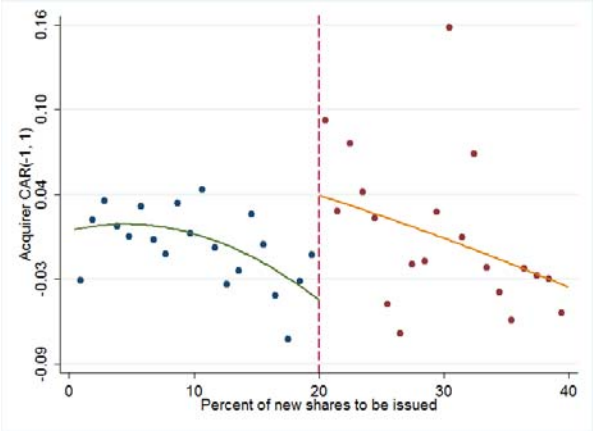
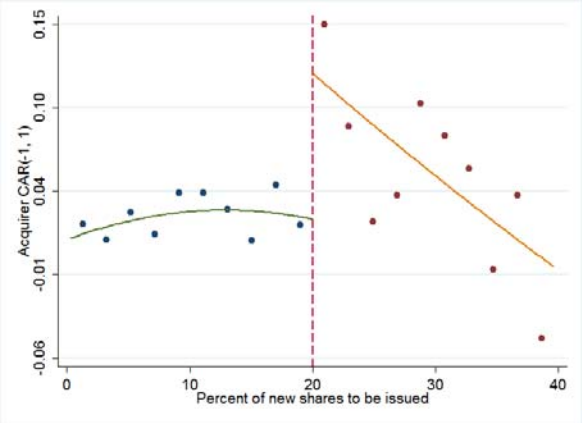


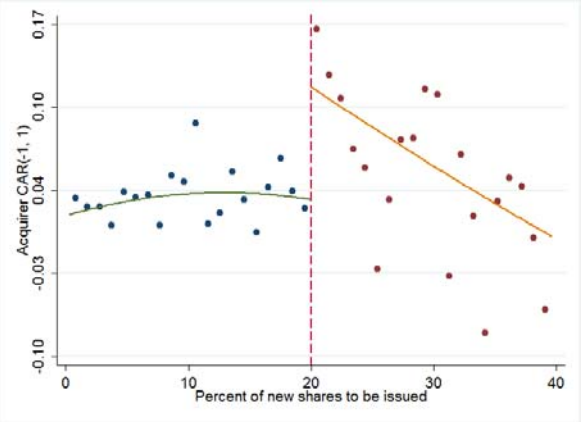
Figure 5. Acquirer announcement returns around the 20% threshold: private targets and low-coverage targets

The dots represent local sample means of acquirer announcement returns using non-overlapping evenly spaced bins on each side of the 20% threshold. The lines are smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold. Panel A (B) plots acquirer announcement returns of all-stock deals involving private targets with the number of bins = 10 (20). Panel C (D) plots acquirer announcement returns of all-stock deals involving low-coverage (i.e., below the sample median) targets with the number of bins = 10 (20). Definitions of all variables are provided in Appendix A.

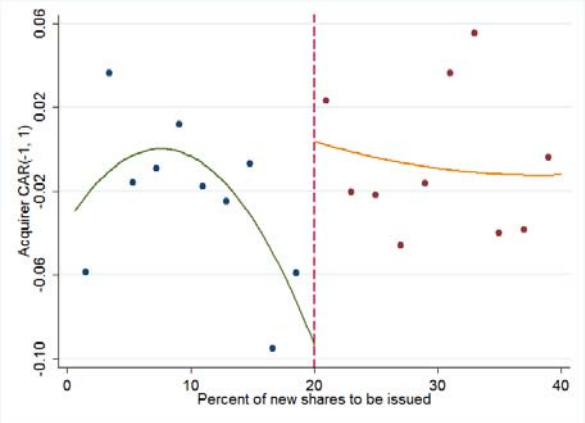
Panel A: Private targets (# bins = 10)



Panel B: Private targets (# bins = 20)



Panel C: Low-coverage targets (# bins = 10)



Panel D: Low-coverage targets (# bins = 20)

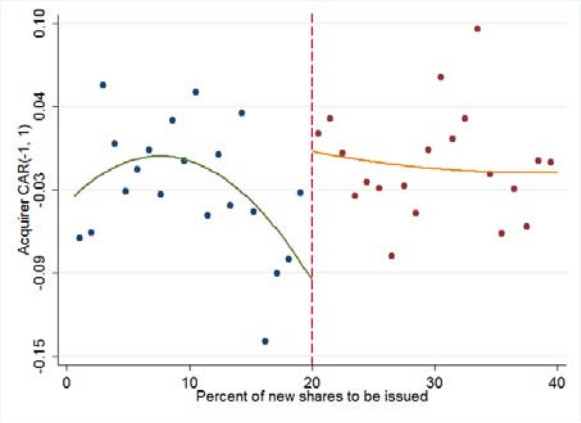
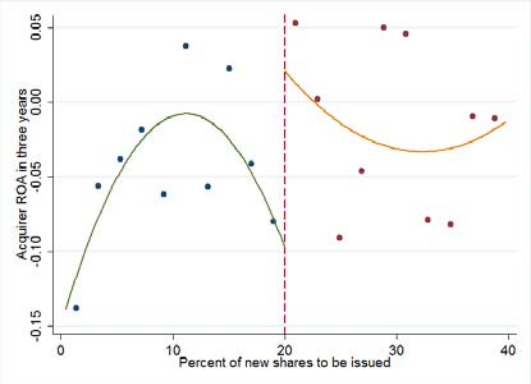


Figure 6. Acquirer post-merger operating performance around the 20% threshold: high institutional ownership and high quasi-indexer ownership

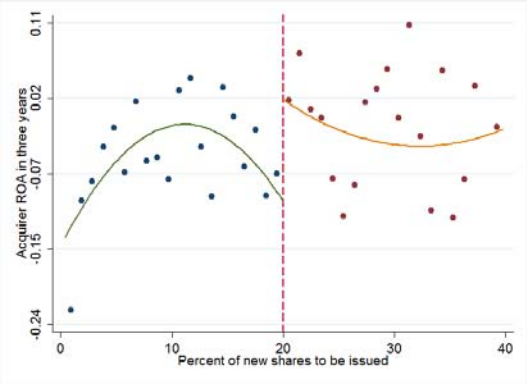
The dots represent local sample means of acquirer post-merger performance measures using non-overlapping evenly spaced bins on each side of the 20% threshold. The lines are smoothed regression lines based on polynomial models estimated separately on the two sides of the 20% threshold. Panel A plots acquirer post-merger performance of all-stock deals whose acquirers have high institutional ownership (i.e., above the sample median). Panel B plots acquirer post-merger performance of all-stock deals whose acquirers have high quasi-indexer ownership (i.e., above the sample median). Definitions of all variables are provided in Appendix A.

Panel A: High institutional ownership

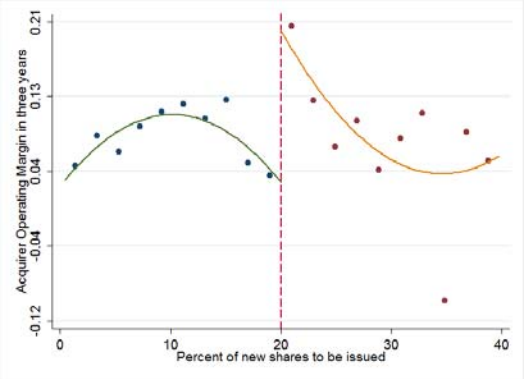
Panel A.1: ROA (# bins = 10)



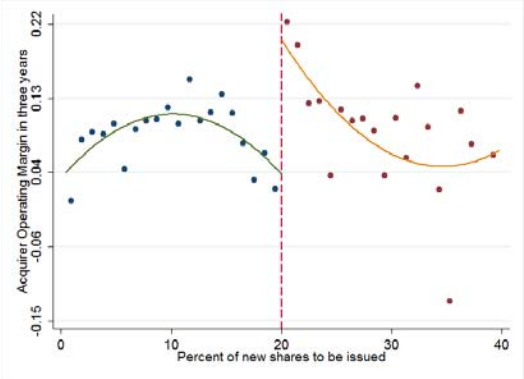
ROA (# bins = 20)



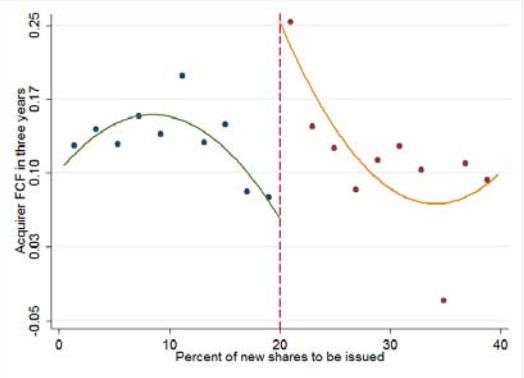
Panel A.2: Operating margin (# bins = 10)



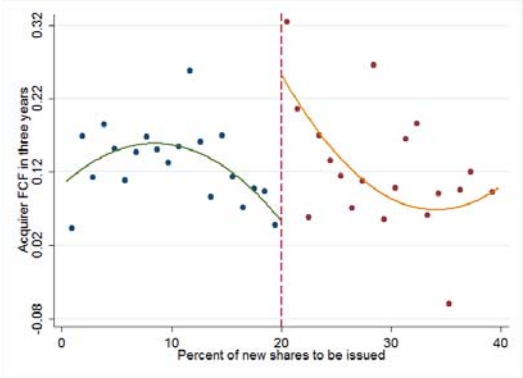
Operating margin (# bins = 20)



Panel A.3: FCF (# bins = 10)

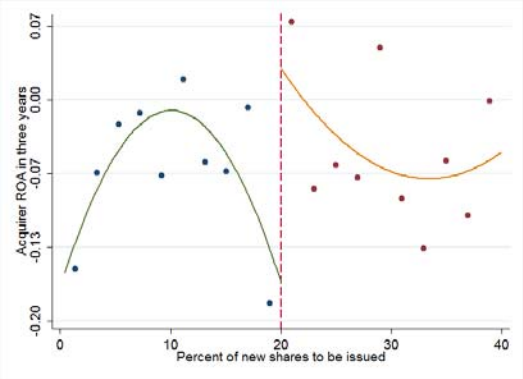


FCF (# bins = 20)

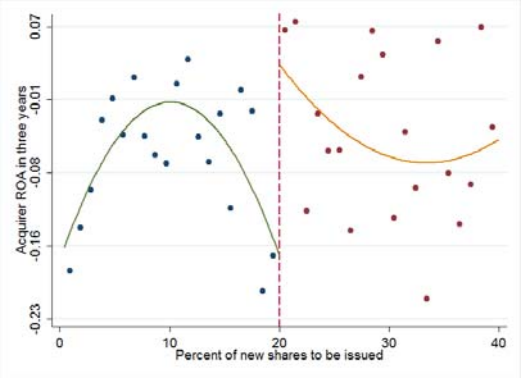


Panel B: High quasi-indexer ownership

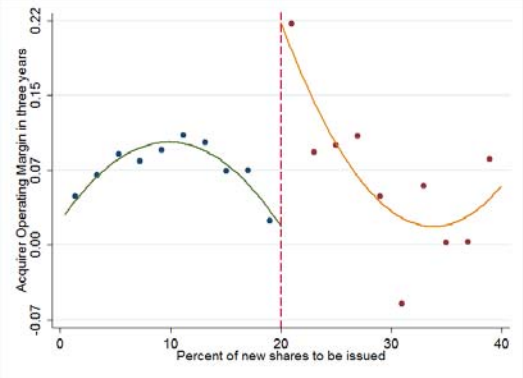
Panel B.1: ROA (# bins = 10)



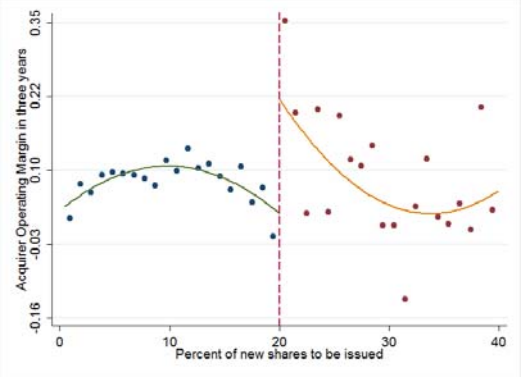
ROA (# bins = 20)



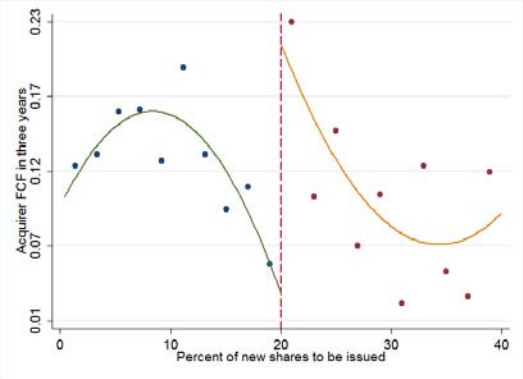
Panel B.2: Operating margin (# bins = 10)



Operating margin (# bins = 20)



Panel B.3: FCF (# bins = 10)



FCF (# bins = 20)

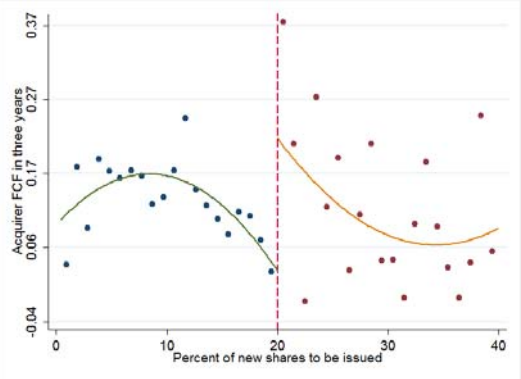


Table 1. Sample formation

This table provides the steps taken to form our sample of deals involving stock payment.

Sample filters	# of deals
Date Announced: 01/01/1995 to 12/31/2015 & Form of the Deal: AA, AM, M	184,503
Acquirer Public Status: P	84,488
Percent of Shares Held at Announcement: less than 50%	84,458
Percent of Shares Acquirer is Seeking to Own after Transaction: 100%	79,713
Target Public Status: V, P, S	79,326
Deal Value ($ Mil): 1 (1995 dollar) & Return Data on CRSP & Basic Accounting Data on Compustat	21,885
Relative size > 10%	10,075
Share issuance > 0	3,146
Exclude Limited Partnerships Traded on NYSE, AMEX, and NASDAQ	2,780
Add Back Deals with Stock Payment But Missing or Zero Share Issuance (753 deals)	3,533
Exclude Share Issuance >100%	3,346
Exclude Deals That Issue More Than 20% But Shareholder Approval Not Required and Deals That Issue Less than 20% But Shareholder Approval Required	3,292

Table 2. Sample distribution over time

The sample consists of 3,292 deals involving stock payment announced between 1995 and 2015 from the Thomson One Banker SDC database. Panel A presents the temporal distribution for the full sample. Panel B presents the temporal distribution by target status. Panel C presents the temporal distribution by methods of payment. Panel D presents the temporal distribution for all-stock deals, separated by target status.

Panel A: Full sample

Year	# of deals	Require shareholder approval	Not require shareholder approval
1995	232	97	135
1996	334	115	219
1997	379	142	237
1998	415	141	274
1999	331	93	238
2000	363	98	265
2001	174	74	100
2002	97	36	61
2003	105	37	68
2004	114	40	74
2005	116	43	73
2006	98	26	72
2007	74	22	52
2008	70	21	49
2009	59	29	30
2010	43	13	30
2011	43	18	25
2012	46	18	28
2013	41	17	24
2014	86	33	53
2015	72	25	47
Total	3,292	1,138	2,154

Panel B: By target status

	Public targets			Private targets		
Year	# of deals	Require shareholder approval	Not require shareholder approval	# of deals	Require shareholder approval	Not require shareholder approval
1995	71	52	19	161	45	116
1996	100	63	37	234	52	182
1997	131	90	41	248	52	196
1998	147	90	57	268	51	217
1999	115	67	48	216	26	190
2000	105	59	46	258	39	219
2001	83	55	28	91	19	72
2002	32	22	10	65	14	51
2003	44	23	21	61	14	47
2004	36	28	8	78	12	66
2005	48	31	17	68	12	56
2006	29	14	15	69	12	57
2007	22	14	8	52	8	44

2008	24	13	11	46	8	38
2009	32	19	13	27	10	17
2010	16	9	7	27	4	23
2011	17	15	2	26	3	23
2012	16	8	8	30	10	20
2013	12	10	2	29	7	22
2014	28	20	8	58	13	45
2015	32	18	14	40	7	33
Total	1,140	720	420	2,152	418	1,734

Panel C: By methods of payment

	All stock payment			Mixed payment		
Year	# of deals	Require shareholder approval	Not require shareholder approval	# of deals	Require shareholder approval	Not require shareholder approval
1995	164	71	93	68	26	42
1996	212	68	144	122	47	75
1997	211	99	112	168	43	125
1998	243	101	142	172	40	132
1999	201	53	148	130	40	90
2000	239	72	167	124	26	98
2001	82	43	39	92	31	61
2002	30	24	6	67	12	55
2003	35	19	16	70	18	52
2004	34	24	10	80	16	64
2005	31	21	10	85	22	63
2006	24	14	10	74	12	62
2007	17	12	5	57	10	47
2008	12	9	3	58	12	46
2009	17	14	3	42	15	27
2010	7	5	2	36	8	28
2011	9	8	1	34	10	24
2012	6	5	1	40	13	27
2013	8	7	1	33	10	23
2014	16	14	2	70	19	51
2015	12	11	1	60	14	46
Total	1,610	694	916	1,682	444	1,238

Panel D: The sample of all-stock deals

	Public targets			Private targets		
Year	# of deals	Require shareholder approval	Not require shareholder approval	# of deals	Require shareholder approval	Not require shareholder approval
1995	60	44	16	104	27	77
1996	68	38	30	144	30	114
1997	89	62	27	122	37	85
1998	107	67	40	136	34	102
1999	76	39	37	125	14	111

2000	76	42	34	163	30	133
2001	49	35	14	33	8	25
2002	19	17	2	11	7	4
2003	23	13	10	12	6	6
2004	20	19	1	14	5	9
2005	24	19	5	7	2	5
2006	14	10	4	10	4	6
2007	11	9	2	6	3	3
2008	7	7	0	5	2	3
2009	12	11	1	5	3	2
2010	6	4	2	1	1	0
2011	7	7	0	2	1	1
2012	5	4	1	1	1	0
2013	4	4	0	4	3	1
2014	11	11	0	5	3	2
2015	10	9	1	2	2	0
Total	698	471	227	912	223	689

Table 3. Summary statistics

The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. Panel A presents summary statistics for the full sample. Panel B compares the subsample of 694 all-stock deals requiring shareholder approval (i.e., the assignment variable ≥ 20%) with the subsample of 916 all-stock deals without requiring shareholder approval (i.e., the assignment variable < 20%). The last two columns present the tests of differences in means and medians between the two subsamples. Panel C presents the correlation matrix for the sample of all-stock deals. Definitions of all variables are provided in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: The sample of all-stock deals

Variable	Mean	10^{th} percentile	Median	90^{th} percentile	Std Dev
CAR(-1, 1)	0.003	-0.128	-0.008	0.137	0.137
Total assets	2005.750	21.661	151.562	2324.290	10344.580
Market cap	4580.030	45.964	568.319	8385.110	18677.020
M/B	7.924	1.452	4.411	16.310	10.856
Leverage	0.075	0.000	0.007	0.263	0.129
Deal value	1018.580	8.637	79.918	1352.310	5892.750
Relative size	0.786	0.123	0.364	1.776	1.185
Diversifying	0.334	0	0	1	0.472
Tender offer	0.010	0	0	0	0.099
Public target	0.434	0	0	1	0.496
Private target	0.566	0	1	1	0.496

Panel B: Comparing all-stock deals with shareholder approval versus those without shareholder approval

	Require shareholder approval			Not require shareholder approval			Test of difference	
Variable	Mean (1)	Median (2)	Std Dev (3)	Mean (4)	Median (5)	Std Dev (6)	t-test (1) - (4)	Wilcoxon test (2) - (5)
CAR(-1, 1)	-0.002	-0.016	0.157	0.007	-0.004	0.121	-0.009	-0.013***
Total assets	3463.300	190.383	14968.870	901.455	130.106	3954.650	2561.845***	60.276***
Market cap	3554.900	307.259	14874.030	5356.710	767.356	21081.940	-1801.81**	-460.097***
M/B	4.905	2.837	8.208	10.211	6.381	12.003	-5.305***	-3.545***
Leverage	0.126	0.042	0.166	0.036	0.002	0.071	0.089***	0.040***
Deal value	1980.350	148.982	8827.070	289.909	49.818	903.356	1690.441***	99.163***
Relative size	1.120	0.584	1.457	0.533	0.266	0.845	0.587***	0.318***
Diversifying	0.303	0	0.460	0.358	0	0.480	-0.055**	0**
Tender offer	0.006	0	0.076	0.013	0	0.114	-0.007	0
Public target	0.679	1	0.467	0.248	0	0.432	0.431***	1***
Private target	0.321	0	0.467	0.752	1	0.432	-0.431***	-1***

Panel C: Pearson correlation

	CAR(-1, 1)	Total assets	Market cap	M/B	Leverage	Deal value	Relative size	Diversifying	Tender offer	Public target
CAR(-1, 1)	1									
Total assets	-0.0272	1								
Market cap	-0.056**	0.362***	1							
M/B	-0.050**	-0.058**	0.171***	1						
Leverage	-0.02016	0.187***	-0.03587	-0.239***	1					
Deal value	-0.063**	0.529***	0.521***	0.053**	0.065***	1				
Relative size	-0.03721	-0.062**	0.03317	0.332***	-0.187***	0.141***	1			
Diversifying	0.067***	-0.063**	-0.00731	0.01255	-0.042*	-0.03281	-0.02623	1		
Tender offer	-0.042*	0.03137	0.02446	-0.02632	0.01789	0.00608	-0.01045	0.00867	1	
Public target	-0.233***	0.193***	0.154***	-0.156***	0.272***	0.173***	0.101***	-0.104***	0.114***	1

Table 4. Testing local randomization for all baseline characteristics

This table presents balancing tests suggested by Lee and Lemieux (2010) and Roberts and Whited (2013). The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The RD coefficients are estimated by fitting a local linear regression using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) is employed. All variables are defined in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Dep. Var.	Method	Coef.	Std. Err.	Z	P > z
M/B	Conventional	1.789	3.078	0.581	0.561
	Bias-corrected	-1.244	3.078	-0.404	0.686
	Robust	-1.244	3.688	-0.337	0.736
Leverage	Conventional	-0.024	0.019	-1.214	0.225
	Bias-corrected	-0.010	0.019	-0.513	0.608
	Robust	-0.010	0.029	-0.350	0.726
Deal value	Conventional	-42.392	119.300	-0.355	0.722
	Bias-corrected	-117.400	119.300	-0.984	0.325
	Robust	-117.400	194.740	-0.603	0.547
Relative size	Conventional	0.064	0.121	0.527	0.598
	Bias-corrected	0.069	0.121	0.569	0.570
	Robust	0.069	0.196	0.351	0.726
Diversifying	Conventional	-0.017	0.075	-0.234	0.815
	Bias-corrected	0.029	0.075	0.393	0.695
	Robust	0.029	0.109	0.269	0.788
Tender offer	Conventional	-0.018	0.034	-0.518	0.605
	Bias-corrected	-0.023	0.034	-0.666	0.505
	Robust	-0.023	0.043	-0.534	0.593
Public target	Conventional	0.011	0.081	0.130	0.896
	Bias-corrected	0.069	0.081	0.852	0.394
	Robust	0.069	0.151	0.460	0.645

Table 5. Effects of shareholder approval on acquirer announcement returns

This table presents the effect of shareholder approval on acquirer announcement returns. The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The dependent variable is acquirer CAR (-1, 1). Panel A (B) reports RD coefficients of acquirer announcement returns estimated by fitting a local linear regression (a quadratic polynomial model) using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) and the rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (CCT, 2014a, 2014b) are employed. Panel C reports RD coefficients of acquirer residual CAR(-1, 1) which is obtained by regressing acquirer CAR(-1, 1) on firm and deal characteristics (as in Equation (6)), and industry and year fixed effects. All variables are defined in Appendix A. Heteroskedasticity-consistent standard errors (in parentheses) are clustered at the acquirer level ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: RD analysis using local linear regressions

Method	Coef.	Std. Err.	z	P > z
Bandwidth = IK				
Conventional	0.056**	0.027	2.102	0.036
Bias-corrected	0.067**	0.027	2.526	0.012
Robust	0.067**	0.033	2.031	0.042
Bandwidth = CCT				
Conventional	0.082**	0.040	2.055	0.040
Bias-corrected	0.086**	0.040	2.154	0.031
Robust	0.086*	0.047	1.840	0.066

Panel B: RD analysis using local quadratic polynomial models

Method	Coef.	Std. Err.	z	P>z
Bandwidth=IK				
Conventional	0.077**	0.039	1.980	0.048
Bias-corrected	0.157***	0.039	4.047	0.000
Robust	0.157*	0.081	1.942	0.052
Bandwidth=CCT				
Conventional	0.107*	0.055	1.949	0.051
Bias-corrected	0.110**	0.055	2.000	0.045
Robust	0.110*	0.061	1.798	0.072

Panel C: RD analysis using local linear regressions: acquirer residual CAR (-1, 1)

Method	Coef.	Std. Err.	Z	P>z
Bandwidth=IK				
Conventional	0.057**	0.023	2.473	0.013
Bias-corrected	0.064***	0.023	2.783	0.005
Robust	0.064**	0.029	2.252	0.024
Bandwidth=CCT				
Conventional	0.084**	0.037	2.251	0.024
Bias-corrected	0.090**	0.037	2.409	0.016
Robust	0.090**	0.044	2.066	0.039

Table 6: Falsification Tests

This table reports RD estimates of acquirer announcement returns at arbitrary threshold points. The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The dependent variable is acquirer CAR (-1, 1). The RD coefficients are estimated by fitting a local linear regression using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) and the rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (CCT, 2014a, 2014b) are employed. Panel A uses a threshold of 10 percent share issuance. Panel B uses a threshold of 30 percent share issuance. All variables are defined in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: The threshold is 10% of new shares to be issued

Method	Coef.	Std. Err.	z	P > z
Bandwidth = IK				
Conventional	-0.002	0.017	-0.123	0.902
Bias-corrected	-0.007	0.017	-0.439	0.661
Robust	-0.007	0.028	-0.262	0.794
Bandwidth = CCT				
Conventional	-0.006	0.021	-0.278	0.781
Bias-corrected	-0.007	0.021	-0.333	0.739
Robust	-0.007	0.025	-0.283	0.777

Panel B: The threshold is 30% of new shares to be issued

Method	Coef.	Std. Err.	z	P > z
Bandwidth = IK				
Conventional	0.021	0.043	0.500	0.617
Bias-corrected	0.028	0.043	0.655	0.513
Robust	0.028	0.054	0.521	0.602
Bandwidth = CCT				
Conventional	0.006	0.065	0.093	0.926
Bias-corrected	0.000	0.065	-0.004	0.997
Robust	0.000	0.077	-0.003	0.998

Table 7: Heterogeneity in the treatment effect: corporate governance

This table reports the RD analysis for acquirers with different corporate governance practices. The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The dependent variable is acquirer CAR (-1, 1). The RD coefficients of acquirer announcement returns are estimated by fitting a local linear regression using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) and the rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (CCT, 2014a, 2014b) are employed. Panel A presents summary statistics of institutional ownership and ownership by types as classified by Bushee (2001). Panel B compares the treatment effect between acquirers with high institutional ownership (i.e., above the sample median) and acquirers with low institutional ownership (i.e., below the sample median). Panel C compares the treatment effect between acquirers with high ownership by quasi-indexers and acquirers with low ownership by quasi-indexers. All variables are defined in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Summary statistics of institutional ownership and ownership by type

	Institutional ownership		Transient ownership		Quasi-indexer ownership		Dedicated ownership	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1995-1999	0.451	0.446	0.162	0.139	0.178	0.154	0.105	0.069
2000-2009	0.460	0.456	0.187	0.162	0.214	0.176	0.057	0.034
2010-2015	0.544	0.602	0.083	0.039	0.212	0.095	0.024	0.000

Panel B: Acquirers with high institutional ownership vs. acquirers with low institutional ownership

	High institutional ownership				Low institutional ownership			
Method	Coef.	Std. Err.	Z	P > z	Coef.	Std. Err.	Z	P > z
Bandwidth = IK								
Conventional	0.090**	0.044	2.039	0.041	0.040	0.036	1.113	0.266
Bias-corrected	0.107**	0.044	2.437	0.015	0.041	0.036	1.131	0.258
Robust	0.107**	0.053	2.041	0.041	0.041	0.051	0.805	0.421
Bandwidth = CCT								
Conventional	0.101*	0.058	1.733	0.083	0.068	0.061	1.119	0.263
Bias-corrected	0.098*	0.058	1.683	0.092	0.078	0.061	1.291	0.197
Robust	0.098	0.069	1.425	0.154	0.078	0.070	1.126	0.260

Panel C: Acquirers with high quasi-indexer ownership vs. acquirers with low quasi-indexer ownership

	High quasi-indexer ownership				Low quasi-indexer ownership			
Method	Coef.	Std. Err.	Z	P > z	Coef.	Std. Err.	Z	P > z
Bandwidth = IK								
Conventional	0.071*	0.038	1.853	0.064	0.056	0.044	1.289	0.197
Bias-corrected	0.094**	0.038	2.459	0.014	0.069	0.044	1.572	0.116
Robust	0.094*	0.053	1.772	0.076	0.069	0.055	1.249	0.212
Bandwidth = CCT								
Conventional	0.107*	0.059	1.810	0.070	0.081	0.065	1.245	0.213
Bias-corrected	0.118**	0.059	1.993	0.046	0.092	0.065	1.412	0.158
Robust	0.118*	0.069	1.715	0.086	0.092	0.075	1.230	0.219

Table 8. Heterogeneity in the treatment effect: information asymmetry

This table reports the RD analysis for acquirers with different degrees of information asymmetry. The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The dependent variable is acquirer CAR (-1, 1). The RD coefficients of acquirer announcement returns are estimated by fitting a local linear regression using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) and the rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (CCT, 2014a, 2014b) are employed. Panel A compares acquirers with private targets and acquirers with public targets. Panel B compares acquirers with low-coverage (i.e., below the sample median) targets and acquirers with high-coverage targets. All variables are defined in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Acquirers with private targets vs. acquirers with public targets

	Private targets				Public targets			
Method	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.101**	0.043	2.352	0.019	0.026	0.033	0.782	0.434
Bias-corrected	0.134***	0.043	3.123	0.002	0.035	0.033	1.065	0.287
Robust	0.134**	0.061	2.193	0.028	0.035	0.060	0.582	0.561
Bandwidth = CCT								
Conventional	0.160**	0.069	2.338	0.019	0.020	0.051	0.400	0.689
Bias-corrected	0.179***	0.069	2.603	0.009	0.008	0.051	0.159	0.874
Robust	0.179**	0.078	2.300	0.021	0.008	0.059	0.137	0.891

Panel B: Acquirers with low-coverage targets vs. acquirers with high-coverage targets

	Low-coverage targets				High-coverage targets			
Method	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.080**	0.038	2.104	0.035	-0.001	0.040	-0.026	0.979
Bias-corrected	0.126***	0.038	3.331	0.001	-0.025	0.040	-0.624	0.533
Robust	0.126**	0.055	2.288	0.022	-0.025	0.169	-0.148	0.882
Bandwidth = CCT								
Conventional	0.111**	0.053	2.078	0.038	-0.031	0.094	-0.331	0.741
Bias-corrected	0.118**	0.053	2.216	0.027	-0.046	0.094	-0.491	0.623
Robust	0.118*	0.064	1.853	0.064	-0.046	0.104	-0.444	0.657

Table 9: Combined CAR and acquirer's share of gains sorted by analyst coverage

This table presents possible mechanisms behind the treatment effect of shareholder approval. The sample consists of all-stock deals involving public target firms announced between 1995 and 2015 from the Thomson One Banker SDC database. The RD coefficients are estimated by fitting a local linear regression using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) and the rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (CCT, 2014a, 2014b) are employed. Panel A presents the RD coefficients when the dependent variable is combined CAR. Panel B presents the RD coefficients when the dependent variable is the acquirer's share of merger gains. All variables are defined in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Combined CAR

	Low-coverage targets				High-coverage targets			
Method	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.083**	0.035	2.414	0.016	0.015	0.035	0.413	0.680
Bias-corrected	0.116***	0.035	3.356	0.001	-0.063*	0.035	-1.794	0.073
Robust	0.116***	0.044	2.681	0.007	-0.063	0.159	-0.398	0.691
Bandwidth = CCT								
Conventional	0.115**	0.046	2.521	0.012	-0.038	0.080	-0.474	0.636
Bias-corrected	0.116**	0.046	2.538	0.011	-0.056	0.080	-0.696	0.486
Robust	0.116**	0.055	2.105	0.035	-0.056	0.088	-0.637	0.524

Panel B: The acquirer's share of gains

	Low-coverage targets				High-coverage targets			
Method	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.110**	0.045	2.443	0.015	-0.015	0.033	-0.443	0.658
Bias-corrected	0.139***	0.045	3.083	0.002	0.094***	0.033	2.835	0.005
Robust	0.139**	0.056	2.482	0.013	0.094	0.267	0.353	0.724
Bandwidth = CCT								
Conventional	0.162**	0.068	2.390	0.017	-0.028	0.091	-0.309	0.758
Bias-corrected	0.182***	0.068	2.687	0.007	-0.039	0.091	-0.426	0.670
Robust	0.182**	0.076	2.398	0.016	-0.039	0.102	-0.381	0.703

Table 10. Acquirer post-merger operating performance

This table presents the treatment effect of shareholder approval on acquirer post-merger operating performance. The sample consists of 1,610 all-stock deals announced between 1995 and 2015 from the Thomson One Banker SDC database. The RD coefficients are estimated by fitting a local linear regression using a triangular kernel to the left and right of the 20% threshold. The optimal bandwidth from Imbens and Kalyanaraman (IK, 2011) and the rule-of-thumb bandwidth from Calonico, Cattaneo, and Titiunik (CCT, 2014a, 2014b) are employed. Panel A presents the RD coefficients of acquirer ROA three years after the deal completion. Panel B presents the RD coefficients of acquirer operating margin three years after the deal completion. Panel C presents the RD coefficients of acquirer free cash flow three years after the deal completion. All variables are defined in Appendix A. ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: ROA

	High institutional ownership				Low institutional ownership			
Method	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.095**	0.047	2.024	0.043	0.006	0.104	0.054	0.957
Bias-corrected	0.142***	0.047	3.016	0.003	-0.211**	0.104	-2.027	0.043
Robust	0.142**	0.062	2.297	0.022	-0.211	0.180	-1.170	0.242
Bandwidth = CCT								
Conventional	0.152*	0.080	1.894	0.058	-0.147	0.167	-0.879	0.379
Bias-corrected	0.165**	0.080	2.058	0.040	-0.181	0.167	-1.088	0.276
Robust	0.165*	0.094	1.765	0.078	-0.181	0.193	-0.940	0.347
	High quasi-indexer ownership				Low quasi-indexer ownership			
Method	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.152**	0.066	2.300	0.021	0.107	0.147	0.728	0.467
Bias-corrected	0.197***	0.066	2.973	0.003	-0.190	0.147	-1.290	0.197
Robust	0.197**	0.085	2.328	0.020	-0.190	0.211	-0.897	0.370
Bandwidth = CCT								
Conventional	0.288***	0.104	2.781	0.005	-0.126	0.131	-0.961	0.337
Bias-corrected	0.323***	0.104	3.117	0.002	-0.163	0.131	-1.237	0.216
Robust	0.323***	0.119	2.730	0.006	-0.163	0.147	-1.108	0.268

Panel B: Operating margin

	High institutional ownership				Low institutional ownership			
	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.178***	0.053	3.388	0.001	-0.014	0.098	-0.147	0.883
Bias-corrected	0.233***	0.053	4.446	0.000	-0.075	0.098	-0.767	0.443
Robust	0.233***	0.067	3.467	0.001	-0.075	0.150	-0.500	0.617
Bandwidth = CCT								
Conventional	0.220***	0.068	3.263	0.001	-0.135	0.157	-0.856	0.392
Bias-corrected	0.244***	0.068	3.622	0.000	-0.174	0.157	-1.107	0.268
Robust	0.244***	0.079	3.107	0.002	-0.174	0.170	-1.026	0.305

	High quasi-indexer ownership				Low quasi-indexer ownership			
	Coef.	Std. Err.	z	P > z	Coef.	Std. Err.	z	P > z
Bandwidth = IK								
Conventional	0.174***	0.062	2.793	0.005	0.029	0.107	0.268	0.789
Bias-corrected	0.211***	0.062	3.389	0.001	-0.009	0.107	-0.087	0.931
Robust	0.211***	0.078	2.702	0.007	-0.009	0.162	-0.057	0.954
Bandwidth = CCT								
Conventional	0.212***	0.075	2.831	0.005	-0.003	0.157	-0.016	0.987
Bias-corrected	0.237***	0.075	3.164	0.002	-0.040	0.157	-0.257	0.797
Robust	0.237***	0.090	2.653	0.008	-0.040	0.171	-0.236	0.813

Panel C: FCF

	High institutional ownership				Low institutional ownership			
Bandwidth = IK								
Conventional	0.198***	0.055	3.582	0.000	0.009	0.092	0.094	0.925
Bias-corrected	0.246***	0.055	4.451	0.000	0.052	0.092	0.562	0.574
Robust	0.246***	0.067	3.699	0.000	0.052	0.120	0.429	0.668
Bandwidth = CCT								
Conventional	0.232***	0.067	3.454	0.001	0.030	0.146	0.207	0.836
Bias-corrected	0.257***	0.067	3.840	0.000	0.028	0.146	0.190	0.850
Robust	0.257***	0.078	3.316	0.001	0.028	0.169	0.163	0.870
	High quasi-indexer ownership				Low quasi-indexer ownership			
Bandwidth = IK								
Conventional	0.159**	0.074	2.149	0.032	0.041	0.084	0.481	0.631
Bias-corrected	0.185**	0.074	2.489	0.013	0.133	0.084	1.576	0.115
Robust	0.185**	0.087	2.118	0.034	0.133	0.131	1.017	0.309
Bandwidth = CCT								
Conventional	0.173**	0.088	1.968	0.049	0.140	0.145	0.963	0.335
Bias-corrected	0.191**	0.088	2.175	0.030	0.149	0.145	1.026	0.305
Robust	0.191*	0.106	1.801	0.072	0.149	0.170	0.874	0.382