

# Shareholder Cross-holdings and Their Effect on Acquisition Decisions\*

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**Abstract:** We document the magnitude and determinants of institutional shareholder cross-holdings. Cross-holdings are created when a shareholder of one firm holds shares in other firms as well. We find that shareholder cross-holdings have risen rapidly over the last twenty years. Cross-holdings are higher the more alike two firms are on a number of dimensions, such as size and performance, suggesting that institutional investing screens result in common holdings in similar firms. Further, we examine the influence of these cross-holdings on bidder managers' selection of acquisition targets. We observe large cross-holdings by some institutional shareholders in an average acquisition and by a majority of institutional shareholders in a significant number of deals. There is strong evidence that bidder managers consider their shareholders' cross-holdings when choosing targets. We conclude that shareholder cross-holdings are sizeable and, at least in the case of acquisitions, affect managerial decisions.

**Keywords:** cross-holdings, institutional investors, target selection, mergers and acquisitions, toeholds

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Direct corporate cross-holdings are common in Europe and Asia (La Porta, Lopez-de-Silanes, and Shleifer (1999)). In this paper, we examine indirect cross-holdings created when institutional shareholders of one US firm hold shares in other US firms as well. Such cross-holdings determine shareholder preferences over managerial decisions that affect those other firms. Aside from documenting their magnitude and determinants, our goal is to examine whether shareholder cross-holdings influence managerial decisions. One decision where cross-holdings are clearly measurable and have the potential to be important is in the selection of an acquisition target. A corporate acquisition almost always results in large value gains for the owners of the target (Jensen and Ruback (1983); Andrade, Mitchell, and Stafford (2001)). As a result, shareholders of the acquirer should be more favorably inclined towards a proposed takeover if they are also shareholders of the target.

The insight that cross-holdings by shareholders alter their preferences over takeover decisions is a special case of the general result that diversified shareholders prefer corporate policies that maximize their portfolio values to policies that narrowly maximize the values of individual firms (Easterbrook and Fischel (1982); Hansen and Lott (1996); Rubin (2006); Matvos and Ostrovsky (2007)). In general, however, externalities on other firms imposed by managers' decisions are likely to be small or hard to estimate, so in a bounded-rationality framework, it makes sense for managers to focus on own firm value. In corporate acquisitions, one of the externalities is large and easily computed, and hence the opportunity to maximize the wealth of the majority of the shareholders is present. Thus, we use merger bids as the experimental setting in which we test whether managers are influenced by their shareholders' cross-holdings in selecting acquisition targets.

A shareholder who owns equity in two firms is naturally concerned with the effect of managers' decisions, for example a takeover bid, on both firms' stock prices. We formally show that the shareholder's preferences over corporate actions are determined by the ratio of her percentage stakes in the two firms. In an acquisition setting, the preferences of a bidder

shareholder are thus given by the ratio of her percentage stake in the target to her percentage stake in the bidder. This ratio, which we call the bidder shareholder cross-holding, fully captures the objective function that the shareholder wants bidder management to use. In particular, the shareholder wants bidder management to act as if the bidding firm itself had a direct stake (or toehold) in the target equal to her cross-holding. Thus, a shareholder who owns five percent of the bidder and two percent of the target wants bidder management to act as if the bidder had a  $2\% / 5\% = 40\%$  toehold in the target. In all toehold models considered in the prior literature, a toehold tends to make a bidder more willing to pursue an acquisition. Intuitively, both a direct toehold by the bidder and cross-holdings by bidder shareholders imply that some of the takeover gains that accrue to the target end up in bidder shareholders' pockets instead. Therefore, cross-holdings by bidder shareholders in a potential target should make it more attractive to the bidder.

Managers who want to take their shareholders' cross-holdings into consideration face the challenge that different shareholders have different cross-holdings in any other firm, with many shareholders holding no shares in the other firm at all. The resulting differences in shareholders' preferences make it far from obvious which decision rules managers should adopt, and even less so which rules they will adopt. We therefore use several complementary measures of institutional shareholder preferences in the empirical analysis. We focus on institutional (as opposed to individual) cross-holdings because of data availability. Two intuitively appealing solutions to the aggregation problem are for managers to maximize a weighted average of shareholder preferences, or for management to simply adopt the preferences of its median shareholder. The median institutional shareholder in our context is defined such that 50% of a firm's institutional shares are held by shareholders with smaller cross-holdings and 50% by shareholders with larger cross-holdings. Thus, policies appealing to the median institution will have the support of at least 50% of institutional shareholder votes.

We begin by documenting the magnitude of institutional cross-holdings between S&P 500 firms in each of 1985, 1995, and 2005. The main finding is that institutional cross-holdings

have risen rapidly over time and have reached remarkably high levels by 2005. We find that 50% of the institutional shares in an average S&P 500 firm are held by investors with mean cross-holdings in other S&P 500 firms of at least 6.0% in 1985, 14% in 1995, and 29% in 2005. Put differently, the median institutional investor in a given S&P 500 firm has seen the average ratio of her percentage stake in a randomly selected second index firm to her stake in the first one rise from 6% to 29% over twenty years. This implies that by 2005, the median institutional investor of an average S&P 500 firm wants management to internalize 29% of any externalities imposed on other firms in the index. Equally strikingly, in a hypothetical conflict (such as a patent dispute) between two S&P 500 firms in 2005, more than 20% of the institutional holdings in either firm would on average be held by investors who prefer the other side to win. We confirm that our results are not due solely to indexing. The cross-holdings in the next 100 largest firms outside the S&P 500 index, while naturally smaller, confirm the conclusion that cross-holdings are rising and significant

To determine the cross-sectional drivers of institutional cross-holdings, we estimate a model of cross-holdings based on firm characteristics and distance measures for characteristics such as size, market-to-book, and prior stock return. We find that the more alike two firms are on any of these dimensions, the greater are their institutional cross-holdings. This is consistent with our conjecture that institutional investors apply size- and performance-based selection screens to the universe of stocks, with the result that firms with similar characteristics will be held by the same institution. We find few changes in the cross-sectional determinants of institutional cross-holdings over time.

Merger bids are a salient example of one firm imposing a large (positive) externality on the value of a second firm, and hence a natural setting in which to study the effect of cross-holdings. We first document the size of institutional cross-holdings in a comprehensive sample of mergers and acquisitions from 1984 to 2006. We find that the bidder's median institutional

shareholder has an average cross-holding of 6.2% in the target.<sup>1</sup> The average cross-holdings in targets are smaller than between S&P 500 firms, mostly because acquisition targets tend to be comparatively small firms with much lower institutional ownership. The distribution of cross-holdings is strongly skewed both across bidders and across institutional shareholders in a given bidder; in five percent of the bidders, the median institution has a cross-holding of more than 46% in the target. On average, 20% of the institutional holdings in the bidder are by investors with cross-holdings of more than 38%, and ten percent of the institutional holdings are by investors with cross-holdings of more than 79%. Hence many institutional investors want bidder management to act as if the bidder had a large toehold in the target.

We further show that cross-holdings are remarkably stable over the year prior to the acquisition event. This suggests that institutional investors with stakes in both bidder and target firms do not change their holdings in anticipation of a takeover attempt nor take strategic stakes to influence the bid decision. Similar to our results in the S&P 500 sample, we find that bidder institutional cross-holdings in targets are greater the more alike the two firms are in terms of their size and performance characteristics.

Turning to the question of whether cross-holdings influence managerial decisions, we find that cross-holdings by bidder shareholders are important in management's choice of takeover targets. Chosen target firms have significantly higher cross-holdings by bidder institutions than do non-target control firms, and the actual bidder-target pair has much higher institutional cross-holdings than alternative pairs formed from matched control firms. This relation continues to hold when we control for both the drivers of cross-holdings we identified before and for known determinants of target selection. Hence the overlap in institutional investors between the bidder and target is significantly larger than expected based on the characteristics of the two firms alone. Further, when we estimate a model predicting which firm

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<sup>1</sup> In other words, the ratio of the median bidder institution's holdings in the target to its holdings in the bidder is on average 6.2%. For this calculation the sample of bidders is restricted to firms whose institutional investors own at least 20% of the outstanding equity.

is chosen by a given bidder as its target, bidder institutional cross-holdings in the potential targets are an important determinant. A one standard deviation increase in the median cross-holding by bidder shareholders increases the probability that a firm is chosen as target by 8.8 percentage points. These results strongly suggest that bidder management takes its shareholders' cross-holdings into account when selecting between takeover targets.

A natural question is how the management team of the bidder comes to know about its institutional shareholders' cross-holdings in other firms. Institutional investors may convey this information through their representatives on boards of directors or through private or public communication with management (Smith (1996); Carleton, Nelson, and Weisbach (1998)). Furthermore, investment banks in their role as M&A advisors to bidding firms customarily create lists of the largest shareholders in the bidder and the target to help predict their likely reaction to a takeover bid. In this process, any significant overlap in institutional investors is generally highlighted to bidder management.

In related and independent work, Matvos and Ostrovsky (2007) analyze the conflicts of interests between shareholders with and without cross-holdings and argue that cross-holdings can explain the on average negative returns to acquiring firms in takeovers. They propose that bidder institutional shareholders fail to block apparently bad takeover deals because these institutions also own stakes in targets and make up the losses from the former with gains from the latter. Different from our work, they do not analyze shareholder cross-holdings in general, their determinants, or their evolution over time. Our analysis shows that the vast majority of bidder institutions hold much larger stakes in the bidder than in the target. When we focus on acquisitions with negative abnormal announcement returns for the bidder, we find that only 4.7% of the institutional holdings in the bidder are on average held by institutions whose stakes in the target are large enough to make up for their losses from the bidder. Some of these institutions earn very high returns, but given the small percentage of bidder shares controlled by such

investors, their influence is likely to be limited. Our results suggest that shareholder cross-holdings are unlikely to explain why bidder institutions as a group fail to block bad takeovers.<sup>2</sup>

The plan of the paper is as follows. The next section analyzes the effects of cross-holdings on shareholders' and firms' objectives and develops our hypotheses. Section II describes our data and variables used in the empirical analysis. Section III first presents summary statistics on the size and prevalence of cross-holdings over time and their determinants, and then examines their effects on target selection. The last section summarizes and concludes.

## I. Hypothesis Development

This section examines how cross-holdings affect shareholders' preferences over corporate decisions, and how management may aggregate its shareholders' preferences when making decisions. We frame our discussion in terms of a corporate acquisition, but the results apply to any corporate action that imposes an externality on other firms in a shareholder's portfolio. Based on the theoretical analysis, we then present our hypotheses.

### I.A. Shareholder preferences with cross-holdings

Consider a shareholder who owns shares in both a bidder and its target. The stand-alone values of the bidder and the target are given by  $V_B$  and  $V_T$ , respectively. The acquisition generates synergies with a value of  $S$ , and the price the bidder needs to offer for the acquisition to succeed is  $P$ .<sup>3</sup> If our shareholder owns  $\alpha_B$  percent of the bidder and  $\alpha_T$  percent of the target, then her pre-acquisition wealth is simply:

$$W_{pre-deal} = \alpha_B \cdot V_B + \alpha_T \cdot V_T \tag{1}$$

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<sup>2</sup> Matvos and Ostrovsky (2007) also show that mutual funds that hold shares in both a bidder and its target are more likely to vote to approve mergers with negative announcement returns. This finding suggests that institutional investors do pay attention to interactions between the firms in their portfolios and is very much consistent with our results.

<sup>3</sup> We abstract away from uncertainty about the level of synergies and about the success probability of the acquisition attempt.

Her wealth gain or loss from the acquisition depends on her stakes in the two firms and the distribution of takeover gains between the firms:

$$W_{post-deal} = \alpha_B \cdot (V_B + V_T + S - P) + \alpha_T \cdot (P) \quad (2a)$$

$$\Delta W_{pre-to-post-deal} = \alpha_B \cdot (V_T + S - P) + \alpha_T \cdot (P - V_T) \quad (2b)$$

The terms in the first parentheses in (2b) are the takeover gains to bidder shareholders, and the terms in the second parentheses are the gains to target shareholders. A shareholder with stakes in both firms can benefit and/or lose on both sides of the deal, depending on the size and distribution of the takeover gains. Such a shareholder will support any deal for which her total wealth gain in (2b) is positive. This shareholder sees her wealth maximized if management maximizes the weighted average of bidder and target values given in (2a).

It follows that a shareholder with stakes in both bidder and target wants bidder management to maximize an objective function that puts positive weights on both bidder and target values. We gain further insight by rescaling the shareholder's objective function in (2a) as follows:

$$\hat{W}_{post-deal} = (V_B + V_T + S - P) + \frac{\alpha_T}{\alpha_B} \cdot (P) \quad (3)$$

Hence our shareholder wants bidder management to put a weight of  $(\alpha_T/\alpha_B)$  on target value and thus to effectively internalize  $(\alpha_T/\alpha_B)$  percent of the takeover gains accruing to target shareholders. But the objective function in (3) is simply the objective of a value-maximizing bidding firm that owns a toehold of  $(\alpha_T/\alpha_B)$  percent in the target (see, for example, Shleifer and Vishny (1986); Hirshleifer and Titman (1990)). Hence a bidder shareholder with cross-holdings of  $(\alpha_T/\alpha_B)$  wants bidder management to act as if the bidder itself had a direct toehold of size  $(\alpha_T/\alpha_B)$ . This motivates our focus on the distribution of these cross-holdings by bidder shareholders in our empirical analysis in Section III.



In models of takeover bidding with toeholds, toeholds make bidders more willing to pursue an acquisition.<sup>4</sup> The intuitive reason is that a toehold bidder is able to capture some of the takeover gains accruing to target shareholders. By the same logic, corporate managers that consider their shareholders' cross-holdings will find firms in which their shareholders own higher stakes to be more attractive takeover targets. The reason is once again that some of the takeover gains accruing to target shareholders will be captured by the bidder's own shareholders. Cross-holdings by bidder shareholders in a potential target should thus make an acquisition bid more likely.

### **I.B. Aggregation of shareholder preferences by bidder management**

The cross-holdings are by construction shareholder-specific and range from zero to several hundred percent in most bidder-target combinations. Management thus faces the question of how to aggregate the diverging preferences of its shareholders into a decision rule for the overall firm. Even if we assume that managers wish to maximize the wealth of their shareholders, theory provides little guidance as to how bidder management should aggregate its shareholders' preferences, and what weight to ultimately attach to the target value in its objective function. We continue to frame our discussion in the context of an acquisition, even though this aggregation problem arises in any setting in which cross-holdings are relevant. Two intuitively appealing solutions to the aggregation problem are for managers to adopt the preferences of its median shareholder, or for managers to maximize a weighted average of shareholder preferences.

Under the median-shareholder criterion, bidder management pursues all takeover deals which are supported by the owners of a majority of its shares. Because of data availability, our empirical analysis will focus on the preferences of *institutional* shareholders. We define the *median institutional shareholder* of a firm such that 50% of institutional holdings in the firm are

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<sup>4</sup> This statement holds true as long as some positive takeover gains accrue to target shareholders. See, for example, Shleifer and Vishny (1986), Hirshleifer and Titman (1990), Chowdhry and Jegadeesh (1994), Burkart (1995), and Singh (1998).

held by investors with larger cross-holdings and 50% by investors with smaller cross-holdings. Since a larger cross-holding makes a bidder shareholder more likely to support an acquisition, the median institutional shareholder defines the most aggressive acquisition strategy managers can implement while retaining the support of a majority of institutional shareholders' votes.

The median-shareholder criterion by design ignores the preferences of most shareholders. Alternatively, managers may try to maximize a weighted average of all their shareholders' subjective preferences. While it is not obvious what weights management should use to aggregate shareholder preferences, most reasonable weighting schemes would imply that managers become more willing to pursue an acquisition even if only 10% or 20% of their institutional shareholders have equity stakes in the target.<sup>5</sup> In our empirical analysis, we will therefore document the preferences both of the median institutional shareholder in each firm and of the subsets of institutional shareholders with the highest cross-holdings, and examine whether their preferences are reflected in bidder management's choice of acquisition targets.

Institutional cross-holdings will only affect corporate decisions if management does in fact consider the portfolios of its shareholders, and/or if diversified institutional shareholders have the means to impose portfolio-value maximization on management. *A priori*, there are several reasons to expect that managers may ignore their shareholders' cross-holdings in other firms. Large concentrated shareholders, such as founding families or venture capitalists, are unlikely to own any cross-holdings in target firms, but are likely to be active in corporate governance and to exert influence over managers. Further, the compensation of top executives is heavily biased towards stock options and restricted stock and thus ultimately depends on own-firm performance (Murphy (1999)). Hence managers are given strong incentives to maximize the

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<sup>5</sup> Drèze (1974) uses shareholders' ownership stakes as weights to aggregate heterogeneous shareholder preferences. Interestingly, applying this weighting scheme to cross-holdings amounts to simply adding up the bidder shareholders' percentage stakes in the target, and hence yields aggregate preferences as if there were a perfect coalition among bidder shareholders. This degree of coordination between shareholders is unrealistic, and we opt not to use this aggregation scheme in the empirical analysis. We do, however, consider the possibility that the largest institutional shareholders may align their preferences through negotiated side-payments.

performance of their own firm, but few obvious incentives to care about any externalities they impose on other firms in their shareholders' portfolios.

The degree to which cross-holdings matter thus depends on the ability of cross-holding investors to influence management. Institutional shareholders with cross-holdings may be able to influence corporate decisions through their representatives on boards of directors, voting at shareholders' meetings, and private or public communication with the management team (Smith (1996); Carleton, Nelson, and Weisbach (1998)). Whether management takes its institutional shareholders' portfolios into account is ultimately an empirical question which we attempt to answer in Section III.

### **I.C. Hypothesis development**

Our goal is to document the magnitude and determinants of institutional cross-holdings and to examine whether they influence managerial decisions. Our specific hypotheses relate to how institutional investors select firms to invest in and to the effects of rising institutional ownership over time. In particular, it is likely that any given institutional investor applies characteristics-based investment screens to the universe of stocks and invests in a subset of firms that pass those screens. This leads to stocks with similar size and performance characteristics having greater cross-holdings by that investor. If institutional investing screens are correlated across institutions, then this effect will be compounded by multiple institutions holding shares in those similar firms. Thus, we expect:

- For any two firms, there is a negative association between shareholder cross-holdings and measures of how different those two firms are in their characteristics and performance.

Further, because of increasing institutional ownership and diversification, we expect:

- The magnitude and prevalence of cross-holdings has been rising over time.

More overlap between bidder and target shareholders implies that more of the takeover gains accruing to the target end up in the pockets of bidder shareholders. Assuming that bidder management pays attention to the overall wealth of its shareholders, higher cross-holdings make it more likely that the benefits to bidder shareholders exceed the acquisition cost and thus that the bid goes ahead. Hence, if managers consider investor cross-holdings when making acquisitions, we expect:

- There is a positive association between cross-holdings by a bidder's shareholders in a potential target and, *ceteris paribus*, the likelihood that firm will be targeted.

## **II. Sample Formation and Variable Construction**

### **II.A. Sample selection**

We employ two different samples in our empirical analysis. The first sample starts with all firms in the S&P 500 index in each of 1985, 1995, and 2005. We match these firms with Compustat and CRSP and with the CDA/Spectrum 13F data on institutional shareholdings.<sup>6</sup> The final firm count in the first sample is 447 S&P 500 firms in 1985, 446 firms in 1995, and 459 firms in 2005.

The second sample begins with all announced (both completed and cancelled) US mergers with announcement dates between January 1, 1984 and December 31, 2006 as identified from the Mergers and Acquisitions database of Thomson Financial's SDC database. We identify all deals where both the bidder and the target are public firms and the form of deal was coded as a merger, an acquisition of majority interest, or an acquisition of assets. After applying the above filters, we get 9,260 deals. The sample period is chosen because the information in SDC is less complete before 1984.

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<sup>6</sup> A 1978 amendment to the Securities and Exchange Act of 1934 requires all institutions with greater than \$100 million of equity securities under discretionary management to report every quarter all common-stock positions greater than 10,000 shares or \$200,000 using the SEC's form 13F.

Next, we match our bidders and targets with Compustat and CRSP data, and only retain an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% after the bid. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. These filters yield 3,639 deals. Finally, we merge the acquisition data with the CDA/Spectrum 13F data on institutional shareholdings in the bidder and the target. Our final sample has 3,540 merger attempts where both the bidder and the target have data on institutional shareholdings in the quarter-end prior to the bid announcement.

Ideally, we would also like to measure cross-holdings at the individual investor level. Using data on institutional investors adds a layer of intermediation between individual investors and firms, and makes it difficult to assess the extent to which the ultimate owners of the assets are diversified across firms. However, given the greater size of their stakes, the cross-holdings of institutional investors are more likely to be reflected in company policies than the cross-holdings of individuals. When interpreting our results it is nevertheless useful to keep in mind that we do not observe the portfolios of non-institutional investors and therefore miss potentially significant cross-holdings. In a similar vein, an institutional portfolio reported to the SEC may be an aggregate of multiple distinct portfolios managed by the institution, adding noise to our measure of cross-holdings.

## **II.B. Measuring cross-holdings**

From Section I we know that shareholders' preferences over corporate actions that affect the value of another firm are determined by the shareholders' cross-holdings, given by their percentage ownership of the other firm divided by their percentage ownership of the first firm. Since different shareholders have different portfolios, their cross-holdings and hence their preferences over corporate actions will differ.

It is worth emphasizing that the cross-holdings between any two firms are not symmetric. The institutional shareholders of firm A may collectively own 30% of firm B, while the

institutional shareholders of firm B collectively own 20% of firm A. Similarly, the median institutional shareholder of firm A may have a very different cross-holding in firm B than the median institutional shareholder of firm B has in firm A. This implies that we will obtain two sets of numbers for each pair of firms—the cross-holdings of firm A’s institutional investors in firm B, and the cross-holdings of firm B’s institutional investors in firm A. For clarity, we call the firm from whose perspective cross-holdings are computed the *base* firm, and the firm in which the cross-ownership stakes are held the *cross-held* firm. Thus when describing the cross-holdings of firm A’s institutional shareholders in firm B, we label A the base firm and B the cross-held firm and define a cross-holding as an investor’s percentage stake in the cross-held firm (B) divided by her percentage stake in the base firm (A).

We adopt three complementary approaches to describing the distribution of cross-holdings between a given pair of firms. Since we do not observe the portfolios of non-institutional investors, we focus most of our analysis on the cross-holdings of institutional investors and restrict our sample to firms that have at least 20% of their equity owned by institutions. This restriction excludes firms in which institutional investors are unlikely to have any influence on management.

The first approach to measuring shareholder preferences captures what percentage of the institutional holdings in the base firm is by investors with large cross-holdings and what percentage is by investors with small or no cross-holdings in the cross-held firm. Figure 1 illustrates the approach. Specifically, we order all institutional investors in the base firm by their cross-holdings and calculate the (marginal) cross-holding for the top 1, 5, 10, 20, and 50 percent of institutional shareholdings (labeled the *top-1%*, *top-5%*, *top-10%*, *top-20%*, and *median cross-holding*, respectively). For example, a *top-10% cross-holding* of 75% means that ten percent of the institutional ownership in the base firm is by investors with cross-holdings of at least 75% in the cross-held firm. Of particular interest is the cross-holding of the median institutional shareholder in the base firm. This *median cross-holding* determines the range of corporate

decisions that the base firm can pursue while maintaining the support of the majority of its institutional shareholders' votes. To complement the analysis for institutional shareholders, we also report cross-holdings for *all* shareholders of the base firm by making the conservative assumption that all non-institutional investors in the base firm have zero holdings in the cross-held firm.

The above approach to measuring cross-holdings ignores the fact that shareholders differ greatly in their ability to impose their preferences on management. We expect managers to be most responsive to the preferences of their largest shareholders; hence our next two approaches look explicitly at the cross-holdings of base-firm blockholders, defined as institutional investors who own at least five percent of the shares. Specifically, we order the blockholders by their cross-holdings, and then report the (marginal) cross-holding for the top 5, 10, 20, 50, 75, and 100 percent of all shares owned by blockholders, in parallel to the calculations for institutional investors described above.

Finally, we consider the possibility that blockholders might coordinate their actions and negotiate side-payments with each other. With costless bargaining, the Coase Theorem (Coase (1960)) predicts that the blockholders should act in unison and support any corporate decision that is profitable for all blockholders combined. The aggregate preferences of any coordinated group of investors are determined by their combined cross-holding, given by the sum of their equity stakes in the cross-held firm divided by the sum of their stakes in the base firm. In reality, coordination between blockholders may not be costless and side-payments are likely to be restricted by law.<sup>7</sup> Hence the combined cross-holding should be interpreted as an upper bound on the cross-holdings the blockholders may bring to bear on the base firm's decision process.

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<sup>7</sup> The Securities and Exchange Commission passed new rules in 1992 allowing shareholders to directly communicate with each other (SEC (1992)). Thus, the costs of creating shareholder coalitions were substantially reduced.

### **III. Empirical Results**

We first examine the magnitude and determinants of institutional cross-holdings between firms in the S&P 500. We then repeat the analysis for a comprehensive sample of bidder-target pairs. Finally, we formally test and reject the null hypothesis that bidder shareholder cross-holdings have no effect on target selection.

#### **III.A. The size and pervasiveness of cross-holdings**

Using the S&P 500 index in 1985, 1995, and 2005, we form all possible pairs of firms that are in the index in the same year. For each firm, we then calculate its shareholders' cross-holdings in every other index firm. Table 1 summarizes the empirical distribution of the pairwise cross-holdings in the three sample years. In Part I of Panels A to C, we calculate cross-holdings for the top 1, 5, 10, 20, and 50 percent of a firm's *institutional* shareholders and limit the calculation to base firms with total institutional ownership no less than 20%. The main result of Table 1 is that institutional cross-holdings have risen rapidly over time and have reached remarkably high levels by 2005. Fifty percent of the institutional shares in an average S&P 500 firm are held by investors with mean cross-holdings in other S&P 500 firms of at least 6.0% in 1985, 14% in 1995, and 29% in 2005 (the "Median Cross-holding" row). Thus, the median institutional investor in an S&P 500 firm has seen her average cross-holding in a randomly selected second S&P 500 firm rise from 6% to 29% over twenty years. As a result, by 2005, this median institutional investor wants management to internalize 29% of any externalities imposed on other firms in the index. Equally strikingly, in a hypothetical conflict between two randomly chosen S&P 500 firms in 2005, more than 20% of the institutional holdings in either firm would



on average be held by investors who prefer the other side to win (the “Top-20% Cross-holding” row).<sup>8</sup>

In Part II of Panels A to C, we calculate cross-holdings for the top 1, 5, 10, 20, and 50 percent of *all* shareholders, assuming that the cross-holdings of non-institutional investors are zero. With this assumption, 50% of the shares in an average S&P 500 firm are held by investors with mean cross-holdings in other index firms of at least 0.1% in 1985, 0.4% in 1995, and 5.8% in 2005. These comparatively small numbers are a direct result of the assumed zero cross-holdings for non-institutional shareholders. However, even under this conservative assumption, 20% of an average S&P 500 firm’s shares in 2005 are controlled by shareholders with mean cross-holdings of more than 83% in a randomly chosen second index firm (the “Top-20% Cross-holding” row).

While surprising in its magnitude, the rise in cross-holdings is consistent with the increasing role of institutional investors in equity markets documented by Gompers and Metrick (2001) and with the rise of index and quasi-index investing as an investment style (see, for example, Cremers and Petajisto (2007)). The results in Table 1 indicate that by 2005, the typical institutional investor in an S&P 500 firm should not be satisfied if managers narrowly maximize the value of their own firm. Instead institutional investors would see their portfolio values maximized if managers internalized a substantial percentage of any externalities imposed on other firms in the index. Whether managers do in fact pay any attention to their shareholders’ cross-holdings is a question we test in the context of mergers and acquisitions in Section III.G.

### **III.B. The cross-sectional determinants of cross-holdings**

We next examine whether and how institutional investor cross-holdings between S&P 500 firms vary with the characteristics of the firms. These cross-sectional determinants of cross-

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<sup>8</sup> Investors with cross-holdings above 100%, i.e., investors who own a higher percentage stake of the cross-held firm than of the base firm, reap a net benefit when value is transferred from the base to the cross-held firm.

holdings are of interest in and of themselves, but will also form a useful benchmark for our subsequent analysis of whether the observed cross-holdings between merging firms are unusual.

To determine the drivers of institutional cross-holdings, we estimate a model of cross-holdings based on individual firm and performance characteristics and measures of how different these characteristics are for any pair of firms. By including measures of differences between firms, we allow for the possibility that a given institutional investor will screen the universe of stocks and invest in firms with similar size or performance characteristics, thus creating cross-holdings between similar firms. Specifically, we control for firm size, the market-to-book ratio, operating performance, prior stock return, and total institutional ownership of both the base and cross-held firm. Further, we include the absolute differences between the two firms in each of the above characteristics. The regressions for the three sample years 1985, 1995, and 2005 are presented in Table 2.

We find that cross-holdings strongly decrease in base-firm total institutional ownership.<sup>9</sup> The likely reason is that all S&P 500 firms have a base level of institutional ownership by index funds and quasi-index investors, who by definition have high cross-holdings with all other firms in the index. As institutional ownership in a firm increases beyond these index investors, the average level of cross-holdings in other index firms falls. Higher institutional ownership in the cross-held firm, on the other hand, increases cross-holdings. The simple reason is that higher institutional interest in the cross-held firm makes it more likely that any given investor in the base firm will also be invested in the cross-held firm.

We further find that cross-holdings increase in the size of both the base and the cross-held firm, but decrease in the absolute difference in size between the two firms. Both base- and cross-held firm operating performance has a positive effect on cross-holdings. Base- and cross-held firm stock performance and M/B ratios, on the other hand, do not have any consistent

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<sup>9</sup> Recall that we call the firm from whose perspective we are reporting cross-holdings the *base* firm, and the firm in which the cross-ownership stake is held the *cross-held* firm. Thus when describing the cross-holdings of firm A's institutional shareholders in firm B, we label A the base firm and B the cross-held firm.

effects on cross-holdings. Notably, the variables capturing absolute differences in valuation ratios and prior performance between the firms come in significantly negatively, indicating that cross-holdings are high when the two firms have experienced similar performance. Overall, our results suggest that the more alike two firms are in terms of size, valuation, and prior performance, the greater are their institutional cross-holdings. This is consistent with our conjecture that institutional investors apply size- and performance-based selection screens to the universe of stocks, with the result that two firms with similar characteristics are held by the same institutions.

We have chosen to analyze the S&P 500 because of the collective economic importance of this set of firms. One could argue that the S&P 500 is tracked by a large number of index funds that have cross-holdings in the constituent firms, but do not care about any externalities, focusing instead on tracking error. While that is likely true of the objective function of index fund managers, the shareholders of index funds do care about externalities, as they directly affect their total return from investing. Nonetheless, we repeat all of our analyses on the next 100 largest firms outside the S&P 500. While cross-holdings in these 100 firms are always smaller than those in the S&P 500, the inferences we have drawn about the growing size and prevalence of cross-holdings and their determinants are unchanged. These results are available from the authors.

### **III.C. The mergers and acquisitions sample**

We next examine the magnitude and the effects (if any) of cross-holdings in a comprehensive sample of mergers and acquisitions from 1984 to 2006. Table 3 presents descriptive statistics on the announced merger deals, the bidders, and the targets in our sample. In Panel A, we show that 76% of the announced deals are eventually completed. Close to a quarter of the deals use only cash as the method of payment, and 39% of the deals are pure stock swaps. Approximately 12% of the targets receive competing bids within one year. Just under half

of the deals are diversifying. The mean relative deal size, defined as the ratio of the transaction value to the market value of the bidder, is 30%. Consistent with the prior literature, there are few direct toeholds, and more than 95% of the bidders have no toehold at all in their targets. On average, the bidder is offering a premium of 43% above the market price of the target, measured four weeks before the bid.

In Panel B, we show that the average three-day abnormal announcement period return (CAR3) for the bidder is  $-1.3\%$ , while the average CAR3 for the target is  $19\%$ . This uneven distribution of takeover gains is typical and the reason for the potential importance of bidder shareholders' cross-holdings for target selection. Following Bradley, Desai, and Kim (1988), we also compute the dollar amount of the synergistic gains ( $= \text{bidder CAR3} \times \text{bidder market capitalization} + \text{target CAR3} \times (1 - \text{toehold}) \times \text{target market capitalization}$ ) as well as the percentage synergy gains ( $= \text{synergy in dollars} / (\text{bidder market capitalization} + (1 - \text{toehold}) \times \text{target market capitalization})$ ). Panel B shows that the average synergies amount to about \$47 million in 2006 dollars, corresponding to an average percentage gain of  $1.9\%$ . This implies that, once we account for the large positive announcement return to the target, mergers in our sample are on average welfare-improving.

Panels C and D present summary statistics on the bidders and targets in our sample, respectively. Consistent with the relative size variable, the bidders are much larger than their targets in terms of both book and market values. The bidders and targets have similar levels of leverage and asset liquidity, while the bidders generate higher sales, enjoy faster sales growth, have higher market-to-book and earnings-to-price ratios, and experience better operating performance and higher stock returns in the year prior to the bid.

Table 4 summarizes the institutional shareholdings in the bidders and targets. On average, institutional investors own  $48\%$  of the equity of bidding firms and  $35\%$  of the equity of targets. Bidder institutions that also own shares in the target control  $16\%$  of the bidder shares, or  $33\%$  of the bidder shares owned by institutions. Target institutions that also own shares in the bidder

control over half of the generally smaller institutional holdings in the target, translating to 20% of the target shares.

### **III.D. The size and pervasiveness of cross-holdings in the M&A sample**

Table 5 summarizes the empirical distribution of cross-holdings by bidder shareholders in targets. In Panel A, we calculate cross-holdings for the top 1, 5, 10, 20, and 50 percent of the bidders' institutional shareholders and limit our sample to bidders with total institutional ownership no less than 20%. This reduces our sample by only 15% to 3,014 observations.

For the average bidder in the sample, we find that 50% of its institutional shares are held by institutions with cross-holdings of at least 6.2% in the target. Following the "Mean" column further, we find that ten percent of institutional shares in the average bidder are controlled by institutions with cross-holdings of at least 79%, and five percent of institutional shares by institutions with cross-holdings of at least 145%. Looking at the distribution of the median (or Top-50%) cross-holding across deals (the "Median Cross-holding" row), we find it to be similarly skewed. In ten percent of bidders, half the institutional shares are held by institutions with cross-holdings of at least 21%, and in one percent of bidders, half the institutional shares are by institutions with cross-holdings of at least 93% in the target.<sup>10</sup>

We conclude that there are institutional shareholders of the bidder with large cross-holdings in most acquisitions, and that there is a significant number of bidders in which even the median institution has a large cross-holding in the target. At the same time, many bidder institutions have no cross-holdings in the target at all, highlighting the difference between these indirect cross-holdings and direct toeholds held by the firm. The extent to which management considers these indirect cross-holdings in its decision making is an empirical question which we

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<sup>10</sup> Panel B calculates cross-holdings for the top 1, 5, 10, 20, and 50 percent of *all* bidder shareholders under the assumption that the cross-holdings of non-institutional investors are zero. Similar to Table 1, this mechanically results in lower estimated cross-holdings. However, even under this assumption, ten percent of the average bidder's shares are controlled by shareholders with cross-holdings of at least 34%.

examine in our target selection analysis. The observed cross-holdings of bidder institutional investors in target firms are smaller than the cross-holdings between S&P 500 firms described in Table 1. The main reason is that target firms (and to a lesser extent also bidders) tend to be substantially smaller than S&P 500 firms and as such attract less institutional investment.

The above analysis ignores the differences in the power of different shareholders to impose their preferences on bidder management. We therefore focus next on bidder blockholders, defined as institutions that own at least five percent of the bidder's shares. Panel A of Table 6 shows that the average cross-holding by the median blockholder is 12% (median 0%). The distribution is again skewed; looking across the "Median Cross-holding" row, we see that in five percent of bidders, the median blockholder has a cross-holding of 82% or more in the target. Focusing on the "Mean" column, we see that 20% of the blockholdings in the bidder are on average controlled by investors with cross-holdings of at least 21%. These numbers confirm that a significant number of blockholders, who are the institutional investors most likely to influence bidder management, have large cross-holdings in the target.

In Panel B of Table 6, we examine what would happen if blockholders were to negotiate side-payments with one another and act as a group. The average combined cross-holding by all blockholders in the bidder is 13%. In ten percent of all deals, however, blockholders want management to act as if the bidder had a 47% toehold in the target, and in five percent of all deals as if the bidder had a 73% toehold in the target. For comparison, Betton, Eckbo, and Thorburn (2007) analyze toeholds held directly by acquirers in a comprehensive sample of twelve thousand bidders and find that only 11% of the bidders own any toehold in the target. In their sample, the average toehold size among bidders with a positive toehold is 21%, with a median of 17%.<sup>11</sup>

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<sup>11</sup> Similar, if somewhat higher, numbers have been documented before by, among others, Bradley, Desai, and Kim (1988), Jarrell and Poulsen (1989), Jennings and Mazzeo (1993), and Betton and Eckbo (2000).

### III.E. The effect of cross-holdings on bidder shareholders' returns

Cross-holdings can alter bidder shareholders' preferences over acquisitions because they allow them to share some of the takeover gains accruing to the target. The abnormal announcement period returns in Table 3 indicate that almost all of the gains from the average takeover accrue to target shareholders, with the wealth effect on bidder shareholders close to zero or even slightly negative. Hence a large stake in the target may significantly improve the wealth effect experienced by a bidder shareholder from an acquisition.

Panel A of Table 7 presents the total abnormal announcement period returns experienced by institutional investors in the bidder based on their investments in *both* the bidder and the target. Institutional investors are once more ordered by the size of their cross-holdings, and the sample is limited to bidders with total institutional ownership no less than 20%. To ease comparison, the abnormal announcement period returns for bidders only are reproduced at the bottom of the panel. The numbers show that the average return improvement achieved by the median bidder institution through its cross-holding in the target is small. This is consistent with our finding that the average size of the median institution's stake in the target is only 6.2% of the size of its stake in the bidder. Bidder institutions with large stakes in the target (relative to their stakes in the bidder), on the other hand, receive substantial return contributions from their cross-holdings. Ten percent of the institutional shares in the average bidder are held by investors with total abnormal announcement returns of 1.2%, and five percent of the institutional shares by investors with total abnormal announcement returns of 2.3% (the "Mean" column). These are substantial improvements over the average abnormal return of -1.5% experienced by bidder investors without cross-holdings.

In Panel B of Table 7, we recalculate Panel A but restrict the sample to acquisitions with negative abnormal announcement period returns for the bidder. We want to assess the extent to which cross-holdings can reverse the negative wealth effect of these acquisitions on bidder institutions. We find that the abnormal announcement period returns remain negative for the vast

majority of bidder institutions even after their stakes in the target are taken into account. On average, only 4.7% of the institutional shares in the bidder are held by investors with stakes in the target large enough to make up for their losses from the bidder (the “Mean” column). In only 4.5% of the deals are the cross-holdings of the median institution large enough to turn its total abnormal announcement period return from negative to positive (the “Median by Cross-holding” row). These results suggest that cross-holdings are unlikely to explain why bidder institutions as a group fail to block what appear to be bad takeover deals.

### **III.F. The evolution of cross-holdings in the year prior to the bid**

It is possible that bidder institutions are able to anticipate bids and consequently increase their cross-holdings in the target in the period leading-up to the bid announcement. Alternatively, institutions may take significant positions in two firms in an attempt to try to influence both management teams to effect a merger. In Table 8 we present the evolution of the cross-holdings by bidder institutions in targets from five quarters prior to a bid up to and including the quarter of the bid announcement. The results in the table apply to the 3,099 bids for which we have data for the full six quarters.

Examining the “Mean” column, which tabulates the cross-holdings by bidder institutions of the average bidder, we see little evidence of an upward trend. In fact, the cross-holding for the median institution trends slightly downward, with no apparent trend among institutions with higher cross-holdings. There is some reduction in cross-holdings from quarter -1 to quarter 0, reflecting a post-announcement sell-off, particularly among those institutions with the greatest cross-holdings prior to the merger. Turning to the “Median” column, we do see that the top-20% cross-holding increases from 14% to 21% in the five quarters before the bid. However, the increase is not a steady one; the cross-holdings rapidly increase to 19% by quarter -3, fall to 18% in the next quarter, and then increase again in the quarter prior to the bid announcement. The cross-holding of the median institution remains steady at 0%, showing no upward trend. The



overall picture from the table is that cross-holdings by bidder institutions are remarkably stable over the year prior to the bid announcement. There is little evidence of bid anticipation or of bidder institutions taking strategic stakes to influence the bid decision.

### **III. G. The effect of cross-holdings on target selection**

In this sub-section, we formally test the null hypothesis that bidder managers ignore their shareholders' cross-holdings when selecting targets. We perform three tests, all rejecting the null hypothesis. First, we compare the cross-holdings in actual bidder-target pairs to those in similar pairs of firms that did not merge, and show that the actual bidder-target pairs have much higher cross-holdings. Next, we confirm this result in a multivariate analysis that controls for other determinants of cross-holdings. Finally, we use cross-holdings to predict the selection of targets by bidders while controlling for known determinants of target selection and for the cross-holding determinants we identified before.

Under the null hypothesis that bidder managers ignore their shareholders' cross-holdings when selecting targets, there should be no difference in the cross-holdings between an actual bidder and its target compared to a randomly selected pair of comparable firms. To test this implication of our null hypothesis, we compare the cross-holdings of bidder shareholders in the actual target to the cross-holdings between three alternative pairs of firms: Pair one consists of the actual bidder and a control target, pair two of a control bidder and the actual target, and pair three of both a control bidder and a control target. To reject the null hypothesis we need to show that the cross-holdings between the actual bidder-target pair consistently exceed those between any of the three alternative pairs of firms.<sup>12</sup>

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<sup>12</sup> It is not enough to show that the cross-holdings between the actual bidder-target pair exceed those between an alternative bidder and alternative target. It may be the case that actual bidders (or actual targets) have for some unrelated reason unusually high cross-holdings in other firms, in which case the cross-holdings between the actual bidder-target pair would exceed those between an alternative bidder and alternative target, but not those between the actual bidder (target) and an alternative target (bidder).

Our control sample of potential bidder-target pairs is obtained by first excluding actual bidders and targets from the Compustat/CRSP population in the announcement quarter. This forms the base set of potential control firms. For each bidder-target pair in our sample, we select a control bidder (target) in the same Fama-French (1997) industry. We require that the difference in total institutional ownership does not exceed 25% of the sample firm total institutional ownership, and that the difference in market capitalization does not exceed 25% of the sample firm market capitalization at the fiscal year-end prior to the bid announcement. Finally, we pick the control bidder (target) with the closest total institutional ownership to the actual bidder (target) in the sample. Matching is done with replacement and only one control bidder (target) is matched to each sample bidder (target). We are able to match 2,210 actual bidder-target pairs with three sets of control pairs (i.e., actual bidder-control target, control bidder-actual target, and control bidder-control target).

We present summary statistics on our actual bidders and targets and their matched controls in Table 9. Panels A and B describe the sample and control bidders, with tests for differences in their characteristics presented in Panel B. The tests confirm that our control bidders are well-matched, with the control bidders having a slightly higher mean market-to-book ratio (but similar median) and slightly lower median (but not mean) sales growth. The only clear differences between the sets of firms are that actual bidders have slightly higher asset liquidity and better stock price performance in the year prior to the merger. We will control for return differences and other characteristics in our multivariate tests.

Panels C and D summarize the sample and control targets. There are more statistically significant differences to report for the targets, even though there is little economic significance to most of the differences. Actual targets are somewhat larger, have slightly lower market-to-book ratios, lower earnings-to-price ratios, and slightly lower sales growth, and have higher stock returns. We will control for these differences in the regression analysis.

Table 10 presents our first test of the null hypothesis by comparing cross-holdings between the actual bidder-target pairs to the cross-holdings between each of the three alternative pairs. Panel A presents the cross-holdings for the actual bidder-target pairs. Panel B presents the cross-holdings between the actual bidders and control targets. Panel C presents the cross-holdings between the control bidders and actual targets. Panel D presents the cross-holdings between the control bidders and control targets. A comparison of Panel A with all three other panels reveals that the cross-holdings between the actual bidders and targets are substantially larger than between any of the three alternative pairs. Notably, cross-holdings between each of the three alternative pairs are very similar to one another, with only the actual bidder-target pairs showing a much higher level of overlap among their shareholders. This evidence rejects the null hypothesis, suggesting instead that bidder managers consider their shareholders' cross-holdings when selecting targets.

Our second test of the effect of cross-holdings on target selection repeats the previous test in a multivariate framework. We estimate a model of cross-holdings using the combined sample of all four pairwise cross-holdings from Table 10 as the dependent variable. The goal is to control for differences between the actual bidders and targets and their control firms that are not captured by our matching procedure. In the empirical model, we explain cross-holdings between the four pairs of firms using the same firm and performance characteristics that we have previously used to explain cross-holdings between S&P 500 firms in Table 2. By including measures of differences between bidders and targets, we again allow for the possibility that institutional investors screen the universe of stocks and invest in firms with similar characteristics, thereby creating cross-holdings among those firms. Finally, we include three dummy variables to identify (1) the actual bidder-control target pair (Control Target Dummy), (2) the control bidder-actual target pair (Control Bidder Dummy), and (3) the control bidder-control target pair (Control Bidder & Control Target Dummy).

The estimation results are presented in Table 11. Across all measures of cross-holdings, the coefficients on the three dummy variables are uniformly negative and significant. This confirms that cross-holdings between the actual bidder and target (captured in the intercept) are significantly larger than between any of the three alternative pairs, even after controlling for firm characteristics that influence cross-holdings. It is worth emphasizing that this result obtains while carefully controlling for the total institutional ownership in each firm. Hence we can rule out the possibility that institutional investors simply prefer to invest in certain types of firms that, for some unrelated reason, also have a high propensity to merge with each other. Instead we have shown that, for a common level of institutional ownership in a group of potential bidders and targets, the overlap in shareholders between the actual bidder and the actual target far exceeds the overlap between any of the alternative pairs.<sup>13</sup>

Our third and final test of the effect of cross-holdings on target choice uses a full-fledged target selection model in order to control for other known determinants of a firm becoming a takeover target. We pair each actual bidder with both its actual target and its control target, resulting in two sets of 2,390 pairs each. We then estimate a conditional logit model predicting which of the two potential targets will be chosen by the bidder. The explanatory variables include a large set of target characteristics that have been shown to predict target selection in the prior literature (see, for example, Palepu (1986)). We also control for the pairwise difference measures from Table 11 and, importantly, for the total institutional ownership in each of the two potential targets. To directly test whether cross-holdings influence target selection, we include cross-holdings by bidder institutions in the actual target and in the control target as an explanatory variable. The results are presented in Table 12 and confirm that a firm is more likely to be chosen as takeover target, the greater are the cross-holdings by the bidder's institutional shareholders. The role of cross-holdings in target selection is economically important: A one standard deviation increase in the median (top-20%) cross-holding by bidder shareholders

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<sup>13</sup> The effect of the various firm and performance characteristics on the level of cross-holdings between (actual and potential) bidders and targets in Table 11 is similar to their effect on cross-holdings between S&P 500 firms discussed in Section III.B.

increases the probability that a firm is chosen as target by 8.8 (9.5) percentage points. These results once more suggest that bidder management takes its shareholders' cross-holdings into account when selecting between potential takeover targets. This is consistent with the results in Tables 10 and 11 and confirms that our findings are not driven by cross-holdings proxying for other determinants of target selection. Instead, bidder shareholders' cross-holdings directly affect bidder management's decision on which firm to acquire.<sup>14</sup>

#### **IV. Summary and Conclusion**

This paper identifies and measures indirect cross-holdings created when institutional shareholders of one firm hold shares in other firms as well, and examines their effects in the case of corporate acquisitions. Diversified shareholders prefer corporate policies that maximize their portfolio values to policies that narrowly maximize the values of individual firms, and target selection in acquisitions is one place where externalities and thus the potential effect of cross-holdings are large and measurable.

We show how to correctly measure the shareholder preferences created by cross-holdings, and we document their prevalence and size in samples of S&P 500 firms and in a comprehensive sample of mergers and acquisitions from 1984 to 2006. We find that cross-holdings between S&P 500 firms have risen rapidly between 1985 and 2005. For the median institutional investor in an S&P 500 firm, the average cross-holding in a randomly selected second S&P 500 firm is 6.0% in 1985, 14% in 1995, and 29% in 2005. This implies that, for a randomly chosen pair of S&P 500 firms in 2005, the median institutional investor of either firm wants management to on average internalize 29% of any externalities imposed on the other firm. Similar effects, while smaller in magnitude, exist outside the S&P 500 index.

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<sup>14</sup> Similar results on the role of cross-holdings in target selection obtain when we use the cross-holdings of blockholders as the explanatory variable. These results are available from the authors upon request.

Cross-holdings are greatest in firms that have similar financial and performance characteristics, likely a result of investment screens employed by institutional investors when forming portfolios. However, even after controlling for these factors, cross-holdings by bidder shareholders in actual takeover targets are significantly greater than their cross-holdings in other potential targets or between other potential bidder-target pairs. Further, bidder institutions' cross-holdings in potential targets are an important predictor in a model of target selection. We conclude that indirect cross-holdings by institutional investors are commonplace and, at least in the case of corporate acquisitions, are important enough to impact corporate decisions.

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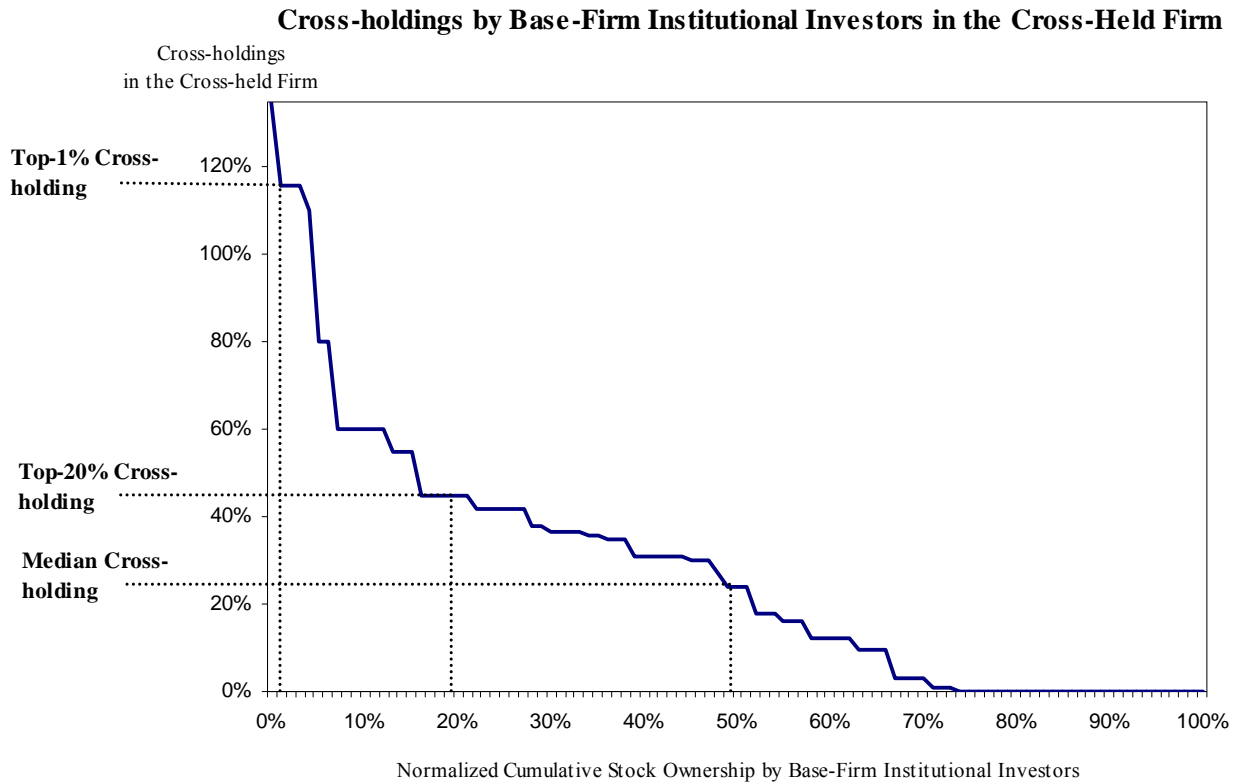
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**Figure 1**  
**Measuring Institutional Cross-holdings**

We call the firm from whose perspective the cross-holdings are computed the *base* firm, and the firm in which the cross-ownership stakes are held the *cross-held* firm. The figure illustrates how the cross-holdings of base-firm institutional shareholders in the cross-held firm are measured. We first rank all base-firm institutional investors by their cross-holdings in the cross-held firm, defined as their percentage ownership of the cross-held firm divided by their percentage ownership of the base firm. Using this ranking, we then calculate the marginal cross-holdings associated with the top 1, 5, 10, 20, and 50 percent of institutional shareholdings in the base firm. In the example illustrated below, one percent of the institutional shareholdings in the base firm are owned by shareholders with cross-holdings of at least 116%, and hence the *top-1% cross-holding* is set to 116%. Twenty percent of the base firm's institutional shareholdings are by shareholders with cross-holdings of at least 45%, and hence the *top-20% cross-holding* is 45%. Finally, the median institutional shareholder has a cross-holding of 24% in the cross-held firm, which we call the *median cross-holding* for short.



**Table 1**  
**Cross-holdings Between S&P 500 Firms**

This table summarizes institutional shareholder cross-holdings between pairs of S&P 500 firms in 1985, 1995, and 2005. We use all constituent firms of the index with available data from CRSP/Compustat and institutional holding data from the CDA/Spectrum database. The final sample consists of 447, 446, and 459 S&P 500 firms in 1985, 1995, and 2005, respectively. We next form all possible pairs of firms that are in the S&P 500 in the same year. Specifically, if there are  $n$  firms with available data in the S&P 500 index in one of the three sample years, then we form  $n*(n-1)$  unique pairs for that year. We denote one firm out of each pair the base firm and the other firm the cross-held firm. For each institutional shareholder of the base firm, we calculate her pair-specific cross-holding as the ratio of her percentage ownership in the cross-held firm divided by her percentage ownership in the base firm. We then order all institutional shareholders of the base firm by their cross-holdings and report the (marginal) cross-holding for the top 1, 5, 10, 20, and 50 percent of institutional shareholdings (labeled the *top-1%*, *top-5%*, *top-10%*, *top-20%*, and *median cross-holding*, respectively). We require that at least 20% of the base firm's equity is owned by institutions for this analysis. In addition to the analysis for institutional shareholders, we calculate cross-holdings for all base-firm shareholders under the conservative assumption that all non-institutional investors have zero cross-holdings. Here the percentiles are with respect to all shareholders, and we do not impose the requirement that institutions own at least 20% of the firm. We report cross-holdings for percentiles of institutional investors in Part I of each panel and for percentiles of all shareholders in Part II of each panel. Panel A presents summary statistics on cross-holdings for S&P 500 firms in 1985, Panel B for S&P 500 firms in 1995, and Panel C for S&P 500 firms in 2005.

**Panel A: Cross-holdings Between S&P 500 Firms in 1985**

	N	Mean	StdDev	Median	95 <sup>th</sup> Percentile		N	Mean	StdDev	Median	95 <sup>th</sup> Percentile
<i>I. Cross-holdings by institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>						<i>II. Cross-holdings by all shareholders</i>					
Top-1% Cross-holding	191,334	6.226	5.203	4.899	15.071	Top-1% Cross-holding	199,362	3.306	2.073	2.803	7.157
Top-5% Cross-holding	191,334	1.834	1.011	1.537	3.792	Top-5% Cross-holding	199,362	1.074	0.438	1.024	1.870
Top-10% Cross-holding	191,334	1.148	0.517	1.053	2.092	Top-10% Cross-holding	199,362	0.520	0.362	0.516	1.082
Top-20% Cross-holding	191,334	0.605	0.380	0.603	1.187	Top-20% Cross-holding	199,362	0.105	0.169	0.018	0.481
Median Cross-holding	191,334	0.060	0.124	0.004	0.306	Median Cross-holding	199,362	0.001	0.006	0.000	0.000

**Panel B: Cross-holdings Between S&P 500 Firms in 1995**

	N	Mean	StdDev	Median	95 <sup>th</sup> Percentile		N	Mean	StdDev	Median	95 <sup>th</sup> Percentile
<i>I. Cross-holdings by institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>						<i>II. Cross-holdings by all shareholders</i>					
Top-1% Cross-holding	198,025	7.342	5.402	5.820	17.764	Top-1% Cross-holding	198,470	4.598	2.835	3.892	9.941
Top-5% Cross-holding	198,025	2.114	1.172	1.761	4.417	Top-5% Cross-holding	198,470	1.397	0.491	1.239	2.388
Top-10% Cross-holding	198,025	1.332	0.514	1.159	2.341	Top-10% Cross-holding	198,470	0.971	0.217	0.976	1.325
Top-20% Cross-holding	198,025	0.871	0.290	0.916	1.291	Top-20% Cross-holding	198,470	0.363	0.271	0.315	0.885
Median Cross-holding	198,025	0.140	0.193	0.064	0.566	Median Cross-holding	198,470	0.004	0.019	0.000	0.028

**Panel C: Cross-holdings Between S&P 500 Firms in 2005**

	N	Mean	StdDev	Median	95 <sup>th</sup> Percentile		N	Mean	StdDev	Median	95 <sup>th</sup> Percentile
<i>I. Cross-holdings by institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>						<i>II. Cross-holdings by all shareholders</i>					
Top-1% Cross-holding	210,222	6.663	4.014	5.623	14.364	Top-1% Cross-holding	210,222	5.157	2.592	4.540	10.289
Top-5% Cross-holding	210,222	2.244	1.009	1.995	4.178	Top-5% Cross-holding	210,222	1.803	0.651	1.643	3.078
Top-10% Cross-holding	210,222	1.475	0.524	1.338	2.490	Top-10% Cross-holding	210,222	1.220	0.297	1.160	1.780
Top-20% Cross-holding	210,222	1.029	0.264	1.001	1.493	Top-20% Cross-holding	210,222	0.827	0.198	0.846	1.100
Median Cross-holding	210,222	0.292	0.246	0.237	0.778	Median Cross-holding	210,222	0.058	0.094	0.010	0.265

**Table 2**  
**Explaining Cross-holdings Between S&P 500 Firms**

This table examines the cross-sectional determinants of cross-holdings between pairs of S&P 500 firms in 1985, 1995, and 2005. We use all constituent firms of the index with available data from CRSP/Compustat and institutional holding data from the CDA/Spectrum database. The final sample consists of 447, 446, and 459 S&P 500 firms in 1985, 1995, and 2005, respectively. We next form all possible pairs of firms that are in the S&P 500 in the same year. Specifically, if there are  $n$  firms with available data in the S&P 500 index in one of the three sample years, then we form  $n*(n-1)$  unique pairs for that year. We denote one firm out of each pair the base firm and the other firm the cross-held firm. For each institutional shareholder of the base firm, we calculate her pair-specific cross-holding as the ratio of her percentage ownership in the cross-held firm divided by her percentage ownership in the base firm. We then order all institutional shareholders of the base firm by their cross-holdings and obtain the (marginal) cross-holding for the top 20 and 50 percent of institutional shareholdings (labeled the *top-20%* and *median cross-holding*, respectively). We require that at least 20% of the base firm's equity is owned by institutions. Total Institutional Ownership is the fraction of a firm's stock that is owned by institutional investors. Market Capitalization is the natural log of the product of number of shares outstanding and share price. Market-to-Book (M/B) Ratio is the ratio of market value total assets to book value total assets, where market value total assets is computed as (book value total assets – book value equity + market capitalization). Return on Assets (ROA) is the ratio of operating income to prior year book value total assets. All absolute difference measures are taken between the base firm and the cross-held firm. All control variables are obtained at the fiscal year end before the cross-holding measures are taken. Columns (1)-(2) report the regression results using cross-holdings of S&P 500 firms in 1985, Columns (3)-(4) using cross-holdings of S&P 500 firms in 1995, and Columns (5)-(6) using cross-holdings of S&P 500 firms in 2005 as the dependent variable. All model specifications employ robust standard errors. Superscripts \*\*\*, \*\*, and \* correspond to statistical significance at the 1, 5, and 10 percent levels, respectively. P-values are reported in brackets.

	1985		1995		2005	
	(1) Top-20% Cross-holding	(2) Median Cross-holding	(3) Top-20% Cross-holding	(4) Median Cross-holding	(5) Top-20% Cross-holding	(6) Median Cross-holding
Base-Firm Total Institutional Ownership	-1.314*** [0.000]	-0.241*** [0.000]	-1.088*** [0.000]	-0.592*** [0.000]	-0.878*** [0.000]	-0.782*** [0.000]
Cross-held Firm Total Institutional Ownership	0.888*** [0.000]	0.139*** [0.000]	0.674*** [0.000]	0.265*** [0.000]	0.590*** [0.000]	0.379*** [0.000]
Base-Firm Market Capitalization	0.128*** [0.000]	0.027*** [0.000]	0.084*** [0.000]	0.036*** [0.000]	0.043*** [0.000]	0.070*** [0.000]
Cross-held Firm Market Capitalization	0.074*** [0.000]	0.036*** [0.000]	0.023*** [0.000]	0.057*** [0.000]	0.024*** [0.000]	0.067*** [0.000]
Base-Firm Market-to-Book Ratio	-0.005*** [0.009]	-0.006*** [0.000]	0.003** [0.010]	-0.005*** [0.000]	0.022*** [0.000]	-0.003*** [0.000]
Cross-held Firm Market-to-Book Ratio	0.008*** [0.000]	0.008*** [0.000]	-0.018*** [0.000]	0.001 [0.505]	-0.011*** [0.000]	0.008*** [0.000]
Base-Firm Return on Assets	0.062*** [0.000]	0.057*** [0.000]	0.035*** [0.000]	0.094*** [0.000]	-0.055*** [0.000]	0.019*** [0.002]
Cross-held Firm Return on Assets	0.202*** [0.000]	0.013*** [0.000]	0.138*** [0.000]	0.032*** [0.000]	0.109*** [0.000]	0.014** [0.021]
Base-Firm Prior Year Stock Return	-0.061*** [0.000]	-0.020*** [0.000]	0.005*** [0.004]	0.019*** [0.000]	-0.009*** [0.000]	-0.010*** [0.000]
Cross-held Firm Prior Year Stock Return	-0.068*** [0.000]	-0.029*** [0.000]	0.037*** [0.000]	0.003** [0.019]	0.060*** [0.000]	0.037*** [0.000]
Absolute Difference in Total Institutional Ownership	0.018*** [0.003]	0.126*** [0.000]	-0.151*** [0.000]	0.188*** [0.000]	0.096*** [0.000]	0.135*** [0.000]
Absolute Difference in Market Capitalization	-0.075*** [0.000]	-0.012*** [0.000]	-0.035*** [0.000]	-0.025*** [0.000]	-0.008*** [0.000]	-0.018*** [0.000]
Absolute Difference in M/B Ratio	-0.045*** [0.000]	-0.012*** [0.000]	-0.012*** [0.000]	-0.012*** [0.000]	-0.008*** [0.000]	-0.010*** [0.000]
Absolute Difference in ROA	-0.152*** [0.000]	-0.050*** [0.000]	-0.022*** [0.000]	-0.057*** [0.000]	-0.041*** [0.000]	-0.016** [0.013]
Absolute Difference in Prior Stock Return	-0.012*** [0.000]	-0.001 [0.373]	-0.024*** [0.000]	-0.023*** [0.000]	-0.010*** [0.000]	-0.012*** [0.000]
Intercept	-0.528*** [0.000]	-0.338*** [0.000]	0.291*** [0.000]	-0.442*** [0.000]	0.580*** [0.000]	-0.695*** [0.000]
Number of Observations	191,334	191,334	198,025	198,025	210,222	210,222
Adjusted R <sup>2</sup>	0.586	0.288	0.552	0.412	0.436	0.498

**Table 3**  
**Summary Statistics on Merger Bids, Bidders, and Targets, 1984-2006**

The sample consists of 3,540 acquisition attempts announced during the period January 1, 1984, to December 31, 2006. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. We keep an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% of the target. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers.

**Panel A: Deal Characteristics**

Complete, All Cash, All Stock, Competing, and Diversifying are dummy variables that take the value of one for completed acquisitions, if only cash is used to pay for the acquisition, if only equity is used, if there are multiple bids for the same target within one year, and if the bidder and target are from two different industries, respectively, and zero otherwise. Relative Size is the transaction value divided by the market value of bidder assets at the end of the fiscal year prior to the bid announcement. Toehold measures the percentage of the target's shares directly held by the bidder prior to the bid announcement. Premium is the ratio of the final offer price to the target stock price four weeks prior to the original announcement date minus one.

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Complete	3540	0.758	0.428	0.000	1.000	1.000
All Cash	3540	0.237	0.425	0.000	0.000	1.000
All Stock	3540	0.387	0.487	0.000	0.000	1.000
Competing	3540	0.123	0.328	0.000	0.000	1.000
Diversifying	3540	0.465	0.499	0.000	0.000	1.000
Relative Size	3285	0.301	0.667	0.004	0.104	1.090
Toehold	3540	0.007	0.043	0.000	0.000	0.000
Premium	3177	0.428	0.563	-0.054	0.346	1.137

**Panel B: Announcement Period Returns, Synergy, and Total Returns**

The abnormal announcement period returns (CAR3) are over days (-1, +1), where day 0 is the date of the initial bid announcement by the acquiring firm. Daily abnormal stock returns are computed using the market model and the value-weighted CRSP index. The estimation window is days (-200, -60) prior to the acquisition announcement date. Following Bradley, Desai, and Kim (1988), the percentage synergy gain is defined as the cumulative abnormal return over the (-1, +1) event window for a value-weighted portfolio of the bidder and the target. The weights for the bidder and the target are based on the market value of equity two days prior to the bid announcement. The target weight adjusts for the percentage of target shares held by the bidder prior to the bid announcement, with the adjustment set to zero for missing toehold values. The dollar value synergistic gain over the same event window (-1, +1) is defined as the percentage synergy gain times the sum of the market values of equity for the bidder and the target in million dollars, again adjusted for the percentage of target shares held by the bidder prior to the bid announcement.

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Bidder CAR3	3540	-0.013	0.084	-0.128	-0.009	0.091
Target CAR3	3540	0.194	0.242	-0.067	0.147	0.609
Synergy (\$)	3540	47.077	1683.547	-756.149	9.443	1028.233
Synergy (%)	3540	0.019	0.082	-0.081	0.011	0.144

**Panel C: Bidder Characteristics**

All firm characteristics are computed as of the fiscal year end prior to the bid announcement. Market Capitalization is the product of number of shares outstanding and share price. Market Value Total Assets is computed as (book value total assets – book value equity + market capitalization). Market Leverage is the ratio of book value total debt to market value total assets. Book Leverage is the ratio of book value total debt to book value total assets. Market-to-Book Ratio is the ratio of market value total assets to book value total assets. Earnings-to-Price Ratio is the ratio of earnings-per-share to share price. Asset Liquidity is the sum of cash, short-term investments, and accounts receivable normalized by book value total assets. Sales Growth is the change in sales normalized by prior year sales. Return on Assets is the ratio of operating income to prior year book value total assets. Prior Year Stock Return is the stock return in the year prior to the bid announcement. Prior Year Mkt-Adj Return is the difference between prior year stock return and contemporaneous market return.

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Market Capitalization	3540	11000.877	33324.373	57.846	1764.455	54587.888
Market Value Total Assets	3540	26117.527	75883.828	105.441	4001.103	126000.000
Book Value Total Assets	3540	18394.760	61961.445	66.061	2456.610	81678.106
Sales	3540	6175.323	14580.720	38.253	1256.749	28757.810
Market Leverage	3531	0.164	0.143	0.000	0.135	0.445
Book Leverage	3531	0.227	0.178	0.000	0.205	0.557
Market-to-Book Ratio	3540	2.006	2.474	0.969	1.382	4.702
Earnings-to-Price Ratio	3540	0.005	0.604	-0.129	0.052	0.133
Asset Liquidity	3500	0.397	0.239	0.069	0.342	0.787
Sales Growth	3540	0.449	7.976	-0.162	0.131	1.130
Return on Assets	3540	0.142	0.186	-0.020	0.135	0.398
Prior Year Stock Return	3540	0.299	0.752	-0.404	0.187	1.229
Prior Year Mkt-Adj Return	3540	0.146	0.733	-0.512	0.030	1.046

**Panel D: Target Characteristics**

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Market Capitalization	3540	1637.238	7512.218	15.422	193.859	6300.682
Market Value Total Assets	3540	5303.292	27025.376	29.709	506.903	18513.938
Book Value Total Assets	3540	4306.687	24738.960	21.093	365.476	14030.363
Sales	3540	1552.640	6070.545	13.884	199.334	6699.457
Market Leverage	3533	0.171	0.164	0.000	0.133	0.489
Book Leverage	3533	0.218	0.204	0.000	0.180	0.605
Market-to-Book Ratio	3540	1.676	1.484	0.856	1.216	3.767
Earnings-to-Price Ratio	3536	-0.086	0.782	-0.604	0.046	0.130
Asset Liquidity	3509	0.425	0.248	0.065	0.398	0.829
Sales Growth	3540	0.223	0.868	-0.237	0.099	0.894
Return on Assets	3540	0.091	0.187	-0.180	0.101	0.323
Prior Year Stock Return	3540	0.179	0.775	-0.635	0.097	1.080
Prior Year Mkt-Adj Return	3540	0.026	0.761	-0.731	-0.064	0.902

**Table 4**  
**Institutional Ownership in Bidders and Targets, 1984-2006**

The sample consists of 3,540 acquisition attempts announced during the period January 1, 1984, to December 31, 2006. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. We keep an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% of the target. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers.

**Panel A: Institutional Ownership in Bidders**

Bidder Institutional Ownership is the fraction of a bidder's stock that is owned by institutional investors. Bidder Blockholder Ownership is the fraction of a bidder's stock that is owned by block institutional investors with share ownership no less than five percent. Bidder Institutions Owning Shares in Target gives the total shareholdings in the bidder by institutions who also own shares in the target. Fraction of Bidder Institutional Ownership Owned by Institutions with Shares in Target gives the percentage of the bidder's institutional ownership that is held by institutions who also own shares in the target.

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Total Institutional Ownership	3540	0.484	0.240	0.069	0.501	0.869
Total Blockholder Ownership	2219	0.159	0.107	0.053	0.129	0.363
Bidder Institutions Owning Shares in Target	3540	0.162	0.156	0.003	0.109	0.480
Fraction of Bidder Institutional Ownership Owned by Institutions with Shares in Target	3540	0.330	0.247	0.016	0.275	0.808

**Panel B: Institutional Ownership in Targets**

Target Institutional Ownership is the fraction of a target's stock that is owned by institutional investors. Target Blockholder Ownership is the fraction of a target's stock that is owned by block institutional investors with share ownership no less than five percent. Target Institutions Owning Shares in Bidder gives the total shareholdings in the target by institutions who also own shares in the bidder. Fraction of Target Institutional Ownership Owned by Institutions with Shares in Bidder gives the percentage of the target's institutional ownership that is held by institutions who also own shares in the bidder.

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Total Institutional Ownership	3540	0.353	0.251	0.020	0.310	0.812
Total Blockholder Ownership	2326	0.167	0.111	0.054	0.139	0.391
Target Institutions Owning Shares in Bidder	3540	0.198	0.187	0.003	0.138	0.583
Fraction of Target Institutional Ownership Owned by Institutions with Shares in Bidder	3540	0.538	0.276	0.058	0.553	0.970



**Table 5**  
**Cross-holdings by Bidder Shareholders in Targets**

The sample consists of 3,540 acquisition attempts announced during the period January 1, 1984, to December 31, 2006. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. We keep an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% of the target. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers. Cross-holdings are defined as the ratio of the shareholder's percentage ownership in the target divided by her percentage ownership in the bidder. We order all institutional investors of the bidder by their cross-holdings, and then report the (marginal) cross-holding for the top 1, 5, 10, 20, and 50 percent of institutional shareholdings (labeled the *top-1%*, *top-5%*, *top-10%*, *top-20%*, and *median cross-holding*, respectively). We require that at least 20% of the bidder's equity is owned by institutions for this analysis. In addition to the analysis for institutional shareholders, we calculate cross-holdings for all bidder shareholders under the conservative assumption that all non-institutional investors have zero cross-holdings. Here the percentiles are with respect to all shareholders, and we do not impose the requirement that institutional investors own at least 20% of the bidder. We report cross-holdings for percentiles of institutional investors in Panel A and for percentiles of all shareholders in Panel B.

**Panel A: Cross-holdings by Bidder Institutional Investors**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Top-1% Cross-holding	3014	4.863	5.084	3.463	6.540	10.629	14.190	23.725
Top-5% Cross-holding	3014	1.451	1.288	1.206	2.007	3.048	3.832	5.869
Top-10% Cross-holding	3014	0.792	0.744	0.693	1.217	1.759	2.169	3.076
Top-20% Cross-holding	3014	0.378	0.460	0.156	0.685	1.066	1.250	1.708
Median Cross-holding	3014	0.062	0.174	0.000	0.000	0.211	0.462	0.926

**Panel B: Cross-holdings by Bidder Shareholders**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Top-1% Cross-holding	3540	2.753	2.729	1.910	3.913	6.356	8.088	11.736
Top-5% Cross-holding	3540	0.730	0.791	0.521	1.195	1.812	2.259	3.118
Top-10% Cross-holding	3540	0.344	0.477	0.021	0.645	1.094	1.312	1.754
Top-20% Cross-holding	3540	0.126	0.267	0.000	0.059	0.554	0.831	1.055
Median Cross-holding	3540	0.005	0.040	0.000	0.000	0.000	0.000	0.164

**Table 6**  
**Cross-holdings by Bidder Institutional Blockholders**

The sample consists of 3,540 acquisition attempts announced during the period January 1, 1984, to December 31, 2006. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. We keep an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% of the target. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers. Cross-holdings are defined as the ratio of the shareholder's percentage ownership in the target divided by her percentage ownership in the bidder. This table focuses on institutional blockholders, defined as shareholders with ownership no less than five percent. The sample is restricted to deals with at least one blockholder in the bidder. We order the blockholders by their cross-holdings in the target, and then report the (marginal) cross-holding for the top 5, 10, 20, 50, 75, and 100 percent of blockholdings (labeled the *top-5%*, *top-10%*, *top-20%*, *median*, *top-75%*, and *all cross-holding*, respectively). We compute two cross-holding measures: for blockholders, and for all blockholders combined assuming that they exchange side-payments and act as a group (*combined cross-holding*). We present the empirical distribution of the two measures in Panels A and B, respectively.

**Panel A: Cross-holdings by Bidder Institutional Blockholders**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Top-5% Cross-holding	2219	0.226	0.439	0.000	0.232	0.869	1.220	1.996
Top-10% Cross-holding	2219	0.225	0.439	0.000	0.232	0.869	1.220	1.996
Top-20% Cross-holding	2219	0.206	0.416	0.000	0.184	0.790	1.141	1.940
Median Cross-holding	2219	0.115	0.305	0.000	0.024	0.411	0.819	1.489
Top-75% Cross-holding	2219	0.073	0.245	0.000	0.000	0.182	0.498	1.277
All Cross-holding	2219	0.071	0.243	0.000	0.000	0.168	0.487	1.267

**Panel B: Combined Cross-holding by Bidder Institutional Blockholders**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Combined Cross-holding	2219	0.132	0.282	0.000	0.129	0.467	0.728	1.267

**Table 7**  
**The Effect of Cross-holdings on Bidder Shareholder Returns Around Merger Announcements**

The sample consists of 3,540 acquisition attempts announced during the period January 1, 1984, to December 31, 2006. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. We keep an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% of the target. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers. We require that at least 20% of the bidder's equity is owned by institutions for this analysis. The abnormal announcement period returns (CAR3) are over days (-1, +1), where day 0 is the date of the initial bid announcement by the acquiring firm. Daily abnormal stock returns are computed using the market model and the value-weighted CRSP index. The estimation window is days (-200, -60) prior to the acquisition announcement date. The total abnormal announcement period return (Total CAR3) for each bidder institutional shareholder is the value-weighted average abnormal announcement return on her stakes in the bidder and the target combined. We report the distribution of these total abnormal announcement period returns for bidder institutional investors sorted based on their cross-holdings as defined in Panel A of Table 5.

**Panel A: Total CAR3 for Bidder Institutional Investors**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Top-1% by Cross-holding	3014	0.052	0.101	0.030	0.093	0.170	0.228	0.409
Top-5% by Cross-holding	3014	0.023	0.077	0.013	0.055	0.117	0.160	0.266
Top-10% by Cross-holding	3014	0.012	0.071	0.005	0.041	0.096	0.133	0.218
Top-20% by Cross-holding	3014	0.000	0.069	-0.001	0.030	0.075	0.112	0.185
Median by Cross-holding	3014	-0.012	0.070	-0.008	0.020	0.057	0.091	0.170
Bidder CAR3	3014	-0.015	0.072	-0.010	0.018	0.055	0.087	0.169

**Panel B: Total CAR3 for Institutional Investors in Bidders with Negative Announcement Returns**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Top-1% by Cross-holding	1807	0.032	0.099	0.009	0.067	0.155	0.210	0.369
Top-5% by Cross-holding	1807	-0.003	0.072	-0.008	0.020	0.076	0.123	0.232
Top-10% by Cross-holding	1807	-0.017	0.064	-0.015	0.002	0.045	0.086	0.178
Top-20% by Cross-holding	1807	-0.032	0.060	-0.022	-0.006	0.015	0.042	0.101
Median by Cross-holding	1807	-0.049	0.057	-0.034	-0.013	-0.005	-0.002	0.015
Bidder CAR3	1807	-0.053	0.058	-0.037	-0.015	-0.006	-0.003	-0.001

**Table 8**  
**The Temporal Evolution of Cross-holdings Prior to the Bid**

The sample consists of 3,540 acquisition attempts announced during the period January 1, 1984, to December 31, 2006. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. We keep an acquisition if the bidder owns less than 50% of the target prior to the bid and is seeking to own greater than 50% of the target. For completed deals, we require that the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers. Cross-holdings are defined as the ratio of the shareholder's percentage ownership in the target divided by her percentage ownership in the bidder. We order all institutional investors of the bidder by their cross-holdings, and then report the (marginal) cross-holding for the top 5, 20, and 50 percent of institutional shareholdings (labeled the *top-5%*, *top-20%*, and *median cross-holding*, respectively). We require that at least 20% of the bidder's equity is owned by institutions for this analysis and restrict the sample to bidders with institutional ownership data available from five quarters prior to the bid announcement (Q-5) up to the announcement quarter (Q0).

		N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
Q-5	Top-5% Cross-holding	3099	1.638	2.496	1.205	2.058	3.33	4.365	9.654
	Top-20% Cross-holding	3099	0.463	1.328	0.144	0.718	1.154	1.433	3.248
	Median Cross-holding	3099	0.112	1.153	0.000	0.000	0.263	0.610	1.422
Q-4	Top-5% Cross-holding	3099	1.603	2.274	1.218	2.102	3.261	4.296	8.310
	Top-20% Cross-holding	3099	0.473	1.336	0.165	0.726	1.159	1.427	3.226
	Median Cross-holding	3099	0.113	1.157	0.000	0.001	0.281	0.628	1.252
Q-3	Top-5% Cross-holding	3099	1.626	2.111	1.230	2.098	3.290	4.269	8.531
	Top-20% Cross-holding	3099	0.473	1.309	0.190	0.754	1.162	1.444	2.857
	Median Cross-holding	3099	0.112	1.163	0.000	0.001	0.277	0.599	1.270
Q-2	Top-5% Cross-holding	3099	1.620	2.214	1.235	2.100	3.328	4.289	7.799
	Top-20% Cross-holding	3099	0.451	0.724	0.177	0.762	1.160	1.452	2.695
	Median Cross-holding	3099	0.094	0.368	0.000	0.001	0.295	0.604	1.252
Q-1	Top-5% Cross-holding	3099	1.624	2.306	1.240	2.134	3.228	4.162	7.828
	Top-20% Cross-holding	3099	0.453	0.655	0.207	0.763	1.164	1.455	2.743
	Median Cross-holding	3099	0.089	0.288	0.000	0.003	0.284	0.601	1.180
Q0	Top-5% Cross-holding	3099	1.475	1.779	1.154	1.905	2.977	3.818	6.753
	Top-20% Cross-holding	3099	0.444	0.856	0.169	0.707	1.106	1.392	2.978
	Median Cross-holding	3099	0.083	0.281	0.000	0.003	0.244	0.547	1.189

**Table 9**  
**Summary Statistics on Matched Control Bidders and Targets**

Our control sample of potential bidder-target pairs is obtained by first excluding actual bidders and targets in the announcement quarter from the Compustat/CRSP population. This forms the base set of potential control firms. For each bidder-target pair in our sample, we select a bidder (target) control in the same Fama-French (1997) industry. We require that the difference in total institutional ownership does not exceed 25% of the sample firm total institutional ownership, and that the difference in market capitalization does not exceed 25% of the sample firm market capitalization at the fiscal year-end prior to the bid announcement. We then pick the control bidder (target) with the closest total institutional ownership to the actual bidder (target) in the sample. Matching is done with replacement and only one bidder (target) control is matched to each sample bidder (target). The unique control bidder and control target then form the control bidder-control target pair. We end up with 2,210 control bidder-control target pairs for acquisitions in our sample. Panel A presents summary statistics for our bidder sub-sample with control firms available. Panel B presents summary statistics for our bidder control sample. The last two columns report the p-values of tests for differences in means and medians, respectively, between actual and control bidders. Panel C presents summary statistics for our target sub-sample with control firms available. Panel D presents summary statistics for our target control sample. The last two columns report the p-values of tests for differences in means and medians, respectively, between actual and control targets.

**Panel A: Bidder Characteristics**

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Total Institutional Ownership	2210	0.508	0.233	0.101	0.519	0.873
Market Capitalization	2210	6742.985	19614.363	81.051	1538.833	25878.352
Market Value Total Assets	2210	20884.164	63797.987	161.975	3700.877	95762.246
Book Value Total Assets	2210	16420.521	56651.267	93.756	2256.715	67782.944
Sales	2210	4135.450	8399.116	47.610	1045.153	18283.906
Market Leverage	2205	0.162	0.139	0.000	0.136	0.431
Book Leverage	2205	0.220	0.174	0.000	0.196	0.528
Market-to-Book Ratio	2210	1.876	1.820	0.983	1.308	4.443
Earnings-to-Price Ratio	2210	0.031	0.208	-0.097	0.054	0.129
Asset Liquidity	2188	0.434	0.246	0.069	0.421	0.795
Sales Growth	2210	0.515	10.054	-0.150	0.138	1.032
Return on Assets	2210	0.139	0.159	-0.002	0.122	0.399
Prior Year Stock Return	2210	0.312	0.752	-0.371	0.201	1.216
Prior Year Mkt-Adj Return	2210	0.156	0.734	-0.478	0.041	1.056

**Panel B: Control Bidder Characteristics**

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile	T-test	Median Test
Total Institutional Ownership	2210	0.504	0.230	0.101	0.519	0.863	0.568	0.663
Market Capitalization	2210	6558.933	19598.223	73.317	1469.340	23912.185	0.755	0.408
Market Value Total Assets	2210	19385.387	54350.710	153.722	3316.912	99443.822	0.401	0.203
Book Value Total Assets	2210	14937.991	46755.814	81.103	2043.585	70849.028	0.343	0.117
Sales	2210	4136.162	8548.663	44.207	999.672	17428.314	0.998	0.399
Market Leverage	2199	0.161	0.150	0.000	0.131	0.447	0.716	0.134
Book Leverage	2199	0.215	0.181	0.000	0.187	0.547	0.299	0.076
Market-to-Book Ratio	2210	1.992	1.995	0.983	1.317	5.331	0.044	0.293
Earnings-to-Price Ratio	2209	0.014	0.835	-0.103	0.053	0.127	0.358	0.961
Asset Liquidity	2193	0.421	0.257	0.064	0.385	0.818	0.085	0.065
Sales Growth	2210	0.483	11.590	-0.148	0.121	0.827	0.921	<0.001
Return on Assets	2210	0.130	0.163	0.001	0.120	0.382	0.055	0.988
Prior Year Stock Return	2210	0.228	0.693	-0.434	0.142	0.940	<0.001	<0.001
Prior Year Mkt-Adj Return	2210	0.072	0.680	-0.543	-0.012	0.794	<0.001	<0.001

**Panel C: Target Characteristics**

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile
Total Institutional Ownership	2210	0.364	0.246	0.036	0.319	0.816
Market Capitalization	2210	1186.599	4737.120	19.731	195.216	4786.986
Market Value Total Assets	2210	4827.742	26724.484	38.563	563.956	16343.199
Book Value Total Assets	2210	4168.701	24807.187	27.289	413.833	13588.808
Sales	2210	1224.332	4286.793	16.614	196.447	5514.085
Market Leverage	2207	0.166	0.159	0.000	0.129	0.472
Book Leverage	2207	0.206	0.196	0.000	0.164	0.566
Market-to-Book Ratio	2210	1.581	1.296	0.891	1.166	3.575
Earnings-to-Price Ratio	2208	-0.054	0.539	-0.537	0.050	0.129
Asset Liquidity	2199	0.455	0.254	0.066	0.453	0.845
Sales Growth	2210	0.180	0.524	-0.238	0.098	0.790
Return on Assets	2210	0.087	0.160	-0.166	0.084	0.314
Prior Year Stock Return	2210	0.204	0.830	-0.622	0.121	1.093
Prior Year Mkt-Adj Return	2210	0.048	0.813	-0.722	-0.048	0.902

**Panel D: Control Target Characteristics**

	N	Mean	StdDev	5 <sup>th</sup> Percentile	Median	95 <sup>th</sup> Percentile	T-test	Median Test
Total Institutional Ownership	2210	0.361	0.244	0.037	0.318	0.809	0.697	0.753
Market Capitalization	2210	1160.182	4810.285	20.072	182.220	4650.952	0.854	0.413
Market Value Total Assets	2210	4225.633	29700.485	34.100	522.841	12586.721	0.479	0.043
Book Value Total Assets	2210	3582.332	27836.387	22.117	373.359	10770.857	0.460	0.014
Sales	2210	1048.955	3530.157	13.197	182.511	4413.287	0.138	0.019
Market Leverage	2206	0.162	0.164	0.000	0.118	0.497	0.462	0.143
Book Leverage	2206	0.206	0.202	0.000	0.160	0.584	0.887	0.493
Market-to-Book Ratio	2210	1.681	1.338	0.892	1.196	4.003	0.012	0.008
Earnings-to-Price Ratio	2210	-0.027	0.388	-0.361	0.053	0.127	0.049	0.139
Asset Liquidity	2198	0.450	0.256	0.071	0.437	0.854	0.468	0.454
Sales Growth	2210	0.218	0.704	-0.245	0.109	0.903	0.038	0.020
Return on Assets	2210	0.089	0.184	-0.185	0.092	0.331	0.625	0.066
Prior Year Stock Return	2210	0.153	0.629	-0.564	0.095	0.953	0.021	0.061
Prior Year Mkt-Adj Return	2210	-0.003	0.614	-0.681	-0.067	0.763	0.018	0.072

**Table 10**  
**Cross-Holdings Between Actual and Control Bidder-Target Pairs**

Our control sample of potential bidder-target pairs is obtained by first excluding actual bidders and targets in the announcement quarter from the Compustat/CRSP population. This forms the base set of potential control firms. For each bidder-target pair in our sample, we select a bidder (target) control in the same Fama-French (1997) industry. We require that the difference in total institutional ownership does not exceed 25% of the sample firm total institutional ownership, and that the difference in market capitalization does not exceed 25% of the sample firm market capitalization at the fiscal year-end prior to the bid announcement. We then pick the control bidder (target) with the closest total institutional ownership to the actual bidder (target) in the sample. Matching is done with replacement and only one bidder (target) control is matched to each sample bidder (target). The unique control bidder and control target then form the control bidder-control target pair. We end up with 2,210 control bidder-control target pairs for acquisitions in our sample. Cross-holdings are defined as the ratio of the shareholder's percentage ownership in the target divided by her percentage ownership in the bidder. We order all institutional investors of the bidder by their cross-holdings, and then report the (marginal) cross-holding for the top 1, 5, 10, 20, and 50 percent of institutional shareholdings (labeled the *top-1%*, *top-5%*, *top-10%*, *top-20%*, and *median cross-holding*, respectively). We require that at least 20% of the bidder's equity is owned by institutions for this analysis. In addition to the analysis for institutional shareholders, we calculate cross-holdings for all bidder shareholders under the conservative assumption that all non-institutional investors have zero cross-holdings. Here the percentiles are with respect to all shareholders, and we do not impose the requirement that institutional investors own at least 20% of the bidder. We report cross-holdings for percentiles of institutional investors in Part I and for percentiles of all shareholders in Part II of each panel. Panel A presents summary statistics on cross-holdings for our actual bidder-actual target sample. Panel B presents results for the actual bidder-control target pairs, Panel C for the control bidder-actual target pairs, and Panel D for the control bidder-control target pairs. The last two columns in Panels B, C, and D report the p-values of tests for differences in means and medians, respectively, between cross-holdings of our actual bidder-actual target pairs (Panel A) and those of the respective alternative pairs.



**Panel A: Cross-holdings Between the Actual Bidder-Actual Target Pairs**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile
<i>I. Cross-holding by bidder institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>								
Top-1% Cross-holding	1945	4.696	4.708	3.535	6.293	9.730	13.137	20.550
Top-5% Cross-holding	1945	1.421	1.176	1.219	1.940	2.900	3.619	5.121
Top-10% Cross-holding	1945	0.779	0.700	0.706	1.179	1.673	2.037	3.027
Top-20% Cross-holding	1945	0.363	0.436	0.162	0.655	1.010	1.192	1.537
Median Cross-holding	1945	0.048	0.148	0.000	0.000	0.150	0.351	0.773
<i>II. Cross-holding by bidder shareholders</i>								
Top-1% Cross-holding	2210	2.790	2.590	2.040	3.926	6.165	7.813	11.416
Top-5% Cross-holding	2210	0.764	0.780	0.597	1.214	1.806	2.255	3.142
Top-10% Cross-holding	2210	0.353	0.473	0.058	0.662	1.090	1.315	1.771
Top-20% Cross-holding	2210	0.126	0.264	0.000	0.070	0.545	0.813	1.040
Median Cross-holding	2210	0.005	0.038	0.000	0.000	0.000	0.000	0.150

**Panel B: Cross-holdings Between the Actual Bidder-Control Target Pairs**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile	T-test	Median Test
<i>I. Cross-holding by bidder institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>										
Top-1% Cross-holding	1945	4.213	4.147	3.054	5.863	8.951	11.582	18.498	<0.001	<0.001
Top-5% Cross-holding	1945	1.294	1.187	1.094	1.784	2.677	3.277	5.457	<0.001	<0.001
Top-10% Cross-holding	1945	0.658	0.637	0.552	1.065	1.513	1.858	2.478	<0.001	<0.001
Top-20% Cross-holding	1945	0.287	0.391	0.045	0.530	0.917	1.078	1.408	<0.001	<0.001
Median Cross-holding	1945	0.029	0.106	0.000	0.000	0.060	0.199	0.594	<0.001	<0.001
<i>II. Cross-holding by bidder shareholders</i>										
Top-1% Cross-holding	2210	2.626	2.627	1.800	3.639	5.972	7.898	12.358	0.037	0.001
Top-5% Cross-holding	2210	0.663	0.737	0.459	1.087	1.668	2.092	3.013	<0.001	<0.001
Top-10% Cross-holding	2210	0.298	0.447	0.000	0.544	1.015	1.220	1.692	<0.001	<0.001
Top-20% Cross-holding	2210	0.096	0.224	0.000	0.019	0.404	0.632	0.988	<0.001	0.001
Median Cross-holding	2210	0.002	0.017	0.000	0.000	0.000	0.000	0.066	0.002	0.064

**Panel C: Cross-holdings Between the Control Bidder-Actual Target Pairs**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile	T-test	Median Test
<i>I. Cross-holding by bidder institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>										
Top-1% Cross-holding	1943	4.162	3.982	3.096	5.702	8.910	11.636	17.626	<0.001	<0.001
Top-5% Cross-holding	1943	1.256	1.040	1.076	1.749	2.612	3.173	4.690	<0.001	<0.001
Top-10% Cross-holding	1943	0.694	0.652	0.599	1.056	1.531	1.888	2.800	<0.001	<0.001
Top-20% Cross-holding	1943	0.295	0.392	0.066	0.527	0.913	1.078	1.464	<0.001	<0.001
Median Cross-holding	1943	0.032	0.118	0.000	0.000	0.062	0.192	0.694	<0.001	<0.001
<i>II. Cross-holding by bidder shareholders</i>										
Top-1% Cross-holding	2210	2.524	2.479	1.714	3.556	5.650	7.673	11.317	<0.001	0.001
Top-5% Cross-holding	2210	0.666	0.722	0.484	1.082	1.628	1.992	2.931	<0.001	<0.001
Top-10% Cross-holding	2210	0.298	0.435	0.006	0.530	0.996	1.188	1.622	<0.001	<0.001
Top-20% Cross-holding	2210	0.096	0.224	0.000	0.024	0.396	0.674	0.984	<0.001	0.001
Median Cross-holding	2210	0.003	0.024	0.000	0.000	0.000	0.000	0.077	0.042	0.068

**Panel D: Cross-holdings Between the Control Bidder-Control Target Pairs**

	N	Mean	StdDev	Median	75 <sup>th</sup> Percentile	90 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	99 <sup>th</sup> Percentile	T-test	Median Test
<i>I. Cross-holding by bidder institutional investors (total institutional ownership <math>\geq 0.2</math>)</i>										
Top-1% Cross-holding	1943	4.071	4.637	2.745	5.530	9.027	11.652	18.885	<0.001	<0.001
Top-5% Cross-holding	1943	1.214	1.041	1.054	1.661	2.483	3.091	4.717	<0.001	<0.001
Top-10% Cross-holding	1943	0.652	0.636	0.533	1.055	1.462	1.789	2.633	<0.001	<0.001
Top-20% Cross-holding	1943	0.282	0.388	0.033	0.505	0.947	1.073	1.365	<0.001	<0.001
Median Cross-holding	1943	0.038	0.144	0.000	0.000	0.071	0.227	1.000	0.023	<0.001
<i>II. Cross-holding by bidder shareholders</i>										
Top-1% Cross-holding	2210	2.541	2.556	1.733	3.540	5.753	7.670	11.741	0.001	<0.001
Top-5% Cross-holding	2210	0.630	0.690	0.431	1.055	1.557	1.952	2.823	<0.001	<0.001
Top-10% Cross-holding	2210	0.282	0.419	0.000	0.508	1.000	1.143	1.503	<0.001	<0.001
Top-20% Cross-holding	2210	0.099	0.228	0.000	0.024	0.413	0.656	1.000	<0.001	0.001
Median Cross-holding	2210	0.007	0.075	0.000	0.000	0.000	0.000	0.146	0.124	0.125

**Table 11**  
**Explaining Cross-Holdings Between Actual and Control Bidder-Target Pairs**

The sample consists of 2,210 acquisition attempts announced during the period January 1, 1984, to December 31, 2006, and three sets of matched (control) bidder-(control) target pairs. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. For completed deals, we keep an acquisition if the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers. Cross-holdings are defined as the ratio of the shareholder's percentage ownership in the target divided by her percentage ownership in the bidder. We order all institutional investors of the bidder by their cross-holdings, and then report the (marginal) cross-holding for the top 1, 5, 10, 20, and 50 percent of institutional shareholdings (labeled the *top-1%*, *top-5%*, *top-10%*, *top-20%*, and *median cross-holding*, respectively). We require that at least 20% of the bidder's equity is owned by institutions for this analysis. Columns (1)-(5) present regression results using different measures of cross-holdings as the dependent variables. The Control Target Dummy takes the value of one if the pair is from the actual bidder-control target sample, and zero otherwise. The Control Bidder Dummy takes the value of one if the pair is from the control bidder-actual target sample, and zero otherwise. The Control Bidder & Control Target Dummy takes the value of one if the pair is from the control bidder-control target sample, and zero otherwise. All model specifications employ robust standard errors. Superscripts \*\*\*, \*\*, and \* correspond to statistical significance at the 1, 5, and 10 percent levels, respectively. P-values are reported in brackets.

	(1) Top-1% Cross-holding	(2) Top-5% Cross-holding	(3) Top-10% Cross-holding	(4) Top-20% Cross-holding	(5) Median Cross-holding
Control Target Dummy	-0.449*** [0.000]	-0.096*** [0.001]	-0.102*** [0.000]	-0.065*** [0.000]	-0.016*** [0.000]
Control Bidder Dummy	-0.529*** [0.000]	-0.155*** [0.000]	-0.078*** [0.000]	-0.063*** [0.000]	-0.015*** [0.000]
Control Bidder & Control Target Dummy	-0.587*** [0.000]	-0.178*** [0.000]	-0.107*** [0.000]	-0.069*** [0.000]	-0.007 [0.114]
Bidder Total Institutional Ownership	-6.442*** [0.000]	-2.463*** [0.000]	-1.336*** [0.000]	-0.675*** [0.000]	-0.193*** [0.000]
Target Total Institutional Ownership	10.290*** [0.000]	2.922*** [0.000]	1.555*** [0.000]	0.712*** [0.000]	0.094*** [0.000]
Bidder Market Capitalization	1.107*** [0.000]	0.285*** [0.000]	0.129*** [0.000]	0.082*** [0.000]	0.027*** [0.000]
Target Market Capitalization	-0.549*** [0.000]	-0.110*** [0.000]	0.005 [0.696]	0.026*** [0.002]	0.013*** [0.000]
Bidder Market-to-Book Ratio	0.005 [0.912]	0.040*** [0.000]	0.021*** [0.000]	0.001 [0.853]	0.003* [0.051]
Target Market-to-Book Ratio	-0.050 [0.257]	0.018 [0.101]	0.013** [0.038]	-0.000 [0.965]	0.000 [0.832]
Bidder Return on Assets	0.425* [0.087]	0.171** [0.036]	0.138*** [0.001]	0.104*** [0.000]	0.032*** [0.000]
Target Return on Assets	-0.029 [0.916]	-0.007 [0.932]	-0.048 [0.138]	-0.025 [0.240]	-0.024*** [0.001]
Bidder Prior Year Stock Return	-0.023 [0.708]	0.034* [0.078]	0.038*** [0.007]	0.015** [0.011]	0.004* [0.086]
Target Prior Year Stock Return	-0.003 [0.957]	0.049*** [0.000]	0.006 [0.597]	-0.002 [0.734]	0.000 [0.986]
Absolute Difference in Total Institutional Ownership	2.314*** [0.000]	1.009*** [0.000]	0.470*** [0.000]	0.269*** [0.000]	0.146*** [0.000]
Absolute Difference in Market Capitalization	-0.589*** [0.000]	-0.288*** [0.000]	-0.151*** [0.000]	-0.100*** [0.000]	-0.026*** [0.000]
Absolute Difference in M/B Ratio	0.039 [0.433]	-0.027** [0.036]	-0.018*** [0.007]	-0.009** [0.017]	-0.004*** [0.006]
Absolute Difference in ROA	0.009 [0.974]	-0.175** [0.037]	-0.137*** [0.000]	-0.015 [0.533]	-0.010 [0.203]
Absolute Difference in Prior Stock Return	-0.134** [0.023]	-0.079*** [0.000]	-0.044*** [0.001]	-0.021*** [0.000]	-0.006*** [0.002]
Intercept	0.035 [0.954]	-0.112 [0.246]	-0.285*** [0.000]	-0.368*** [0.000]	-0.170*** [0.000]
Year Fixed Effect	YES	YES	YES	YES	YES
Number of Observations	7776	7776	7776	7776	7776
Adjusted R <sup>2</sup>	0.283	0.438	0.525	0.525	0.269

**Table 12**  
**Target Selection**

The sample consists of 2,390 acquisition attempts announced during the period January 1, 1984, to December 31, 2006, and 2,390 actual bidder-control target pairs. The bidders and targets are listed in the SDC's Mergers and Acquisitions database and have institutional holding data in the CDA/Spectrum database. For completed deals, we keep an acquisition if the bidder owns more than 90% of the target after the deal completion. All dollar amounts are in 2006 millions of dollars, all percentages are in real numbers. Cross-holdings are defined as the ratio of the shareholder's percentage ownership in the target divided by her percentage ownership in the bidder. We order all institutional investors of the bidder by their cross-holdings, and then obtain the (marginal) cross-holding for the top 1, 5, 10, 20, and 50 percent of institutional shareholdings (labeled the *top-1%*, *top-5%*, *top-10%*, *top-20%*, and *median cross-holding*, respectively). We require that at least 20% of the bidder's equity is owned by institutions for this analysis. The dependent variable, Target, takes the value of one for an actual target, and zero for a control target. All absolute difference measures are taken between the actual bidder and the actual or control target. Columns (1)-(5) present conditional logit regression results using different measures of cross-holdings as the key explanatory variable. All model specifications employ robust standard errors. Superscripts \*\*\*, \*\*, and \* correspond to statistical significance at the 1, 5, and 10 percent levels, respectively. P-values are reported in brackets.

	(1)	(2)	(3)	(4)	(5)
Top-1% Cross-holding	0.029*** [0.003]				
Top-5% Cross-holding		0.097** [0.014]			
Top-10% Cross-holding			0.460*** [0.000]		
Top-20% Cross-holding				1.069*** [0.000]	
Median Cross-holding					2.898*** [0.000]
Target Total Institutional Ownership	4.358*** [0.000]	4.414*** [0.000]	4.031*** [0.001]	4.247*** [0.001]	4.516*** [0.000]
Target Market Capitalization	2.630*** [0.000]	2.633*** [0.000]	2.436*** [0.000]	2.403*** [0.000]	2.428*** [0.000]
Target Market Leverage	0.198 [0.415]	0.183 [0.452]	0.183 [0.453]	0.267 [0.278]	0.253 [0.304]
Target Market-to-Book Ratio	0.026 [0.594]	0.023 [0.624]	0.025 [0.597]	0.029 [0.544]	0.018 [0.706]
Target Earnings-to-Price Ratio	-0.184 [0.129]	-0.179 [0.138]	-0.178 [0.103]	-0.167 [0.152]	-0.174 [0.148]
Target Asset Liquidity	0.367* [0.072]	0.359* [0.078]	0.352* [0.085]	0.388* [0.060]	0.394* [0.056]
Target Return on Assets	-1.120*** [0.000]	-1.110*** [0.000]	-1.060*** [0.000]	-1.017*** [0.001]	-1.021*** [0.000]
Target Prior Year Stock Return	0.334*** [0.000]	0.330*** [0.000]	0.326*** [0.000]	0.331*** [0.000]	0.321*** [0.000]
Absolute Difference in Total Institutional Ownership	-1.129 [0.384]	-1.129 [0.379]	-1.121 [0.383]	-1.333 [0.310]	-0.923 [0.483]
Absolute Difference in Market Capitalization	-1.416** [0.018]	-1.386** [0.020]	-1.530** [0.012]	-1.525** [0.014]	-1.520** [0.011]
Absolute Difference in M/B Ratio	-0.351*** [0.000]	-0.350*** [0.000]	-0.343*** [0.000]	-0.344*** [0.000]	-0.336*** [0.000]
Absolute Difference in ROA	-1.764*** [0.000]	-1.755*** [0.000]	-1.689*** [0.000]	-1.662*** [0.000]	-1.676*** [0.000]
Absolute Difference in Prior Stock Return	-0.267*** [0.002]	-0.273*** [0.001]	-0.261*** [0.002]	-0.252*** [0.003]	-0.251*** [0.002]
Bidder Fixed Effects	YES	YES	YES	YES	YES
Number of Observations	4780	4780	4780	4780	4780
Pseudo R <sup>2</sup>	0.113	0.111	0.120	0.128	0.122