Product Market Competition in a World of Cross-Ownership: Evidence from Institutional Blockholdings

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Abstract

We analyze whether and how institutional cross-ownership of same-industry firms affects product market behavior. Our baseline results show that cross-held firms experience significantly higher market share growth than non-cross-held firms. We establish causality by relying on a difference-in-differences approach based on the quasi-natural experiment of financial institution mergers. We also find evidence suggesting that institutional cross-ownership facilitates within-industry joint ventures and strategic alliances, within-industry acquisitions, interlocking boards, innovation activities, and pricing power. Overall, our evidence suggests that cross-ownership by institutional blockholders offers strategic benefits by fostering product market coordination.

Key words: cross-ownership, institutional blockholding, product market competition, institution merger

JEL number: G23, G32, G34, L11, L22

Over the past few decades, modern businesses, especially publicly traded firms, have become increasingly interconnected through common stock ownership. As Figure 1 shows, the fraction of U.S. public firms held by institutional blockholders that simultaneously hold large blocks of other same-industry firms has increased from below 10% in 1980 to about 50% in 2010. This increasing trend of institutional cross-ownership of same-industry firms suggests that treating firms as individual decision-makers on the product market may not adequately capture real strategic interactions among them. In fact, ample anecdotal evidence shows that large common blockholders can exert significant influence on the corporate decisions and product market strategies taken by their cross-held firms.[1] While existing literature focuses almost exclusively on *direct* cross-ownership by same-industry firms (i.e., corporate equity holdings among each other), little attention has been paid to the role of *indirect* cross-ownership by large common shareholders such as institutional investors in product market relationships.[2] Given the tremendous growth in same-industry institutional cross-ownership and the fact that such ownership is still largely unregulated (as opposed to the heavy regulations on direct same-industry ownership changes such as horizontal mergers), understanding the economic consequences of same-industry institutional cross-ownership, especially its implications for product market dynamics, is important for both academics and policy makers.

In this paper, we aim to address the above research question by empirically examining whether and, if so, how institutional cross-ownership of same-industry firms affects product market performance. We hypothesize that cross-ownership can offer product market benefits by fostering coordination among firms that are cross-held by the same blockholder. Obviously, one major cost to institutional blockholders that hold multiple blocks in the same industry is under-diversification. Thus, the benefits derived from same-industry blockholdings must be large

[1] For example, US Airways Group and AMR Corporation (the parent company of American Airlines), became cross-held by Tiger Management LLC starting in 1996. The two companies formed a broad marketing alliance in 1998. As another example, activist investor Carl Icahn was the largest shareholder in two truck makers, Oshkosh Corp. and Navistar International Corp., in 2011. He reportedly urged the two companies to merge (*Wall Street Journal*, December 20, 2011, "Icahn's Candidates for Oshkosh Board Would Support Navistar Merger"). Yet another example is the role played by TIAA-CREF, a cross-holder of two oil companies, Texaco and Pennzil, in resolving the litigation issues between the two firms in 1987 (Hansen and Lott, 1996).

[2] Several studies investigate the product market implications of direct cross-ownership among firms. See, e.g., Parker and Röller (1997), Allen and Phillips (2000), and Fee, Hadlock, and Thomas (2006).

enough to offset the costs in order to explain the observed pattern of institutional cross-holdings. One important benefit of institutional cross-holdings is economies of scale in information production (Kacperczyk, Sialm, and Zheng, 2005). We argue that another important benefit is that institutional cross-holders can influence the product market strategies of these same-industry firms to enhance the combined value of their holdings.[3]

A cross-holder's objective is to maximize risk-adjusted portfolio returns. However, intense competition among its portfolio firms, especially those operating in the same industry and thus offering similar products and services, can impose negative externalities (e.g., interfirm lawsuits, advertising wars, and R&D races) on one another and reduce combined portfolio returns for the cross-holder. Consequently, the cross-holder has an incentive to make portfolio firms reduce rivalry against each other (Hansen and Lott, 1996) and foster implicit or explicit coordination among the firms in the product market.[4] Thus, when firms become cross-held by the same institutional blockholder, the blockholder may play a bridge-building role by facilitating coordination among them. For instance, cross-held firms may enhance their product market competitiveness by forming strategic alliances among themselves, which would enable them to share resources (e.g., patent licensing agreements among technology firms), lower production and distribution costs, and reduce duplication of R&D efforts. In the extreme, these firms may merge together to realize the full potential of synergies. Moreover, the cross-holding institution, because of its access to the management of the firms in which it holds large equity stakes, may facilitate information sharing among these cross-held firms and advise them to collaborate strategically by, for example, sharing technical know-how, coordinating resource allocation to avoid competing against each other in the same product space, or collectively bargaining against major suppliers to achieve purchasing efficiencies. This hypothesis predicts that firms cross-held

[3] Prior literature shows that institutional investors exert significant influence on corporate policies in various settings (see, e.g., Brickley, Lease, and Smith, 1988; Bushee, 1998; Hartzell and Starks, 2003; Parrino, Sias, and Starks, 2003; Aghion, Van Reenen, and Zingales, 2013) and that portfolio considerations of large shareholders influence corporate decision-making (e.g., Faccio, Marchica, and Mura, 2011).

[4] Hansen and Lott (1996) provide a theory whereby cross-holders maximize their portfolio values by inducing their portfolio firms to internalize negative externalities. Similar arguments have also been made in the industrial organization literature on coalition formation among firms (see, e.g., Bloch, 1995; Yi, 1997).

by the same institutional blockholder should gain a competitive advantage in the product market relative to otherwise similar non-cross-held firms.[5]

One natural question is why same-industry firms do not pursue efficiency-enhancing collaboration by themselves in the absence of cross-holding institutions. We argue that there are at least three reasons. First, firms operating in the same industry often have diverging objectives and have a natural tendency to compete with one another. Second, the competing nature and lack of mutual trust may lead to coordination failures such as those described by a typical "prisoner's dilemma" problem. While it may be in the firms' long-term interest to cooperate with each other, they may have an incentive to deviate from a cooperative equilibrium to achieve higher gains in the short term. Third, due to incomplete contracting, same-industry firms contemplating collaborations may be concerned about the risk of expropriation by their counterparties, especially when investments are relationship-specific or information asymmetry is high (e.g., Allen and Phillips, 2000). Therefore, absent a common large shareholder, cooperative behavior among competing firms may fail to emerge. Cross-ownership by the same blockholding institution can serve as a commitment (or bonding) device to mitigate frictions associated with incomplete contracting. Because of their incentives and potential influence on cross-held firms' management via direct intervention, behind-the-scenes engagement, and the threat of exit (i.e., "voting by feet"), cross-holding institutions can enhance the level and efficiency of product market cooperation and more readily enforce collaborative agreements among same-industry firms.

Using a comprehensive sample of U.S. public firms from 1980 through 2010, we examine the impact of institutional cross-holdings of same-industry firms on product market performance. Our baseline results show that cross-held firms experience significantly higher market share growth than non-cross-held firms after controlling for factors commonly believed

[5] The null hypothesis of our study is that institutional investors that hold multiple blocks in firms in the same industry do not influence these firms' product market strategies or performance. This may arise because institutions have limited incentives and ability to push for changes in firms' product market strategies or because multiple blockholdings make institutions too busy to focus on each of their portfolio companies and thus reduce their effectiveness in influencing corporate management. Therefore, it is an empirical question whether institutional cross-ownership affects firms' product market performance.

to affect product market performance.[6] This relation is driven primarily by activist institutions. We also find that the gains in market share due to cross-ownership translate into higher stock valuation and improved operating profits.

Nevertheless, institutional blockholders do not invest randomly. A potential endogeneity concern is that institutions possess superior information (and/or information-processing skills) and thus are willing to cross-hold firms in a given industry only when they expect that these firms can aggressively gain market share in the future. In the meantime, unobservable firm characteristics such as corporate culture or managerial traits may also correlate with both cross-ownership and future product market performance, making our baseline results spurious. To address these endogeneity concerns, we exploit a quasi-natural experiment involving financial institution mergers using a difference-in-differences (DiD) approach. When two institutions merge, a block-held firm in the portfolio of the acquirer (target) may switch from being non-cross-held to being cross-held, because the target (acquirer) blockholds another same-industry firm before the merger. Thus, the treatment sample consists of firms such that their cross-holding institutions increase in number just because of the merger. The control sample, on the other hand, consists of other blockheld firms in the same institution's portfolio that do not change cross-holding status. These financial institution mergers generate plausibly exogenous variation in a firm's cross-ownership status because the majority of the mergers are motivated by deregulations in the financial sector and are thus unlikely to be driven by private information about individual stocks in the merging institutions' portfolios. We find evidence that treatment firms experience a significantly greater increase in market share growth than control firms around the institution mergers, suggesting a causal impact of cross-ownership on market share growth.[7]

[6] Following the literature on the interaction between financial decisions and product market performance (e.g., Campello, 2006; Fresard, 2010; Chemmanur and He, 2011), we measure a firm's product market strength using the growth of its sales-based market share, which captures the effects of both price and quantity of goods sold as well as the entry and exit of same-industry firms over time. We provide a detailed discussion on this measure in Section II.B.2.

[7] To address the reverse causality concern, we also use a difference-in-differences approach in the context of import tariff changes following the methodology of Fresard (2010). In unreported analysis, we find that the positive effect of existing (i.e., predetermined) cross-ownership status on product market performance is magnified when tariff cuts toughen the competitive environment unexpectedly.

We then explore how institutional cross-ownership improves a firm's product market performance. We again adopt a difference-in-differences approach using financial institution mergers as exogenous shocks to cross-ownership. We find that treatment firms whose cross-ownership increases due to the exogenous shock are significantly more likely to form same-industry joint ventures and strategic alliances, make within-industry acquisitions, and share common board members with other cross-held firms after the institution mergers. These results suggest that cross-ownership plays a bridge-building role and facilitates explicit coordination. We also find that treatment firms experience an increase in their innovation productivity and price-cost margin relative to control firms, suggesting that cross-held firms may collaborate on their innovation activities (e.g., by sharing technological know-how and other R&D resources) and may coordinate their product market strategies implicitly by cutting production and distribution costs (e.g., via collective bargaining against major suppliers and/or reducing marketing campaigns against each other). Overall, these results suggest that cross-ownership by institutional blockholders facilitates product market coordination.

Our results on the growth of sales-based market share (reflecting changes in both price and quantity of goods sold) seem more consistent with cost-side effects (i.e., via improved productive efficiency) than with price-side effects (i.e., via price collusion among same-industry firms) because of three reasons. First, the collusion hypothesis requires that firms with the potential to collude, i.e., those interconnected through common institutional blockholders, possess dominant market power such that their joint decisions can have a significant impact on prices at the industry level.[8] However, it does not appear plausible that a typical blockholder would have such dominating influence in the majority of industries in our sample. Second, in the model of Salant, Switzer, and Reynolds (1983), strategic attempts by colluding firms to reduce their aggregate output will only result in higher equilibrium output by other same-industry firms (i.e., non-colluding firms). Since both types of firms in the industry face the same equilibrium price, this result suggests that colluding (cross-held) firms should lose rather than gain market share, which is opposite to what we find. In contrast, our coordination hypothesis suggests that

[8] For example, Salant, Switzer, and Reynolds (1983) show that in a Cournot model, horizontal mergers motivated by collusive intentions are unprofitable unless at least 80% of the firms in that industry collude.

firms sharing common blockholders can enhance their production efficiency, lower prices, and grab greater market share from other non-cross-held firms in the same industry. Third, we conduct an event study around announcements of activist block purchases and find that the positive effect of cross-ownership on stock returns does not spill over to other non-cross-held same-industry firms and that major corporate customers of cross-held firms do not experience negative stock price reactions. These results, together with the above-mentioned result on innovation productivity, lend further support to our coordination hypothesis but not the collusion hypothesis.

Finally, we conduct two event studies to test the stock price implications of cross-ownership. First, we examine the impact of a newly acquired block by an institution on the prices of stocks already blockheld by the same institution. We find that stocks already blockheld by the institution that are in the same industry as the newly acquired block experience an abnormal cumulative announcement return of about two percentage points higher than those not in the same industry as the new block. Second, we analyze the cumulative abnormal returns (CARs) of treatment and control stocks in our institution merger sample surrounding the merger announcements, and find that the average CAR for treatment firms is approximately 2.5 percentage points higher than that for control firms. These results are consistent with our conjecture that the positive effect of cross-ownership on product market performance is reflected in stock prices and the gains are likely to be captured by the cross-holders.

Our paper makes four main contributions to the literature. First, to the best of our knowledge, this is the first firm-level study that examines the implications of institutional cross-ownership for firms' product market behavior and performance. Second, our paper is also the first to use financial institution mergers as an exogenous shock to firms' cross-holding status and to establish a *causal* link between institutional cross-ownership and firms' market share growth. Third, by analyzing the various coordination activities among cross-held firms, our paper sheds light on *how* interfirm relationships induced by modern ownership structure affect firms' strategic behavior and the competitive landscape of an industry. Fourth, and most importantly, our study illustrates that the traditional view of treating firms as *individual* decision-makers on

the product market (along with conventional measures of industry competitiveness) may not adequately capture real strategic interactions among firms or characterize the actual level of competition within an industry. Given the substantial growth of large cross-holdings, future studies on product market competition should take into account these indirect ownership linkages among firms operating in the same industry.

The rest of the paper is organized as follows. Section I discusses the related literature. Section II describes sample selection and reports summary statistics. Section III presents the baseline results on the relation between product market share growth and cross-ownership. Section IV addresses identification issues. Section V discusses how cross-ownership affects product market performance. Section VI examines the stock price implications of cross-ownership. Section VII concludes.

I. RELATION TO THE EXISTING LITERATURE

Our paper is related to several strands of finance and economics literature. The first is the literature on the implications of direct cross-ownership among same-industry firms for their product market behavior. Existing industrial organization theories suggest that cross-ownership among rival firms via mutual corporate equity holdings can reduce competition and lead to higher prices (e.g., Reynolds and Snapp, 1986; Farrell and Shapiro, 1990; Gilo, Moshe, and Spiegel, 2006). Empirical studies find evidence that such cross-ownership arrangements offer strategic benefits in product market relationships (Allen and Phillips, 2000; Fee, Hadlock, and Thomas, 2006) and lead to collusive outcomes (e.g., Parker and Röller, 1997).[9] However, this line of research examines only cross-ownership by the same-industry firms themselves but not that by common shareholders such as institutional investors. Our paper complements this literature by showing that institutional cross-ownership provides strategic benefits by facilitating product market collaboration.[10]

[9] Moreover, there is a sizable literature in the 1970s and early 1980s on corporate objectives when shareholders are heterogeneous, e.g., because they have different holdings in other firms (see, among others, Ekern and Wilson (1974), Radner (1974), Hart (1979), and Grossman and Stiglitz (1980)).

[10] Our paper also connects to the vast literature on how firms' ownership structure and financing decisions interact with their product market behavior and performance. For example, previous studies have shown that cash holdings (Fresard, 2010), debt financing (Khanna and Tice, 2000; Campello, 2006; Lyandres, 2006), initial public offerings

Second, our study also fits in the literature on the influence of institutional investors on corporate decisions and performance. A number of studies find evidence that institutional investors play the role of large shareholders and discipline corporate managers in various settings (e.g., Bushee, 1998; Hartzell and Starks, 2003; Parrino, Sias, and Starks, 2003; Del Guercio, Seery, and Woidtke, 2008; Gaspar, Massa, and Matos, 2005; Aghion, Van Reenen, and Zingales, 2013). Moreover, the literature indicates that institutional blockholders play a governance role. Much of the literature, however, treats institutional investors' portfolio holdings as independent positions and does not take externalities among portfolio companies into account. There are three notable exceptions. The first is the study by Faccio, Marchica, and Mura (2011), which shows that portfolio considerations of large shareholders influence corporate risk-taking. The other two exceptions are Matvos and Ostrovsky (2008) and Harford, Jenter, and Li (2011), both of which investigate the influence of cross-ownership by institutional investors in the context of acquisitions but arrive at opposite conclusions.

Third, our paper is also related to a growing body of literature on the interconnectedness of firms and its implications. Firms can be linked to each other through various types of relationships, such as customer-supplier relationships (Fee and Thomas, 2004; Fee, Hadlock, and Thomas, 2006; Cohen and Frazzini, 2008), sharing of common financial intermediaries (Asker and Ljungqvist, 2010), and interfirm alliances (Chan, Kensinger, Keown, and Martin, 1997; Gomes-Casseres, Hagedoorn, and Jaffe, 2006). Two recent studies closely related to ours examine the implications of cross-ownership by institutional investors. Azar (2011) shows that, at the industry level, greater cross-ownership is associated with a less competitive product market. We differ from Azar (2011) by focusing our tests on product market collaboration at the *firm* level and addressing the endogeneity issue using the quasi-natural experiment of financial institution mergers. In a working paper subsequent to ours, Azar, Schmalz, and Tecu (2014) find evidence of anticompetitive effects associated with cross-ownership in the airline industry. Since the airline industry is characterized by high entry barriers and high concentration of market share

(Chod and Lyandres, 2011; Chemmanur and He, 2011), leveraged buyouts (Chevalier, 1995; Dasgupta and Titman, 1998), venture capital financing (Chemmanur, Krishnan, and Nandy, 2011), and merger activity (Healy, Palepu, and Ruback, 1992; Andrade, Mitchell, and Stafford, 2001; Betton, Eckbo, and Thorburn, 2008; Spiegel and Tookes, 2011) all significantly affect firms' product market behavior and performance.

among a small number of dominant players, the anticompetitive effects they document may not be readily generalizable to other industries with dissimilar competitive landscapes. Unlike their paper, we focus on product market strategies by each individual *firm* (as opposed to each *airline route* in their study which is part of an airline company's portfolio of products), and analyze *all* industries, the majority of which can be very different in nature from the airline industry. While they only use one institution merger during the financial crisis (i.e., in 2009) as an exogenous shock to cross-ownership, we examine multiple institution mergers spanning from 1980 to 2008, which mitigates the concern for potential omitted variables coinciding with a single shock that directly affect firm behavior. Moreover, we consider institutional blockholdings of 5% or more when defining cross-ownership, whereas Azar, Schmalz, and Tecu (2014) consider equity holdings of any size.

II. SAMPLE SELECTION AND SUMMARY STATISTICS

A. Sample Selection

The sample examined in this paper includes U.S.-listed firms with common stocks traded on the NYSE, NASDAQ, and AMEX during the period 1980–2010. We retain firm-years with positive values for sales and total assets, those with available industry classification information (four-digit SIC codes), and those with at least two firms in the same industry.[11] We retrieve quarterly institutional holdings data from Thomson's CDA/Spectrum database (form 13F). Market share data and other financial statement items are from Compustat. Institution merger data are from Huang (2014). The above sample selection process results in 96,128 firm-year observations.

B. Variable Measurement

B.1 Measuring Cross-Ownership

[11] Following recent studies on the interaction between corporate finance and product market behavior, such as Campello (2006), Fresard (2010), and Hadlock and Sonti (2012), we use four-digit SIC codes to define product markets (industries) throughout the paper, although our results are also robust to alternative industry definitions such as using Fama-French 48 industries or the 10-K text-based industry definitions developed by Hoberg and Philips (2010, 2013).

For each quarter in the 1980–2010 sample period, we extract institutional holdings information from Thomson's CDA/Spectrum database and define a holding as a block if it exceeds 5% of the outstanding shares. Cross-holdings arise when an institution simultaneously holds more than one block in the same four-digit SIC industry. We then merge the quarterly information with Compustat data and aggregate over the four quarters before each firm's fiscal year ending date to obtain annual measures for cross-holdings.

To gauge a firm's cross-ownership status in any given fiscal year, we construct five measures. The first, *CrossDummy*, is a dummy variable that equals one if the firm is cross-held in any of the four quarters prior to the fiscal year end and zero otherwise.[12] The second measure, *LnNumCross*, is the natural logarithm of one plus the average number of unique institutions that cross-hold the firm in the four quarters prior to the fiscal year end. This measure captures the extent to which a firm is connected to other same-industry peers through cross-ownership. The third measure, *AvgPercent*, is the average percentage holding in same-industry peers block-held by the average cross-holding institution. More specifically, we first calculate the average percentage holding in same-industry firms (other than the one under consideration) block-held by each cross-holding institution during the four quarters prior to the fiscal year end and then average across all such institutions. This measure captures the intensity of cross-holding activities for the average institution. The fourth measure, *LnAvgNum*, is similarly defined. It is the natural logarithm of one plus the average number of same-industry peers block-held by the average cross-holding institution. The last measure, *TotalCrossOwn*, is the sum of all cross-holding institutions' average percentage holdings in the firm itself. This measure captures the total power of cross-holding institutions to influence firm management if they have similar goals.

B.2 Measuring Market Share Growth and Other Control Variables

We use the change in market share as our main measure for product market performance. Following specifications in the literature on product market competition, we define a firm's

[12] For robustness, we also construct two variations of *CrossDummy*. The first defines the cross-holding dummy based on whether the firm is cross-held in the *last* fiscal quarter of the year, and the second defines the dummy based on whether the firm is cross-held in *all* four quarters over the fiscal year. All our results remain qualitatively similar using these two alternative definitions of the cross-holding dummy.

market share as its sales in a year divided by the same four-digit SIC industry's total sales in that year. We then calculate a firm's market share growth as the difference in market share between the current year and the previous year. For example, if a firm's market share in year *t* is 20% and it is 22% in year *t*+1, the market share growth is two percentage points (or, 0.02 in our regressions).[13]

In this paper, we use sales-based market share growth as our primary measure for product market performance because of four reasons. First, it is well motivated by theoretical models linking corporate policies to product market performance (e.g., Maksimovic, 1986; Bolton and Scharfstein, 1990; Chevalier and Scharfstein, 1996; Campello and Fluck, 2006), and thus has become a standard measure of product market strength in recent empirical finance literature analyzing the interactions between financial/ownership structures and product markets.[14] Second, as Opler and Titman (1994) point out, sales-based market share growth is the most direct measure of customer-driven gains/losses in sales. Since the ability of a firm to generate cash flows depends in large part on attracting and retaining customers, market share growth captures an important dimension of a firm's product market performance. In fact, the very first step of many real-world valuation models (such as discounted cash flow techniques) is to estimate a firm's future sales growth rate because it reflects a firm's expected market power and earnings potential that directly contribute to its value. Third, because market share growth of firms in the same industry sums up to one, the measure enables us to gauge the gain in sales by cross-held firms relative to other firms in the same industry. Last, sales are less subject to accounting discretion/manipulation than reported earnings. Thus, sales growth may provide a more reliable measure of corporate performance than earnings-based performance measures. Nevertheless, since we are interested in the extent to which product market share growth translates into

[13] We conduct unit root tests on the level of market share for firms with at least 20 years of annual data. The augmented Dickey-Fuller tests show that the level of market share is non-stationary at the 1% level for about 97.7% of the firms. We thus use the change in market share, i.e., market share growth, as our outcome variable. For the majority of the firms, the augmented Dickey-Fuller tests reject the null that market share growth is non-stationary at the conventional levels.

[14] For example, Campello (2006) empirically examines the within-industry relation between leverage and sales-based market share growth; Fresard (2010) shows that large cash reserves lead to systematic future market share gains at the expense of industry rivals; and Chemmanur and He (2011) find that going public (i.e., IPOs) helps a firm to enhance its product market power by grabbing market share from its same-industry competitors.

operating profits and firm value, we also use price-cost margins and stock returns as our alternative performance measures.

We control for a vector of firm characteristics that may affect a firm's future market share growth. We compute all these variables for firm *i* over its current fiscal year *t*. The controls include firm size (the natural logarithm of total assets), growth opportunities (Tobin's *Q*), cash-to-asset ratio, leverage (long-term debt divided by total assets), profitability (return on assets), R&D capital scaled by book equity, capital expenditures over total assets, acquisition expenditures over total assets, growth in investment (the percentage change in property, plant, and equipment from year *t-1* to *t*), the average fractional ownership by institutional blockholders, total institutional ownership, as well as a dummy variable to indicate whether a firm is block-held by institutional investors in any fiscal quarter of the year.[15] To control for investor activism, we retrieve Schedule 13D filings from the SEC EDGAR database and count the number of initial 13Ds (i.e., excluding amendments) targeting the firm during the year.[16] Since electronic filings became available on EDGAR starting from 1994, we retrieve all 13Ds during the 1994–2010 period and focus on the subsample of firm-years between 1995 and 2010 in tests involving this variable.

C. Summary Statistics

To minimize the effects of outliers, we winsorize all continuous variables at the 1st and 99th percentiles. Table 1, Panel A provides summary statistics. The top five rows summarize our main measures for the extent of cross-ownership. About 40% of the firm-years in our sample are

[15] Following Chan, Lakonishok, and Sougiannis (2001) and Hirshleifer, Hsu, and Li (2013), we define a firm's R&D capital as its five-year cumulative R&D expenses assuming an annual depreciation rate of 20%. We then scale this number (the R&D capital) by the sum of the firm's book equity value and itself. Replacing this variable with R&D-to-assets ratio in the regressions does not qualitatively change our results.

[16] Depending on whether they have activist intentions, investors can choose to file a 13-D or a 13-G form when their holdings exceed 5% of a company's outstanding shares. A 13-D is required only when the blockholder intends to engage in active intervention. On the other hand, a 13-G form would suffice if the blockholder does not intend to change or influence the control over a company. Therefore, 13-D filers are generally more active in corporate governance than blockholders that do not file 13-Ds. See, e.g., Edmans, Fang, and Zur (2013) and Clifford (2008), for detailed discussions on the 13-D/13-G regulations. Since we are interested in the heterogeneity across institutions in terms of activism, we use 13-D filings as an indicator.

cross-held by at least one institution.[17] Since we replace these cross-ownership measures with zeros if a given firm-year is not cross-held, these five measures are all positively skewed. The next row summarizes the one-year-ahead market share growth ($MktShareGrow_{t+1}$) for our sample firm-years. Since market share changes are essentially a zero sum game (if there are no entries and exits), the mean and median market share growth rates are approximately zero. There is, however, considerable variation in $MktShareGrow_{t+1,}$ which has an interquartile range of 0.005 and a standard deviation of 0.066. The rest of the panel summarizes our control variables. On average, a firm in our sample has a book value of assets of $2.3 billion (or $1.3 billion in real 1982-1984 dollars), a Tobin's *Q* of 1.94, a cash-to-asset ratio of 17.6%, leverage of 17.3%, ROA of 5.7%, an R&D capital ratio of 11.7%, a capital-expenditure-to-assets ratio of 6.4%, an acquisition-expenditure-to-assets ratio of 2%, and an annual PPE growth rate of 19.9%. The average fractional ownership by institutional blockholders is 10.2% and the average total institutional ownership is 34.4% of the outstanding shares. About 68% of the firm-years in our sample have at least one institutional blockholder during any fiscal quarter over the year. Finally, the average log number of initial 13D filings targeting a firm during a year is about 0.089.

Table 1, Panel B summarizes the characteristics of cross-held and non-cross-held firm-years. These univariate comparisons indicate that, on average, cross-held firms have higher market share growth, larger total assets, a smaller mean but larger median of Tobin's *Q*, a higher cash-to-assets ratio, lower leverage, better operating performance (in terms of ROA), more R&D capital, fewer capital expenditures, more acquisition expenses, less PPE growth, greater institutional ownership, fewer initial 13D filings, and higher fractional ownership by institutional blockholders. In untabulated analysis, we find that the average holding period for an institutional block is about 7 quarters and that 64.5% of cross-held blocks are owned by non-transient institutions (Bushee, 1998). These findings suggest that cross-holders are long-term shareholders who are likely to exert influence on corporate management in order to reap strategic benefits.

Table 1, Panel C presents the distribution of cross-held and non-cross-held firm-years across the Fama-French 12 industries. We also break down firms that are not cross-held into

[17] If we define the annual cross holding dummy using a firm's cross holding status only in the last fiscal quarter of the year (instead of in any of the fiscal quarters), about 34% of the firm-years are cross-held.

those that are block-held and those that are not. As we can see, a reasonable fraction of firms in each industry is cross-held, with a higher concentration in Business Equipment, Healthcare, and Telecommunications. Industries in which firms are least likely to be cross-held are Consumer Non-Durables and Chemicals.

Figure 1 describes the pattern of institutional cross-ownership over time. The blue line with diamonds shows the fraction of U.S. public firms that are cross-held by institutional investors in any quarter of the fiscal year, and the purple line with squares shows the fraction of U.S. public firms that are cross-held by institutional investors in the last quarter of the fiscal year. Both lines show that the fraction of U.S. public firms that are cross-held has increased tremendously from below 10% in 1980 to about 50-60% in 2010, indicating that cross-ownership has now become so widespread that it is likely to have a profound impact on modern firm organization and market structure. The red dashed line shows that the fraction of institutional blockholders (i.e., those already owning over 5% of a firm's equity) that also cross-hold other same-industry firms is relatively stable over time, fluctuating mostly between 20% and 30%, which indicates that a cross-holding strategy has its own benefits (e.g., the economy of scale in information production and the potential benefits of fostering coordination among its portfolio companies) and costs (e.g., under diversification and exposure to industry-specific shocks), and thus has not become an industry norm. The green dotted line, which plots the fraction of all U.S institutional investors that cross-hold, reveals a somewhat similar pattern over time.

Overall, the patterns in the figure indicate that cross-ownership has gained considerable momentum over the past three decades, making it an interesting and important phenomenon to understand and explore.[18]

III. EMPIRICAL RESULTS ON THE RELATION BETWEEN PRODUCT MARKET SHARE GROWTH AND CROSS-OWNERSHIP

To assess how a firm's cross-ownership relates to its future product market performance,

[18] Since the main purpose of this study is to analyze the causal impact of cross-ownership on firms' product market performance rather than the motivations for cross holding from the perspective of an institution, we leave further investigations of these time trends to future studies. It is worth noting that our institution merger setting helps isolate the effect of cross-ownership from confounding factors that motivate cross-ownership.

we estimate various forms of the following model using the ordinary least squares (OLS) method:

$$MktShareGrow_{i,t+1} = \alpha + \beta CrossMeasure_{i,t} + \gamma Z_{i,t} + Year_t + Firm_i + \varepsilon_{i,t}, \quad (1)$$

where *i* indexes firm and *t* indexes time. The dependent variable is a firm's one-year-ahead market share growth as defined in the previous section. The cross-ownership measure, *CrossMeasure*, is one of the five cross-holding proxies (discussed in the previous section) for firm *i* over fiscal year *t*. *Z* is a vector of time-varying firm characteristics that may affect a firm's future market share growth. *Year* captures year fixed effects and *Firm* captures firm fixed effects. We cluster standard errors at the firm level.

We include firm fixed effects in the baseline regressions because, as in most empirical studies involving a potentially endogenous explanatory variable, it is possible here that unobservable variables that are omitted from our empirical model, i.e., Equation (1), affect both cross-ownership and market share growth, rendering our findings spurious. For example, high-quality managers may be able to boost a company's future market share growth via smarter product market strategies while in the meantime attracting more cross-holding institutions. In this case, management talent is unobservable and positively correlated with both cross-ownership and market share growth, which could bias our coefficient estimates of the cross-ownership measure upward. To the extent that the omitted firm characteristics that are correlated with both market share growth and cross-ownership are constant over time, the inclusion of firm fixed effects can remove the bias due to time-invariant firm characteristics.

Table 2, Panel A reports the baseline regression results estimating Equation (1) using *CrossDummy* as the measure for cross-ownership. The coefficient estimates of *CrossDummy* in all four specifications are positive and significant at the 1% level, suggesting that cross-ownership of a firm is associated with a higher market share growth rate in the following year. To be more concrete about its economic significance, Column (2) implies that a firm's one-year-ahead market share growth ($MktShareGrow_{t+1}$) when cross-held will be 0.005 higher than when it is not cross-held. Considering that market share growth in our sample has a standard deviation of 0.066, the magnitude of this effect is economically meaningful.

We control for a comprehensive set of time-varying firm characteristics that may affect future product market performance shown by the existing literature. We find that firms with smaller total assets, higher Tobin's *Q*, higher acquisition expenditures, and higher PPE growth enjoy higher future market share growth. Interestingly, the presence of institutional blockholders is negatively associated with future market share growth, possibly because blockholders may have a preference for more mature firms. Since blockholders may differ in their incentives and abilities to influence corporate strategies, we include the natural logarithm of one plus the number of initial 13D filings targeting the firm during the current year as an additional control in Column (4). The results suggest that the presence of activist investors is associated with greater future market share growth, which is consistent with these investors exerting active influence on corporate strategies and performance (Brav, Jiang, Partnoy, and Thomas, 2008).

Table 2, Panel B reports the OLS results using the other four measures of cross-ownership as well as two variations of the cross-holding dummy (depending on how we aggregate quarterly cross-holding information into an annual measure). We use the same set of control variables as in Column (4) of Panel A. To save space, we show only the coefficients on the cross-ownership measures, and omit the coefficient estimates of the control variables. The coefficient estimates of all six measures are positive and significant at either the 1% or the 5% level. The economic significance seems non-trivial as well. Based on the coefficient estimates reported in Column (1), for example, increasing the number of cross-holding institutions from the 25th percentile to the 75th percentile of its distribution is associated with an increase in a firm's market share growth of 0.693*0.007 = 0.005.

We conduct a rich set of robustness tests for our baseline results and present them in Table 2, Panel C. We again use the same set of controls as in Model (4) of Panel A and show only the results obtained using *CrossDummy* as the measure for cross-ownership. Robustness tests using other measures of cross-ownership yield qualitatively similar results. Column (1) uses the 10-K text-based fixed industry definitions (FIC 500) developed by Hoberg and Philips (2010,

2013) to define product markets and cross-holding status.[19] Column (2) examines only manufacturing industries (with SIC codes between 2000 and 3999). Column (3) uses a refined definition of industries by dropping those whose fourth digit of their SIC code is 0 or 9, as some studies such as Clarke (1989) and Kahle and Walking (1996) argue that such SIC codes might not accurately define economic markets. To address the concern that our baseline results might be driven by industries with a small number of firms, Column (4) drops industry-years with fewer than five firms.[20] Column (5) considers only firm-years that are blockheld (i.e., having at least one institution holding more than 5% of the firms' equity). Column (6) examines only S&P 500 firms, and Column (7) uses an alternative definition of market share growth: the difference between a firm's log market share in the next year and its log market share in the current year. Column (8) examines long-run product market performance in terms of the increase in market share from year *t* to year *t+3*. In all of the above regressions, the coefficient estimates of *CrossDummy* are significantly positive.[21,22]

Since activist institutions have strong incentives and abilities to influence corporate decision-making, we examine whether the cross-holdings of these activist institutions have a larger impact on firms' product market performance than cross-holdings of non-activist institutions.[23] We define activists using Schedule 13D filings. We match the 13D filers with the

[19] We thank Gerard Hoberg and Gordon Phillips for making their industry definitions publicly available on their websites. Although we report results using only FIC 500, our results are similar when using alternative industry definitions such as FIC 300 or FIC 400.

[20] In untabulated analysis, we also try dropping industry-years with fewer than 20 firms, or directly controlling for industry size (the number of firms in an industry-year), and find qualitatively similar results.

[21] To rule out the possibility that our results are mechanically driven by firms making acquisitions, we also drop firms that make same-industry acquisitions during either the current or the next year (at t or t+1), or those making same-industry acquisitions in any year of our sample period. We find qualitatively similar results. For example, when we exclude firms making same-industry acquisitions in any year of the sample period, the coefficient estimate before *CrossDummy* in Column (4) of Panel A, Table 2 is 0.007 and significant at the 1% level (with a t-value of 3.91).

[22] To address the concern that some firms may operate in multiple industries at a time, we conduct another robustness test by dropping all firm-years that report multiple business segments in Compustat, and our results still hold.

[23] While activist institutions have greater incentives and abilities to influence firm management by actively participating in corporate decision-making, seemingly passive institutional cross-holders may also facilitate product market coordination. Recent studies show that, because of their large ownership stakes, seemingly passive institutions can exert significant influences on corporate governance and corporate decision-making (see, e.g., Appel, Gormley, and Keim, 2015; Crane, Michenaud, and Weston, 2014). Thus, cross-holdings by passive institutions may serve as a "commitment device" to overcome coordination failures. It is useful to note that, if index funds and quasi-indexers are the main cross-holders and they indeed play a passive role in corporate decision-

13F institutions in our sample and classify institutional blockholders into activist institutions (i.e., those that filed at least one 13D in the past three years) and non-activist ones (i.e., those that did not file any 13D in the past three years). About 63% of the firm-years with cross-ownership have at least one activist cross-holder.

We construct the cross-ownership measures for activist and non-activist institutions separately and regress future market share growth on these modified cross-ownership measures. Table 2, Panel D presents the results. All specifications include the full set of control variables in the previous panels as well as firm and year fixed effects. As we can see, the coefficients on all five cross-ownership measures based on activist institutions are positive and significant at the 1% level, whereas the coefficients on cross-ownership measures based on non-activist institutions are generally insignificant. Moreover, the differences between the coefficients on the same cross-ownership measure for the two types of institutions are significant in all five specifications. These results suggest that cross-ownership by activist institutions has a stronger association with future market share growth than that by non-activist institutions.[24]

Overall, our baseline results suggest that a firm's cross-ownership is positively related to its future market share growth, supporting the hypothesis that institutional cross-holders enhance a firm's product market performance by influencing its management and strategic decision making.

The above analysis follows the literature on the implication of a firm's financial and ownership structure for its product market performance (e.g., Campello, 2006; Fresard, 2010; Chemmanur and He, 2011) by examining a firm's market share growth. However, one may wonder whether the gains in market share can translate into other performance measures such as long-term abnormal stock returns or operating profitability. To test this, we run OLS regressions of one-year-ahead abnormal stock performance and industry-adjusted operating performance (profit margins) on cross-ownership measures and controls. We use one-year-ahead buy-and-

making, it should be more difficult for us to reject the null hypothesis that institutional cross-holders do not affect the product market performance of their cross-held firms.

[24] In untabulated analysis, we also define cross-ownership based on holdings by institutional investors as classified in Bushee (1998, 2001). We find that cross-ownership by dedicated institutions and that by quasi-indexing institutions are positively related to future market share growth, and that cross-ownership by these two types of institutions is more positively associated with future market share growth than that by transient institutions.

hold abnormal returns (*BHAR*) and cumulative abnormal returns (*CAR*) based on the Fama-French-Carhart four-factor model to measure long-run abnormal stock performance, and construct three measures of one-year-ahead operating performance. *NOP* is the industry-adjusted net operating profitability (net income before extraordinary items and discontinued operations, plus tax expense and interest expense net of interest income, divided by sales); *NPM* is the industry-adjusted net profit margin (net income before extraordinary items and discontinued operations divided by sales); and *OPMBD* is the industry-adjusted operating profit margin before depreciation (operating income before depreciation divided by sales). Table 3 reports the regression results. All specifications include the full set of control variables in the baseline regressions in Table 2 as well as firm and year fixed effects. We find evidence that a firm's cross-holding status in the current year is positively related to its future stock and operating performance, suggesting that the gains in product market share induced by cross-ownership indeed translate into higher stock valuation and improved operating profits. We note, however, that these results are just correlations and are subject to potential endogeneity concerns (as will be discussed below).[25]

IV. IDENTIFICATION

As discussed earlier, an endogeneity concern is that omitted variables correlated with both a firm's cross-holding status and its future product market performance could bias the results. While including firm fixed effects alleviates the concern for time-invariant firm-specific omitted variables, it cannot fully resolve the issue if the omitted variables are time-varying. In addition, there is a potential reverse causality concern that firms with a higher potential to increase market share may attract more cross-holding institutional investors.

In this section, we address the endogeneity concerns by using a relatively new identification strategy in the literature: a DiD approach based on the quasi-natural experiment of financial institution mergers that generates plausibly exogenous variation in a firm's cross-

[25] Moreover, these alternative measures might capture the possible effects of cross-ownership on other aspects of a firm's operational efficiency than its product market strength, such as corporate governance, managerial compensation and risk taking, tax reporting strategies, information asymmetry, and so on. Therefore we focus on market share growth as our main product market performance measure.

ownership status.

A. The Experiment

The experiment of institution mergers, first adopted in Huang (2014), relies on the fact that financial institutions (e.g., bank holding companies, security brokers, asset management firms, etc.) often merge for reasons unrelated to the fundamentals of their portfolio holdings. Interfirm mergers between financial institutions are often a result of consolidation in the financial sector in response to deregulations. For instance, commercial banks were allowed to directly acquire existing investment banks as Section-20 subsidiaries in 1997. Further, following the Gramm-Leach-Bliley Act of 1999, commercial banks, investment banks, securities firms, and insurance companies were allowed to consolidate. These fundamental changes in regulations led to a wave of mergers of financial institutions and, as a result, the combination of the asset management arms of the merging financial firms. Two examples are the merger between Chase Manhattan Corp. and J.P. Morgan & Co. in 2000 and that between Fleet Boston Corp. and Bank of America in 2003. The size and scope of these banks indicate that the mergers are unlikely to be driven by the performance of an individual firm in their asset management arms' portfolios.[26] Over 60% of the institution mergers in our sample result from consolidation in the banking sector, while the rest are mergers between a bank and a non-bank financial institution, and those between non-bank financial institutions. Previous literature also suggests that mergers between two pure-play asset management firms are motivated largely by business strategy considerations of the institutions themselves, such as to achieve economies of scale in fund operations and to build market share by expanding financial product offerings (Jayaraman, Khorana, and Nelling, 2002), rather than by the characteristics of the individual stocks that these institutions either already hold or are about to invest in. Therefore, these non-bank mergers in the financial sector may also generate exogenous shocks to a firm's cross holding status because they are unlikely to be driven by concerns or information regarding any particular stocks in the portfolios of the

[26] See, e.g., Houston, James, and Ryngaert (2001) for a discussion of the motivations for bank mergers.

merging institutions. [27]

When two financial institutions merge, the acquirer usually takes over the existing portfolios (including the blockholdings) of the target and would generally maintain these acquired holdings (especially blocks) for an extended period of time due to liquidity and transaction cost concerns (see, e.g., Holthausen, Leftwich, and Mayers, 1990; Keim and Madhavan, 1996). Therefore, if a firm is block-held by one of the merging institutions but not cross-held by either of the two institutions before the merger and in the meantime a same-industry peer is similarly held by the other party of the merger, then both firms would become cross-held by the same (merged) institution right after the merger.[28] This event provides us with a nice quasi-natural experiment to test how firms' cross-ownership status affects their subsequent product market performance. Institution mergers in our setting provide a source of exogenous variation in firms' ownership structure, which should affect a firm's subsequent product market performance only through their effect on the firm's cross-holding status.

A key advantage of our identification strategy is that there are multiple shocks in this setting that affect different firms at exogenously different times. Identification with multiple shocks avoids a common difficulty faced by studies with a single shock, namely, the existence of potential omitted variables coinciding with the shock that directly affect firms' product market performance.

B. Identifying Treatment and Control Firms

We construct our financial institution merger sample from SDC's Mergers and Acquisitions database. We require that: (1) the merger is between two 13F institutions (or their parent firms) in the financial sector (with primary SIC codes in the 6000 to 6999 range) and announced during the period between 1980 and 2008; (2) the merging institutions cannot be

[27] Nevertheless, as we discuss below, we find that our results continue to hold if we restrict the sample of mergers to those in response to deregulation in the banking industry.

[28] Of course, these newly acquired cross-holdings by the merged institution may also change after the merger (especially over a long horizon) due to other reasons such as portfolio diversification considerations, turnover of portfolio managers, and firm- and industry-specific information. However, as long as there are no systematic economic forces to completely "undo" the formation of these new cross-holdings, we would, on average, still expect an increase in the extent of cross-ownership for these affected firms around the merger.

controlled by the same parent firm before the merger; (3) the merger is completed within one year after the initial announcement; and (4) the target institution stops filing 13F forms within one year after the completion of the deal.

To identify treatment firms, we require that the firms be block-held by one of the merging institutions (institution "A") but not cross-held by either merging institution during the quarter immediately before the merger completion date. We also require that the other party of the merger (institution "B") block-holds at least one other same-industry firm during the same quarter before the merger. We classify the non-cross-held firms by institution "A" satisfying these conditions as our treatment firms because such firms would switch from not being cross-held by the two merging institutions before the merger to being cross-held after the merger, so their total number of cross-holders would on average increase. Note that the procedure described above does not use any ex post information such as the actual cross-holding status of the firms post-merger. The crucial advantage of using only ex ante information to define treatments (and controls) is that we can largely mitigate the concern that the actual holding/selling decision of the merged institution may be endogenous in the sense that it may be driven by information regarding the firms' future prospects.[29]

When conducting the difference-in-differences analysis, we want to control for the managerial skills and investment styles of the merging institutions, which could be related to firm characteristics such as future product market performance. Hence, for each merger-institution pair, we require that potential control firms also be block-held by that particular institution but not cross-held by either merging institutions during the last quarter before the merger. The only difference between treatments and controls is that for the latter, we do not require the other party of the merger to simultaneously block-hold same-industry firms so that on average the control firms' cross-ownership status would not change around the merger. Other

[29] In fact, using only ex ante information to define our treatment and control firms may bias us against finding meaningful treatment effects because after the merger the treatment firms could only lose (rather than gain) cross-ownership from the merged institution whereas the control firms (which did not gain any cross-ownership due to the merger) face the opposite situation. Therefore, everything else equal, our difference-in-differences test results would have become stronger if we had required our treatment firms to be actually cross-held and our control firms to be actually non-cross-held by the merged institution following the event. In unreported analysis, we confirmed this conjecture.

than controlling for the potential confounding effects of institutions' skills and styles, the procedure described above has another advantage, which is to ensure that the treatment and control firms are both block-held by the same institution before the merger, further mitigating the concern that institutional block holdings (rather than cross-holdings) or time-invariant institution fixed effects (e.g., managerial talent, financial strength, and investment styles) drive our DiD results.[30]

Finally, for a firm to enter our estimation sample, we require that it have non-missing Compustat records for a symmetric seven-year (three years before and three years after the institution merger plus the year of the merger) window around the merger. After this step, we identify 45 unique treatment firms and 546 unique control firms for the 49 merger-institution pairs (covering 30 unique institution mergers) in this way.

The choice of a seven-year window (from year -3 to year +3) reflects a trade-off between relevance and accuracy. On the one hand, choosing too wide a window may incorporate too much noise that is irrelevant to the events and may unnecessarily reduce the sample size (because the firms then need to have non-missing data for more years) and thus lower the power of our test. On the other hand, there may be a gap between the change in a firm's ownership structure and its product market strategies and performance. Given the above considerations, we focus on a seven-year window, although results based on a five-year window are broadly similar.

C. The DiD Estimation

We adopt a multivariate DiD approach with the full set of interactions between firm fixed effects and the merger-institution pair fixed effects, as follows:

$$AvgMktShareGrow_{i,j,t} = \alpha + \beta_1 Treat * Post + \beta_2 Post + \beta_3 Treat + \gamma' Control_{i,t-1} + \delta Fixed_{i,j} + \varepsilon_{i,j,t}, \quad (2)$$

where *i* indexes firm, *j* indexes the merger-institution pair, and *t* indexes time (the period either before or after the merger). *AvgMktShareGrow* is the three-year average market share growth for

[30] However, this procedure also makes treatment and control firms come from different industries (otherwise they would have both been cross-held before the event). Although our DiD estimation framework mitigates this concern by including firm fixed effects (under the assumption that firms do not change their major industries in the few years around the merger), we fully address this concern by adopting an alternative procedure for finding controls, which we discuss in detail in the robustness section (Section IV.D).

firm *i* either in the pre- merger or the post- merger period. *Treat* is a dummy that equals one for treatment firms and zero for control firms. *Post* is a dummy that equals one for the post- merger period and zero for the pre- merger period. *Control* is a vector of the control variables used in our baseline regression in Equation (1), except for *LnNum13D*, the inclusion of which will reduce our sample size and thus the power of our DiD test. To mitigate concerns for simultaneity, we measure control variables at year -4 for the pre-merger period and at year 0 for the post-merger period. In some specifications, we control for the full interactions between firm fixed effects and the merger-institution-pair fixed effects. This is the most stringent estimation framework that fully controls for both cross-sectional heterogeneity and common time trends that affect both groups of firms. Under this regression framework, year fixed effects as well as *Treat* itself are unidentified (and thus are dropped from the regressions) because their effects have been fully absorbed by the *firm*merger* fixed effects. In other specifications, we include firm fixed effects and merger fixed effects (and/or industry fixed effects) separately. In such cases, year fixed effects are fully absorbed by the merger fixed effects, but *Treat* becomes identified because a given firm can act both as a treatment in one merger and as a control in another (occurring at a different time).

Table 4 reports the results from the baseline DiD analysis as described in Equation (2). In all specifications, the coefficient estimate before *Treat*Post* is positive and significant, suggesting that the treatment firms whose cross-ownership increases due to financial institution mergers enjoy a greater increase in market share growth relative to control firms whose cross-holdings do not change. In terms of economic significance, the coefficient estimates of *Treat*Post* across the four columns indicate that firms whose cross-ownership increases due to exogenous shocks would experience around 1.4 to 2.4 percentage points higher average market share growth than control firms over a seven-year period around the events, which is economically significant, considering that market share growth in the DiD sample has a standard deviation of 8.9%.

In untabulated analysis, we also check the DiD estimator for the average change in cross-ownership to verify the premise of the natural experiment: exogenous shocks to cross-ownership

due to institution mergers should on average lead to an increase in the number of cross-holders and the total percentage ownership by cross-holders for the treatment group relative to the controls. We examine two measures of cross-ownership: *LnNumCross*, which is the log of one plus the average number of cross-holding institutions (over a three-year period either before or after the event); and *TotalCrossOwn*, which is the average total percentage equity owned by cross-holding institutions. Consistent with our conjecture, we observe a significant increase in both measures for treatment firms relative to control firms around the institution mergers.

The success of the DiD approach hinges on the satisfaction of the key identifying assumption behind this strategy, i.e., the parallel trends assumption, which states that in the absence of treatment, the DiD estimate is zero. To test this assumption, we perform two placebo tests using year -4 as the "pseudo-event" year and examining average market share growth in the window of year -7 to year -1. For brevity, we do not tabulate the results but only describe them here. The first placebo test takes the actual set of financial institutions that conduct mergers in year 0, but redefines treatment and control firms following the procedure described in Section IV.B. We then perform the same multivariate DiD analysis (as in Table 4) on this newly generated sample. The coefficient estimate before *Treat*Post* now becomes much smaller (around 0.01) and statistically insignificant in all four specifications. The second placebo test uses the same set of treatment and control firms identified in Section IV.B, and analyzes their average market share growth during a seven-year window symmetrically around the hypothetical "event" year (year -4). In all four specifications similar to those reported in Table 4, the coefficient estimates before *Treat*Post* are statistically insignificant. These results show that there are no observable divergent trends in market share growth between the two groups of firms before the exogenous shock, suggesting that the parallel trends assumption is likely to hold in our setting.

D. Robustness

We conduct various robustness tests for the DiD analysis and report the results in Table 5. First, as stated earlier, the treatment and control firms in our main DiD analysis necessarily

belong to different industries. To the extent that different industries may experience differential structural changes in their product markets around the merger dates, our DiD results could merely reflect structural breaks in different industries rather than the difference in firms' cross-ownership status. To address this concern, we use an alternative procedure to find control firms. Specifically, for each treatment firm, we first find its same-industry peers not cross-held by the merging institutions during the quarter before the merger and then retain those that are block-held by some non-merging institutions during that quarter. We then retain all such unique control firms for a particular merger, run our DiD analysis, and report the results in Table 5, Panel A. As we can see, our main DiD results continue to hold under this alternative definition of controls.

Second, instead of aggregating the information in the pre- and post-merger periods, we adopt the same regression framework as in the baseline OLS analysis and consider the year-by-year variation in market share growth for treatment and control firms. The results are presented in Table 5, Panel B. The increase in market share growth for the treatment group is significantly larger than the increase for the control group, reinforcing our findings in the previous panels.

Third, we adopt a propensity-score-matching method to control for differences in observable characteristics between the treatment and control firms prior to the event. Specifically, we rely on a nearest neighbor matching of propensity scores, originally developed by Rosenbaum and Rubin (1983) and also adopted in recent literature such as Lemmon and Roberts (2010). We first run a probit regression in year -4 (i.e., strictly before our DiD analysis period) of a dummy variable that equals one if a firm belongs to the treatment group (and zero otherwise) on a comprehensive list of observable characteristics, including all the independent variables in our main DiD regression, as well as their market share growth and cross-ownership status (i.e., *LnNumCross* and *TotalCrossOwn*). We then use the predicted probabilities, or propensity scores, from this probit estimation and perform a nearest-neighbor match with replacement. Since the number of potential control firms is considerably larger than the number of treatment firms, we choose to find 3 controls for each treatment. This will allow us to avoid relying on too little information or including vastly different observations. However, our results

are robust to any number of matches between 1 and 5.[31] After obtaining a closely matched sample of firms, we repeat the main DiD tests as in Table 4, and report the results in Table 5, Panel C. As we can see, the increase in cross-ownership status due to an exogenous shock still causes an increase in market share growth, even in this sample of propensity-score-matched firms.

In untabulated analysis, we perform two more robustness tests. First, to address the concern that our DiD results can be mechanically driven by the increase in same-industry acquisitions for reasons *other than* cross-ownership changes (note that acquisitions due to increased cross-ownership are one of the possible channels we examine in the next section), we drop firms making any same-industry acquisitions during the post-event period and continue to observe a positive and significant treatment effect.

Second, to make our DiD setting as clean as possible (i.e., to make sure that our events are truly exogenous), we limit our sample of financial institution mergers only to those in response to the banking-industry deregulations (the Gramm-Leach-Bliley Act) in late 1990s. Although this strict sample-screening procedure has greatly reduced the number of observations, the coefficient before *Treat*Post* in the DiD test is still very similar, in terms of both statistical and economic significance, to our main DiD results reported in Table 4.

Overall, the DiD analysis suggests that an exogenous increase in a firm's cross-ownership results in higher future market share growth, which is consistent with a positive causal effect of cross-ownership on product market performance.

V. POSSIBLE SOURCES OF PRODUCT MARKET GAINS

[31] In untabulated analysis, we find that prior to matching, the treatment group has significantly larger cross-ownership, higher cash ratio and PPE growth, and lower leverage and institutional ownership than the control group. However, after matching, these differences become much smaller in magnitude and none of them are statistically significant. Further, the majority of differences in the estimated propensity scores between the treatment firms and their corresponding matches from the control group are trivial. For example, for the first-best matches, the maximal difference between the matched propensity scores is 0.008. Even for the worst (third-best) match, the maximal difference between the treatment and control firms is only 0.021 in propensity scores, while the 95th percentile is only 0.012. Considering that the mean propensity score for the treatment and control group is around 0.14, these represent tiny differences. Hence, the matching process has removed any meaningful observable differences between the two groups of firms prior to the DiD analysis.

Our evidence so far is consistent with the hypothesis that cross-ownership helps firms on their product markets. In this section, we explore in greater depth how cross holdings facilitates market share growth. Section V.A. shows that an increase in cross-ownership may encourage explicit product market collaborations among firms cross-held by the same institution in the form of joint ventures, strategic alliances, and acquisitions, and thus lead to higher future market share growth. In Section V.B., we find that exogenous shocks that enhance a firm's cross-ownership make the firm more likely to share its board of directors with other cross-held same-industry firms (i.e., having a larger number of interlocking board members). Section V.C. argues that the sharing of technological know-how and collaboration in R&D efforts may help cross-held firms increase their innovation productivity. Section V.D. shows that firms' price-cost margins rise following exogenous increases in cross-ownership. Finally, Section V.E. provides a detailed discussion on the price-side and cost-side explanations for the market share growth induced by cross-ownership.[32]

A. Explicit Product Market Collaborations

In this section, we examine whether explicit product market collaborations could help explain the positive effect of cross-ownership on market share growth. If two firms in a given industry are owned (cross-held) by the same institution that exerts influence on firm management, they are likely to coordinate on product market strategies and better integrate their resources by entering into some form of product market agreements (joint ventures and strategic alliances), or, in the extreme case, merging with each other (i.e., same-industry acquisitions). As a result, collectively these cross-held firms can tap into larger new markets, grab more business opportunities, enjoy greater economies of scale in production and sales, and ultimately compete more effectively against other non-cross-held rivals.[33]

[32] A clean identification of the effects of these coordination activities on product market performance is difficult, because it would require exogenous shocks to each of these collaboration activities or instrumental variables that influence product market outcomes only through a certain type of coordination activities. Therefore, we rely on economic arguments and previous literature to establish the link between these coordination activities and market share growth.

[33] Chan, Kensinger, Keown, and Martin (1997) find that strategic alliances are value-increasing and that partnering firms tend to display better operating performance than their industry peers over the five-year period surrounding the year in which an alliance is formed. Johnson and Houston (2000) find that horizontal joint ventures create

To test the above conjecture, we perform a DiD analysis on firms' product market collaboration activities in the setting of institution mergers. Specifically, we compare the total number of same-industry joint ventures, strategic alliances, and acquisitions between a given firm and its same-industry peers cross-held by the same institution during the three years before and the three years after the institution merger for both treatment and control firms. The data on joint ventures, strategic alliances, and acquisitions during the 1980–2010 period are taken from the Security Data Company's (SDC's) Mergers and Acquisitions database. For acquisitions, we require that the bidder (acquirer) owns less than 50% of the target shares prior to the transaction.

Table 6, Panel A presents the results using our original DiD test sample. Each column includes either the full interaction between firm fixed effects and merger-institution fixed effects, or these fixed effects separately (and/or with industry fixed effects). The dependent variable, *LnNumSame*, is the log of one plus the total number of same-industry joint ventures, strategic alliances, and acquisitions between a firm and its same-industry peers cross-held by the same institution during the three years before or the three years after the institution mergers. We conduct both a univariate analysis by not including any controls and a multivariate analysis by including common control variables from the literature (see, e.g., Cremers, Nair, and John (2009)) such as firm size, Tobin's *Q*, operating performance (*ROA*), asset tangibility (*PPE* over assets), financial slack (cash over assets ratio), and firm leverage. To make sure our results are not driven by any systematic changes in block ownership or institutional holdings, we follow the main DiD specifications in Table 4 to also control for *BlockOwn*, *InstOwn*, and *BlockDummy*.

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synergistic gains that are shared by the partners whereas vertical joint ventures generate gains only for suppliers. Similarly, Slovin, Sushka, and Mantecon (2007) find evidence that horizontal joint ventures generate greater gains than vertical or cross-industry ventures, and that horizontal ventures capitalize expected monopoly rents. A large body of marketing literature (see, e.g., Rindfleisch and Moorman, 2001; Rindfleisch and Moorman, 2003; Sivadas and Dwyer, 2000; and Rothaermel and Deeds, 2004) has also shown that joint ventures and strategic alliances can help firms improve their product quality and in turn strengthen their competitiveness. Likewise, some finance papers have found that same-industry mergers and acquisitions can reduce cash flow risks and result in better operating performance, although the evidence is less conclusive. For example, Fee and Thomas (2004) find evidence consistent with improved productive efficiency and buying power as sources of gains to horizontal mergers. Sheen (2013) shows that mergers by firms in the same product market can lead to operational efficiencies and lower costs. Using text-based analysis of 10-K product descriptions, Hoberg and Philips (2010) find that ex post cash flows and transaction stock returns both increase for mergers with similar product market language and that firms merge and buy assets to increase product differentiation. However, earlier evidence such as Mueller (1985) indicates that market share does not increase for horizontal and conglomerate mergers for the largest firms between 1950 and 1970.

As we can see, the coefficient estimates before *Treat*Post* are all positive and significant at the 1% level, showing that treatment firms (i.e., those that experience an increase in cross-ownerships due to financial institution mergers) are more likely to increase their product market collaboration with same-industry cross-held firms via joint ventures, strategic alliances, as well as acquisitions compared with control firms after the institution mergers.

The above DiD analysis suggests that explicit product market collaboration in the form of same-industry joint ventures, strategic alliances, and acquisitions might be one economic channel through which cross-ownership increases product market performance.

B. Interlocking Boards

When two firms are cross-held by the same institution, the institution can facilitate information sharing and strategic coordination among the cross-held firms through overlapping board memberships (i.e., board members that sit on both boards). These interlocking board members may enable the cross-held firms to compete more effectively with non-cross-held rivals in the same industry. Thus, interlocking boards could be another form of inter-firm collaboration that helps explain the positive effect of cross-ownership on market share growth.[34]

To test this conjecture, we examine the effect of cross-holding on a firm's likelihood of sharing board members with other same-industry firms cross-held by the same institutional blockholder in the DiD framework, using the sample constructed in Section IV.B. We retrieve the data on boards of directors from RiskMetrics. Since the RiskMetrics director data start in 1993, we examine only institution merger deals that took place on or after 1996 (so we can use the board data three years prior to the mergers). Also, since RiskMetrics only has limited

[34] The Clayton Act of 1914 prohibits any person from serving as a director in any two companies that are in direct competition with each other. However, this act is very rarely enforced although there have been potential violations (Dooley, 1969; Hallock, 1997). One reason for the poor enforcement of the interlocking regulation is that it "was so fraught with loopholes and so easily evaded that it was hardly worth the allocation of resources required to enforce it" (Halverson, 1976). For example, it is difficult to determine whether two firms are direct competitors and to quantify the revenues generated by one company in competition with the other, i.e., "competitive sales" as defined in the act. Nevertheless, the act does not apply to interlocking boards between financial institutions including banks, banking associations, and trust companies. Nor does it apply to interlocking boards between firms with less than $10 million in "capital, surplus, and undivided profits."

coverage of our sample firms, we use three-digit SIC codes rather than four-digit codes to define industries to increase the power of our tests.

Table 6, Panel B reports the DiD estimators for our measure of a firm's interlocking board membership, *FracInterlock*, which is the average fraction of a given firm's board of directors who simultaneously sit on the boards of other same-industry firms cross-held by the same institution in a fiscal year. We use the same set of controls as in Panel A, the coefficient estimates of which are not reported for brevity. As we can see, in all columns the coefficient estimates before *Treat*Post* are significantly positive, suggesting that following an exogenous shock to a firm's cross-ownership status, the firm is more likely to have board members who simultaneously sit on the boards of other same-industry firms cross-held by the same institution. Thus, our DiD analysis suggests that interlocking board memberships are another plausible underlying economic channel through which cross-ownership affects product market performance.

C. Innovation Productivity

Another possible reason for why cross-held firms are able to achieve greater market share growth is that they can share technological know-how and coordinate R&D efforts to lower production costs, enhance product quality, and improve innovative efficiency (Grossman and Shapiro, 1986). To explore this possible economic gain due to cross-ownership, we analyze how treatment firms' innovation productivity changes relative to the control group in the institution merger setting.

Following the innovation literature (e.g., Hirshleifer, Hsu, and Li, 2012), we measure a firm's innovation productivity by the number of patents it generates per dollar of its lagged R&D expenditures. We gather patenting data from the National Bureau of Economic Research (NBER) Patent Citation database, the database from Kogan et al. (2012) (available at https://iu.box.com/patents), and the Harvard Business School (HBS) patent database (available at http://dvn.iq.harvard.edu/dvn/dv/patent).[35] For completeness, we also examine a firm's R&D

[35] Following the recent literature (e.g., He and Tian, 2013), we use the application year instead of the grant year to determine a firm's innovation output (i.e., patents) in a given year because the patent application year has been

capital ratio (defined earlier), following Chan, Lakonishok, and Sougiannis (2001) and Hirshleifer, Hsu, and Li (2012). Again, we average these two measures of a firm's innovation productivity over the three-year period before and the three-year period after the institution mergers and adopt the same model specifications as the previous two subsections. Table 6, Panel C reports the DiD estimators. In all columns, the coefficient estimates before *Treat*Post* are significantly positive at the 5% level, suggesting that, following an exogenous shock to a firm's cross-ownership status due to institution mergers, the cross-held firm enjoys higher growth in innovation productivity than similar control firms. This finding is consistent with the production efficiency benefits offered by cross-ownership due to resource sharing and coordinated R&D efforts among cross-held firms. Hence, the gains in innovation productivity due to collaboration on R&D projects could be another contributor to the enhancement in product market performance induced by cross-ownership.

D. Price-Cost Margin

To examine whether the gains in market share growth caused by cross-ownership translate into increases in operating profitability, we compare the change in price-cost margin for both the treatment and control firms in the DiD framework.[36] The three measures of price-cost margin examined here, *NOP*, *NPM*, and *OPMBD* are the same as those in Table 3, so the tests in this subsection can be thought of as an extension of the earlier tests on other performance measures to the DiD setting (when we have a cleaner identification). We average these industry-adjusted price-cost margin measures over the three-year period before and the three-year period after the institution mergers and compare across treatment and control groups.

The multivariate DiD results are presented in Table 6, Panel D. To fully control for all observable factors that determine a firm's price-cost margin, we include an expanded list of

shown to better align with the actual time when the innovation activities take place. To address the truncation concern for innovation activities that take place towards the end of our sample period, we adjust the patent data by using the "weight factors" first developed by Hall, Jaffe, and Trajtenberg (2001) and estimating the shape of the application-grant distribution, which is also a standard practice in the innovation literature.

[36] It is worth noting that the test itself does not distinguish whether the increase in price-cost margins associated with cross-ownership is driven by an increase in prices or by a decrease in costs. As will be discussed in the next subsection, the overall evidence in our paper is more consistent with cost reductions than with price increases as the primary driver of our market share growth (and price-cost margin) results.

control variables (in addition to those used for the previous three panels) in the second specification for each price-cost margin measure, such as market share growth, R&D capital ratio, capital expenditure ratio, acquisition expenses over assets, and growth in intangible assets (*PPE*). As we can see, the coefficient estimates before *Treat * Post* are positive and significant at the 5% or 10% level in five out of six specifications, suggesting that cross-ownership allows firms to enjoy a higher profit margin.

It is worth noting that price-cost margins likely reflect the outcome of both explicit and implicit product market coordination. The mechanisms discussed above suggest that cross-ownership by institutional blockholders enable firms to gain market share by fostering explicit product market coordination (e.g., joint ventures and R&D alliances). However, cross-holding institutions could use their information about the companies they block-hold and their influence over the companies' management to facilitate bridge-building and the development of implicit business ties. Although these "behind-the-scenes" activities are generally not observable, the outcome of such collaborative behavior can be partly captured by price-cost margins. A high price-cost margin could be a manifestation of reduced costs because of efficiency improvements induced by cross-ownership.[37] For instance, cross-held firms can coordinate R&D efforts to lower production costs and improve innovative efficiency (Grossman and Shapiro, 1986) and increase purchasing efficiencies (see, e.g., Fee and Thomas, 2004). A high price-cost margin could also indicate a firm's ability to increase price without losing much demand for its products, which reflects its pricing power that may arise from its cooperation with same-industry firms held by a common block-holder. Such product market coordination activities include, but are not limited to, joint "predation" strategies via financial collaboration to drive out local competitors (see, e.g., Bolton and Scharfstein, 1990) and reducing aggressive marketing campaigns that attack each other, which could potentially raise the local entry barrier and enhance the market power (and thus market share growth) of cross-held firms against other same-industry rivals. Therefore, the evidence of an increase in price-cost margin for treatment firms following

[37] It is possible that the result on profit-cost margins can be driven by a reduction in unit cost due to fixed costs being spread over a greater number of goods sold. Since we do not observe the cost structure or the number of units sold, we are not able to directly test the specific forms of cost reduction.

institution mergers can be interpreted as consistent with cross-ownership facilitating both explicit and implicit coordination.

E. Efficiency Gains or Collusion?

As in the case of horizontal mergers (e.g., Fee and Thomas, 2004), improved productive efficiency may be the primary driver of gains in product market share for cross-held firms. Cross-ownership, by fostering various forms of product market collaboration, can reduce cross-held firms' production and operational costs and help them realize greater economies of scale, which in turn allow the firms to charge a lower price to attract more customers, grab market share, and eventually drive some of their same-industry rivals out of the market. If the increase in demand (and the corresponding quantities of goods sold) dominates the decrease in price (due to cost efficiency), then the firms' sales revenue (and thus their sales-based market share) will increase relative to that of their same-industry rivals that are not cross-held.

Our results in Section V.C regarding innovation productivity in the DiD setting support the above production efficiency explanation, implying that institutional cross-ownership can lead to the sharing of technological know-how and coordinated R&D efforts among cross-held firms. Moreover, in partial support of the conjecture that cross-held firms may "soften" competition among each other by reducing unnecessary marketing costs (or advertising wars), we find, in untabulated analysis, that treatment firms' advertising expenditures per dollar of sales drop significantly relative to those of the control firms in the post-merger year. These results provide support for the production efficiency (i.e. cost reduction) explanation.

However, one may wonder whether the gains in market share can also be driven by increased price collusion facilitated by cross-ownership. In other words, by reducing the number of *independent* decision-making firms in an industry, cross-ownership can induce the firms in the industry to coordinate better on price and move towards a more monopolistic equilibrium. Our results on the growth of sales-based market share seem more consistent with cost-side effects (i.e., via improved productive efficiency) than with price-side effects (i.e., via price collusion among same-industry firms) because of three reasons. First, the collusion hypothesis requires

that firms with the potential to collude, i.e., those interconnected through common institutional blockholders, possess dominant market power such that their joint decisions can have a significant impact on prices at the industry level. For example, Salant, Switzer, and Reynolds (1983) show that in a Cournot model, horizontal mergers motivated by collusive intentions are unprofitable unless at least 80% of the firms in that industry collude, which is unlikely to happen for most industries in practice. Second, in the model of Salant, Switzer, and Reynolds (1983), strategic attempts by colluding firms to reduce their aggregate output will only result in higher equilibrium output by other same-industry firms (i.e., non-colluding firms). Since both types of firms in the industry face the same equilibrium price, this result suggests that colluding (cross-held) firms should lose rather than gain market share, opposite to what we find in our paper. Third, as we discuss in the next section (Section VI.A), our 13D-filing event-study results that the positive announcement effect of cross-ownership on stock returns does not spill over to other non-cross-held same-industry firms and that corporate customers of cross-held firms do not experience negative stock price reactions indicate that price collusion induced by institutional cross-ownership is unlikely to be the primary driver of our main results.

Nevertheless, without detailed data on unit output price, unit marginal cost, or the quantities of goods sold, it remains difficult to pin down the exact sources of efficiency gains induced by cross-ownership. We leave further exploration of this issue to future studies.

VI. EVENT STUDIES

As argued before, if cross-owners facilitate coordination among their portfolio companies and improve these firms' product market performance, the stock prices of these companies should reflect the gains in market share. In this section, we conduct two tests to examine the effect of cross-ownership on stock returns using the event-study approach, which measures market reactions to unanticipated events and thus is less prone to endogeneity problems. Section VI.A uses the event-study approach to examine the impact of a newly acquired block by an institution on the price of stocks already blockheld by that institution. Section VI.B compares the

average cumulative abnormal returns of treatment and control stocks in our institution merger sample surrounding the announcement of the mergers.

A. Announcement Returns of Existing Blocks around Schedule 13D Filings

Schedule 13D filings provide an ideal setting in which we can examine the stock price effect of cross-ownership for three reasons. First, 13D filings provide a clear indication of activism pursued by the filing institution. Second, 13D filings are generally unanticipated, because they are associated with significant abnormal returns for the firms being targeted around the time of the filings (Brav, Jiang, Partnoy, and Thomas, 2008). Last but not least, the acquisition of a new block and the corresponding filing of a 13D form would change the cross-holding status of stocks already blockheld by the institution. Our hypothesis predicts that stocks already blockheld by the institution that are in the same industry as the newly acquired block should experience significantly positive abnormal returns following the 13D filing on the new block. In contrast, stocks already blockheld by the institution that are not in the same industry as the newly acquired block should experience insignificant returns because of the lesser ability of the blockholder to achieve coordination benefits.

For each 13D filing by a 13F institution, we retrieve the institution's 13F holdings in the quarter immediately before the filing and classify blocks in the institution's portfolio into cross-held blocks and non-cross-held blocks. Specifically, cross-held blocks are stocks already blockheld by the institution that are in the same four-digit SIC industry as the newly acquired block, and non-cross-held blocks are stocks already blockheld by the institution that are not in the same industry as the newly acquired block. We focus on initial 13D filings by institutions and identify 324 cross-held blocks and 8,081 non-cross-held blocks for the 1994–2010 period. We calculate the average cumulative abnormal returns of cross-held and non-cross-held blocks around the filing of a 13D on a newly acquired block by the same institution. The abnormal returns are obtained using the CAPM and the Fama-French-Carhart four-factor model. We use a

12-day event window, from day -1 to +10, with day 0 as the filing date.[38] The results, reported in Table 7, Panel A, show that cross-held blocks deliver a cumulative abnormal return (CAR) of 1.8% to 2.4%, whereas non-cross-held blocks have a much smaller CAR (close to 0%). The difference between the CARs of the two groups of blocks is significant at conventional levels. These results are consistent with our prediction that the stock prices of cross-held firms reflect the potential gains induced by cross-ownership.

Moreover, we examine the stock price reaction of same-industry firms that are not in the 13D filer's portfolio but are blockheld by other institutional investors. If cross-ownership leads to increased collusion between the cross-held firms and their same-industry rivals (so as to push up industry-wide output price and profits), we should expect positive abnormal returns for same-industry rivals, regardless of whether they are cross-held by the financial institution filing the 13D. On the other hand, if the increase in product market performance induced by cross-ownership is driven mainly by production efficiency, the positive abnormal return should be observed only for same-industry firms whose stocks are cross-held by the institution filing the 13D but not for rivals. The results, reported in the same panel, show that stocks that are not in the 13D filing institution's portfolio but are blockheld by other institutions have an insignificant CAR (close to 0%) during the event window.[39] This finding echoes that in Fee and Thomas (2004), who find that horizontal mergers do not increase collusion among same-industry firms but rather improve productive and purchasing efficiencies for the merged firms. Meanwhile, the difference between the CAR for cross-held stocks and these non-cross-held same-industry stocks is significant at conventional levels. This result suggests that industry-wide collusion induced by institutional cross-ownership is not the primary driving force in our sample.

To test whether cross-ownership enables firms to raise prices at the expense of their customers, we examine the stock price reaction of corporate customers of cross-held firms in the

[38] It appears that it takes time for the market to fully incorporate the information in 13D filings. For example, Brav, Jiang, Partnoy, and Thomas (2008) use a 40-day window around the filings to examine the market reaction. In unreported analysis, we obtain qualitatively similar results using alternative window lengths.

[39] If the market correctly anticipates the loss in market share for same-industry firms not cross-held by the 13D institution, these firms should on average experience negative abnormal returns. The fact that we observe insignificant (close to zero) abnormal returns suggests that there are confounding effects, e.g., industry-wide undervaluation or the market's anticipation of subsequent block acquisitions in the same industry.

13D filing setting. If cross-held firms collude by increasing their prices and restricting output, the corporate customers of these cross-held firms should experience significant negative announcement returns around the 13D filing. We identify corporate customers of cross-held firms using Compustat industry segment files (following Fee and Thomas, 2004). The result, reported also in Table 7, Panel A, shows that corporate customers of cross-held firms have positive but insignificant CARs during the event window. This finding provides further evidence against the hypothesis that cross-ownership engenders anticompetitive effects in our sample.

B. Announcement Returns of Treatment and Control Firms around Institution Mergers

To gauge the causal impact of cross-ownership on a firm's market value (stock price), we further analyze the average cumulative abnormal returns of treatment and control stocks in our institution merger sample surrounding the announcement of the mergers. Again, we obtain the abnormal returns using the CAPM and the Fama-French-Carhart four-factor model, respectively, and examine the CARs from day -1 to +10, with day 0 as the announcement date of the institution merger. Since CARs reflect changes of stock prices for treatment and control firms, this test can be viewed as a DiD analysis on the effect of cross-ownership on stock performance.

Table 7, Panel B presents the results for this event study. The CARs for treatment firms are around 2-3% and statistically significant, whereas those for control firms are small and insignificant. Moreover, the difference between the CARs for treatment firms and for control firms is significant at the 5% level. The economic magnitude is also large: treatment firms outperform control firms by approximately 2.4 percentage points during the 12-day announcement period. This finding is consistent with the conjecture that gains in market share growth due to an exogenous increase in cross-ownership status are partly reflected in stock prices.

VII. CONCLUSION

In this paper, we analyzed whether and how institutional cross-ownership of same-industry firms affects product market behavior. We found that cross-held firms experience

significantly higher market share growth than non-cross-held firms. To establish causality, we adopted a difference-in-differences approach based on the quasi-natural experiment of financial institution mergers. Further, we identified several forms of product market coordination through which a firm's cross-ownership improves its market share growth: within-industry joint ventures and strategic alliances, within-industry acquisitions, collaboration on innovation activities, interlocking boards, and pricing power. Overall, our evidence shows that cross-ownership by institutional blockholders offers strategic benefits by fostering product market coordination. By establishing a causal relationship between cross-ownership and product market performance and exploring potential economic channels, our study has important implications for studies on the interaction of ownership/organizational structure and product market behavior and suggests that future research on product market competition should carefully examine firms' interconnectedness through common equity ownership.

REFERENCES

Aghion, Philippe, John Van Reenen, and Luigi Zingales, 2013, Innovation and institutional ownership, *American Economic Review* 103, 277–304.

Allen, Jeffrey W., and Gordon M. Phillips, 2000, Corporate equity ownership, strategic alliances, and product market relationships, *Journal of Finance* 55, 2791–2815.

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

Appel, Ian, Todd A. Gormley, and Donald B. Keim, 2015, Passive investors, not passive owners, *Journal of Financial Economics*, forthcoming.

Asker, John, and Alexander Ljungqvist, 2010, Competition and the structure of vertical relationships in capital markets, *Journal of Political Economy* 118, 599–647.

Azar, Jose, 2011, A new look at oligopoly: Implicit collusion through portfolio diversification, Unpublished working paper.

Azar, Jose, Martin C. Schmalz, and Isabel Tecu, 2014, Anti-competitive effects of common ownership: Evidence from the airline industry, Unpublished working paper.

Betton, Sandra, B. Espen Eckbo, and Karin S. Thorburn, 2008, Corporate takeovers, in B.E. Eckbo, ed. *Handbook of Corporate Finance: Empirical Corporate Finance*, Volume 2, Elsevier/North-Holland Handbook of Finance Series.

Bloch, Francis, 1995, Endogenous structures of association in oligopolies, *RAND Journal of Economics* 26, 537-556.

Bolton, Patrick, and David S. Scharfstein, 1990, A theory of predation based on agency problems in financial contracting, *American Economic Review* 80, 93–106.

Brav, Alon, Wei Jiang, Frank Partnoy, and Randall Thomas, 2008, Hedge fund activism, corporate governance, and firm performance, *Journal of Finance* 63, 1729–1775.

Brickley, James A., Ronald C. Lease, and Clifford W. Smith, Jr., 1988, Ownership structure and voting on antitakeover amendments, *Journal of Financial Economics* 20, 267–291.

Bushee, Brian, 1998, The influence of institutional investors on myopic R&D investment behavior, *The Accounting Review* 73, 305–333.

Bushee, Brian, 2001, Do institutional investors prefer near-term earnings over long-run value? *Contemporary Accounting Research* 18, 207–246.

Campello, Murillo, 2006, Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics* 82, 135–172.

Campello, Murillo, and Zsuzsanna Fluck, 2006, Product market performance, switching costs, and liquidation values: The real effects of financial leverage, Unpublished working paper.

Chan, Louis K.C., Josef Lakonishok, and Theodore Sougiannis, 2001, The stock market valuation of research and development expenditures, *Journal of Finance* 56, 2431–2456.

Chan, Su H., John W. Kensinger, Arthur J. Keown, and John D. Martin, 1997, Do strategic alliances create value? *Journal of Financial Economics* 46, 199–221.

Chemmanur, Thomas J., and Jie He, 2011, IPO waves, product market competition, and the going public decision: Theory and evidence, *Journal of Financial Economics* 101, 382–412.

Chemmanur, Thomas J., Karthik Krishnan, and Debarshi Nandy, 2011, How does venture capital financing improve efficiency of private firms? A look beneath the surface, *Review of Financial Studies* 24, 4037–4090.

Chevalier, Judith A., 1995, Do LBO supermarkets charge more? An empirical analysis of the effects of LBOs on supermarkets' pricing, *Journal of Finance* 50, 1095–1112.

Chevalier, Judith, and David S. Scharfstein, 1996, Capital market imperfections and countercyclical markups: Theory and evidence, *American Economic Review* 86, 703–725.

Chod, Jiri, and Evgeny Lyandres, 2011, Strategic IPOs and product market competition, *Journal of Financial Economics* 100, 45–67.

Clarke, Richard N., 1989, SICs as delineators of economic markets, *Journal of Business* 62, 17–31.

Clifford, Christopher P., 2008, Value creation or destruction? Hedge funds as shareholder activists, *Journal of Corporate Finance* 14, 323–336.

Cohen, Lauren, and Andrea Frazzini, 2008, Economic links and predictable returns, *Journal of Finance* 63, 1977–2011.

Crane, Alan D., Sebastien Michenaud, and James P. Weston, 2014, The effect of institutional ownership on payout policy: A regression discontinuity design approach, Unpublished working paper, Rice University.

Cremers, Matijn K. J., Vinay B. Nair, and Kose John, 2009, Takeovers and the Cross-section of Returns, *Review of Financial Studies* 22, 1409–1445.

Dasgupta, Sudipto, and Sheridan Titman, 1998, Pricing strategy and financial policy, *Review of Financial Studies* 11, 705–737.

Del Guercio, Diane, Laura Seery, and Tracie Woidtke, 2008, Do boards pay attention when institutional investor activists "just vote no"? *Journal of Financial Economics* 90, 84–103.

Dooley, Peter C., 1969, The interlocking directorate, *American Economic Review* 59, 314–323.

Edmans, Alex, Vivian W. Fang, and Emanuel Zur, 2013, The effect of liquidity on governance, *Review of Financial Studies* 26, 1443–1482.

Ekern, Steinar, and Robert Wilson, 1974, On the theory of the firm in an economy with incomplete markets, *Bell Journal of Economics and Management Science* 5, 171-180.

Faccio, Mara, Maria-Teresa Marchica, and Roberto Mura, 2011, Large shareholder diversification and corporate risk-taking, *Review of Financial Studies* 24, 3601–3641.

Farrell, Joseph, and Carl Shapiro, 1990, Asset ownership and market structure in oligopoly, *RAND Journal of Economics* 21, 275–292.

Fee, C. Edward, and Shawn Thomas, 2004, Sources of gains in horizontal mergers: Evidence from customer, supplier, and rival firms, *Journal of Financial Economics* 74, 423–460.

Fee, C. Edward, Charles J. Hadlock, and Shawn Thomas, 2006, Corporate equity ownership and the governance of product market relationships, *Journal of Finance* 61, 1217–1251.

Fresard, Laurent, 2010, Financial strength and product market behavior: The real effects of corporate cash holdings, *Journal of Finance* 65, 1097–1122.

Gaspar, José-Miguel, Massimo Massa, and Pedro Matos, 2005, Shareholder investment horizons and the market for corporate control, *Journal of Financial Economics* 76, 153–165.

Gilo, David, Yossi Moshe, and Yossi Spiegel, 2006, Partial cross ownership and tacit collusion, *RAND Journal of Economics* 37, 81–99.

Gomes-Casseres, Benjamin, John Hagedoorn, and Adam B. Jaffe, 2006, Do alliances promote knowledge flows? *Journal of Financial Economics* 80, 5–33.

Grossman, Gene M., and Carl Shapiro, 1986, Research joint ventures: An antitrust analysis, *Journal of Law, Economics, & Organization* 2, 315–337.

Grossman, Sanford J., and Joseph E. Stiglitz, 1980, Stockholder unanimity in making production and financial decisions, *Quarterly Journal of Economics* 94, 543–566.

Hadlock, Charles, and Ramana Sonti, 2012, Financial strength and product market competition: Evidence from asbestos litigation, *Journal of Financial and Quantitative Analysis* 47, 179–211.

Hall, Bronwyn H., Adam Jaffe, and Manuel Trajtenberg, 2001, The NBER patent citation data file: lessons, insights and methodological tools, Unpublished working paper.

Hallock, Kevin F., 1997, Reciprocally interlocking boards of directors and executive compensation, *Journal of Financial and Quantitative Analysis* 32, 331–344.

Halverson, James T., 1976, Interlocking directorates – Present anti-trust enforcement interest placed in proper analytical perspective, *Villanova Law Review* 21, 393–408.

Hansen, Robert G., and John R. Lott, Jr., 1996, Externalities and corporate objectives in a world with diversified shareholder/consumers, *Journal of Financial and Quantitative Analysis* 31, 43–68.

Harford, Jarrad, Dirk Jenter, and Kai Li, 2011, Institutional cross-holdings and their effect on acquisition decisions, *Journal of Financial Economics* 99, 27–39.

Hart, Oliver D., 1979, Monopolistic competition in a large economy with differentiated commodities, *Review of Economic Studies* 46, 1–30.

Hartzell, Jay C., and Laura T. Starks, 2003, Institutional investors and executive compensation, *Journal of Finance* 58, 2351–2374.

He, Jie, and Xuan Tian, 2013, The dark side of analyst coverage: The case of innovation, *Journal of Financial Economics* 109, 856-878.

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

Hirshleifer, David A., Po-Hsuan Hsu, and Dongmei Li, 2012, Innovative efficiency and stock returns, *Journal of Financial Economics* 107, 632–654.

Hoberg, Gerard, and Gordon Phillips, 2010, Product market synergies and competition in mergers and acquisitions: A text-based analysis, *Review of Financial Studies* 23, 3773–3811.

Hoberg, Gerard, and Gordon Phillips, 2013, Text-Based network industries and endogenous product differentiation, Unpublished working paper.

Holthausen, Robert W., Richard W. Leftwich, and David Mayers, 1990, Large-block transactions, the speed of response, and temporary and permanent stock-price effects, *Journal of Financial Economics* 26, 71–95.

Houston, Joel, F., Christopher M. James, and Michael D. Ryngaert, 2001, Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders, *Journal of Financial Economics* 60, 285–331.

Huang, Jiekun, 2014, Shareholder Coordination, corporate governance, and firm value, Unpublished working paper.

Jayaraman, Narayanan, Ajay Khorana, and Edward F. Nelling, 2002, An analysis of the determinants and shareholder wealth effects of mutual fund mergers, *Journal of Finance* 57, 1521–1551.

Johnson, Shane A., and Mark B. Houston, 2000, A reexamination of the motives and gains in joint ventures, *Journal of Financial and Quantitative Analysis* 35, 67–85.

Kacperczyk, Marcin, Clemens Sialm, and Lu Zheng, 2005, On the industry concentration of actively managed mutual funds, *Journal of Finance* 60, 1983–2012.

Kahle, Kathleen, and Ralph A. Walking, 1996, The impact of industry classifications on financial research, *Journal of Financial and Quantitative Analysis* 31, 309–335.

Keim, David B., and Ananth Madhavan, The upstairs market for large-block transactions: analysis and measurement of price effects, *Review of Financial Studies* 9, 1–36.

Khanna, Naveen, and Sheri Tice, 2000, Strategic response of incumbents to new entry: The effect of ownership structure, capital structure, and focus, *Review of Financial Studies* 13, 749–779.

Kogan, L., D. Papanikolaou, A. Seru, and N. Stoffman, 2012. Technological innovation and growth. Unpublished working paper.

Lemmon, Michael, and Michael Roberts, 2010, The response of corporate financing and investment to changes in the supply of credit, *Journal of Financial and Quantitative Analysis* 45, 555–587.

Loomis, Carol J., 2014, BlackRock: The $4.3 trillion force, *Fortune Magazine*, July 7.

Lyandres, Evgeny, 2006, Capital structure and interaction among firms in output market: Theory and evidence, *Journal of Business* 79, 2381–2421.

Matvos, Gregor, and Ostrovsky, Matvos, 2008, Cross-ownership, returns, and voting in mergers, *Journal of Financial Economics* 89, 391–403.

Maksimovic, Vojislav, 1986, Optimal capital structure in oligopolies, Unpublished Doctoral Dissertation, Harvard University.

Mueller, Dennis C., 1985, Mergers and market share, *Review of Economics and Statistics* 67, 259–67.

Opler, Tim, and Sheridan Titman, 1993, The determinants of leveraged buyout activity: Free cash flow vs. financial distress costs, *Journal of Finance* 48, 1985–1999.

Parker, Philip M., and Lars-Hendrik Röller, 1997, Collusive conduct in duopolies: Multimarket contact and cross-ownership in the mobile telephone industry, *RAND Journal of Economics* 28, 304–322.

Parrino, Robert, Richard W. Sias, and Laura T. Starks, 2003, Voting with their feet: Institutional ownership changes around forced CEO turnover, *Journal of Financial Economics* 68, 3–46.

Radner, Roy, 1974, A note on unanimity of stockholders' preferences among alternative production plans: A reformulation of the Ekern-Wilson model, *Bell Journal of Economics and Management Science* 5, 181–184.

Reynolds, Robert J., and Bruce R. Snapp, 1986, The competitive effects of partial equity interests and joint ventures, *International Journal of Industrial Organization* 4, 141–153.

Rindfleisch, Aric, and Christine Moorman, 2001, The acquisition and utilization of information in new product alliances: A strength-of-ties perspective, *Journal of Marketing* 65, 1–18.

Rindfleisch, Aric, and Christine Moorman, 2003, Interfirm cooperation and customer orientation, *Journal of Marketing Research* 40, 421–436.

Rosenbaum, Paul R., and Donald B. Rubin, 1983, The central role of the propensity score in observational studies for causal effects, *Biometrika* 70, 41–55.

Rothaermel, Frank T., and David L. Deeds, 2004, Exploration and exploitation alliances in biotechnology: A system of new product development, *Strategic Management Journal* 25, 201–221.

Salant, Stephen W., Sheldon Switzer, and Robert J. Reynolds, 1983, Losses from horizontal merger: The effects of an exogenous change in industry structure on Cournot-Nash equilibrium, *Quarterly Journal of Economics* 98, 185–199.

Sheen, Albert, 2013, The real product market impact of mergers, *Journal of Finance*, forthcoming.

Sivadas, Eugene, and F. Robert Dwyer, 2000, An examination of organizational factors influencing new product success in internal and alliance-based processes, *Journal of Marketing* 64, 31–49.

Slovin, Myron, Marie E. Sushka, and Tomas P. Mantecon 2007, Analyzing joint ventures as corporate control activity, *Journal of Banking and Finance* 31, 2365–2382.

Spiegel, Matthew, and Heather Tookes, 2013, Dynamic competition, valuation, and merger activity, *Journal of Finance* 68, 125–172.

Yi, Sang-Seung, 1997, Stable coalition structures with externalities, *Games and Economic Behavior* 20, 201–237.

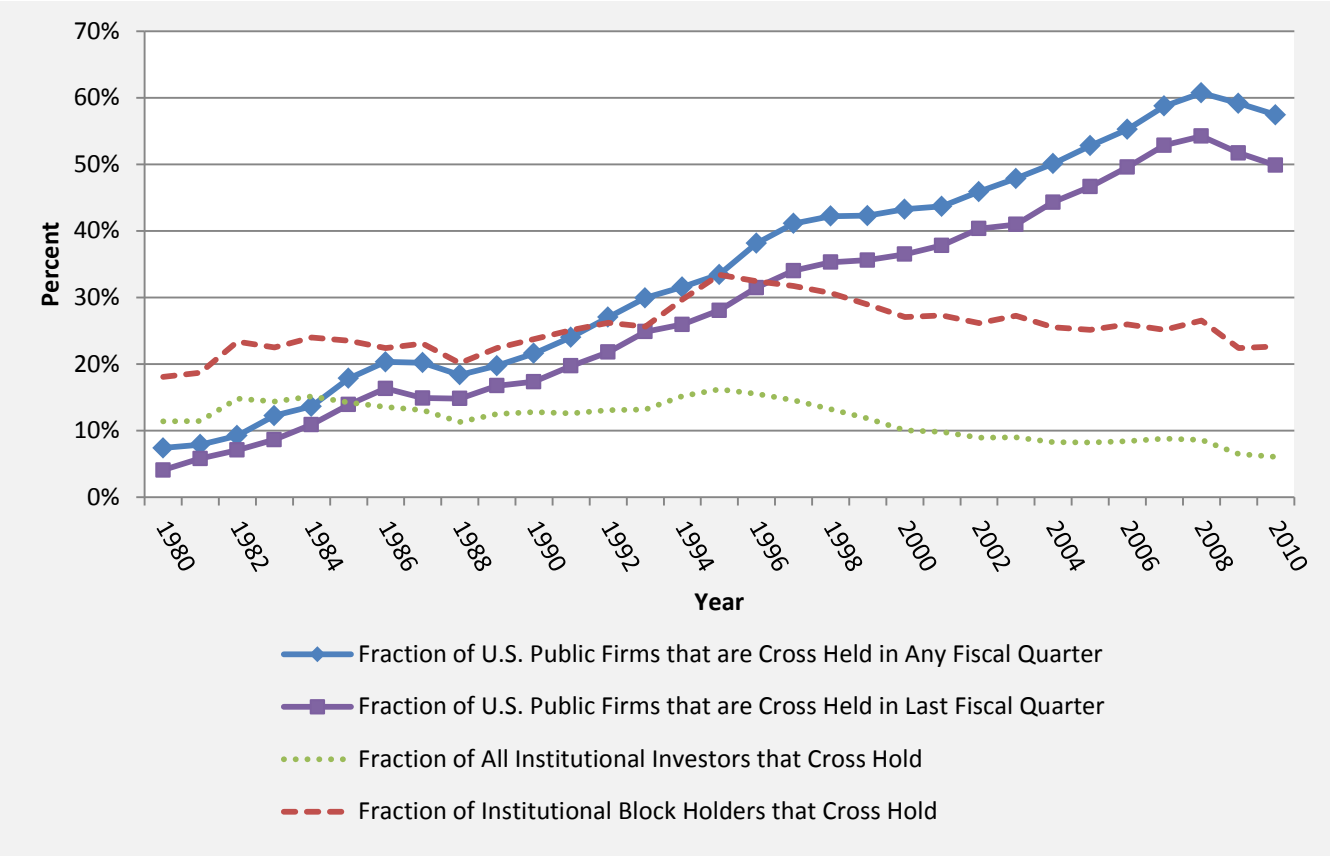

Fig. 1: Patterns of institutional cross-ownership over time. This figure plots the trend in cross-ownership by institutional investors from 1980 through 2010. The industry definition is 4-digit SIC codes. The blue line with diamonds shows the fraction of U.S. public firms that are cross-held by institutional investors in any quarter of the fiscal year. The purple line with squares shows the fraction of U.S. public firms that are cross-held by institutional investors in the last quarter of the fiscal year. The green dotted line represents the fraction of all U.S institutional investors that cross-hold same-industry firms in a given year. The red dashed line shows the fraction of institutional blockholders that cross-hold same-industry firms in a given year.

Table 1 Summary Statistics and Sample Characteristics

This table reports summary statistics based on the sample of U.S. public firms from 1980 to 2010. Panel A provides summary statistics. *CrossDummy* is a dummy variable that equals one if a firm is cross-held in any of the four quarters prior to the fiscal year end, and zero otherwise. *LnNumCross* is the natural logarithm of one plus the average number of unique institutions that cross-hold a firm in the four quarters prior to the fiscal year end. *AvgPercent* is the average percentage holding in same-industry rivals block-held by an average cross-holding institution. *LnAvgNum* is the natural logarithm of one plus the average number of rivals block-held by the cross-holding institutions during the fiscal year. *TotalCrossOwn* is the sum of all cross-holding institutions' average percentage holdings in a firm itself. $MktShareGrow_{t+1}$ is the difference between a firm's market share in the next year and that in the current year. Other variables include total assets (*Assets*), inflation-adjusted total assets in real 1982-1984 dollars (*AdjAssets*), Tobin's *Q* (*TobinQ*), cash and equivalents over assets (*CashAssets*), leverage (*Leverage*), return on assets (*ROA*), R&D capital scaled by book equity (*R&DCapital*), capital expenditures over assets (*CapexAssets*), acquisition expenditures over assets (*AcqAssets*), growth in property, plant, and equipment (*PPEGrowth*), the average percentage ownership by institutional blockholders (*BlockOwn*), the percentage ownership by institutional investors (*InstOwn*), a dummy to indicate whether a firm is block-held in any of the four quarters prior to the fiscal year end (*BlockDummy*), and the natural logarithm of one plus the number of initial 13D filings targeting the firm during the fiscal year (*LnNum13D*). Panel B summarizes the characteristics of cross-held and non-cross-held firm-years. Panel C presents the distribution of cross-held firms, non-cross-held but block-held firms, and non-block-held firms across the Fama-French 12 industries. ***, **, and * indicate that a two-sample t-test or a nonparametric median test is significant at 1%, 5%, and 10%, respectively.

Panel A: Summary statistics

Variable	Mean	P25	Median	P75	S.D.	N
CrossDummy	0.398	0.000	0.000	1.000	0.489	96,128
LnNumCross	0.338	0.000	0.000	0.693	0.441	96,128
AvgPercent	0.022	0.000	0.000	0.045	0.031	96,128
LnAvgNum	0.398	0.000	0.000	0.693	0.623	96,128
TotalCrossOwn	0.059	0.000	0.000	0.087	0.094	96,128
$MktShareGrow_{t+1}$	0.002	-0.002	0.000	0.003	0.066	96,128
Assets (in $ billions)	2.284	0.030	0.126	0.629	19.514	96,128
AdjAssets (in $ billions)	1.310	0.020	0.083	0.387	10.034	96,128
TobinQ	1.936	1.030	1.355	2.102	1.696	96,128
CashAssets	0.176	0.024	0.086	0.251	0.212	96,128
Leverage	0.173	0.006	0.120	0.282	0.185	96,128
ROA	0.057	0.028	0.106	0.166	0.221	96,128
R&DCapital	0.117	0.000	0.000	0.174	0.194	96,128
CapexAssets	0.064	0.020	0.042	0.080	0.069	96,128
AcqAssets	0.020	0.000	0.000	0.005	0.056	96,128
PPEGrowth	0.199	0.022	0.091	0.230	0.461	96,128
BlockOwn	0.102	0.000	0.067	0.163	0.115	96,128
InstOwn	0.344	0.098	0.286	0.551	0.276	92,914
BlockDummy	0.677	0.000	1.000	1.000	0.468	96,128
LnNum13D	0.089	0.000	0.000	0.000	0.255	52,783

Panel B: Characteristics of cross-held and non-cross-held firms

Variable	Cross-held		Non-cross-held			
	Mean (1)	Median (2)	Mean (3)	Median (4)	Difference (1)-(3)	Difference (2)-(4)
MktShareGrow$_{t+1}$	0.004	0.000	0.001	0.000	0.003***	0.000***
Assets	3.025	0.249	1.795	0.07	1.230***	0.179***
AdjAssets	1.626	0.148	1.101	0.049	0.525***	0.099***
TobinQ	1.902	1.388	1.961	1.341	-0.059***	0.047***
CashAssets	0.203	0.109	0.158	0.074	0.045***	0.035***
Leverage	0.169	0.110	0.176	0.128	-0.007***	-0.018***
ROA	0.070	0.108	0.052	0.106	0.018***	0.002*
R&DCapital	0.141	0.020	0.102	0.000	0.039***	0.020***
CapexAssets	0.061	0.040	0.065	0.044	-0.004***	-0.004***
AcqAssets	0.023	0.000	0.018	0.000	0.005***	0.000***
PPEGrowth	0.189	0.094	0.202	0.089	-0.013***	0.005***
BlockOwn	0.175	0.155	0.056	0.000	0.119***	0.155***
InstOwn	0.502	0.491	0.233	0.152	0.269***	0.339***
BlockDummy	1.000	1.000	0.490	0.000	0.510***	1.000***
LnNum13D	0.081	0.000	0.096	0.000	-0.015***	0.000***

Panel C: Distribution of cross-held and non-cross-held firms in industries

Fama-French 12 Industry	Fraction of Firm-years Across Industries		
	Cross-held	Non-cross block-held	Non block-held
Consumer Non-Durables	22.83%	45.86%	31.31%
Consumer Durables	32.01%	40.39%	27.59%
Manufacturing	34.10%	40.93%	24.97%
Energy	42.18%	19.92%	37.90%
Chemicals and Allied Products	25.45%	43.75%	30.80%
Business Equipment	54.77%	17.26%	27.97%
Telephone and Television Transmission	45.56%	25.80%	28.64%
Utilities	35.92%	21.94%	42.13%
Shops	37.93%	34.44%	27.63%
Healthcare, Medical Equipment, and Drugs	46.97%	19.47%	33.56%
Finance	41.61%	25.22%	33.17%
Other	38.14%	31.98%	29.88%

Table 2 Baseline Regression of Future Market Share Growth on Cross-Ownership

This table reports the OLS regression results of future market share growth on cross-ownership measures and other controls. *LnAssets* is the natural logarithm of total assets. Definitions of other variables are given in Table 1. Panel A reports baseline results using *CrossDummy* as the measure for cross-ownership. Panel B analyzes alternative measures for cross-ownership. *LastCrossDummy* is a dummy that equals one if a firm is cross-held in the last fiscal quarter. *AllCrossDummy* is a dummy that equals one if a firm is cross-held in all four quarters over the fiscal year. Panel C reports robustness test results for Panel A. Panel D decomposes cross-ownership into that held by activist institutions (i.e., those that filed at least one 13D during the past three years) and that by non-activist institutions, and compares their coefficients using a Wald test. Each regression includes a separate intercept. The estimations correct for error heteroskedasticity and within-firm error clustering. We report t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Baseline regressions

Dep. Variable	$MktShareGrow_{t+1}$			
	(1)	(2)	(3)	(4)
CrossDummy	0.004***	0.005***	0.005***	0.006***
	(5.903)	(5.782)	(6.144)	(4.856)
LnAssets		-0.002***	-0.001**	-0.001
		(-3.578)	(-2.141)	(-1.236)
TobinQ		0.001***	0.001***	0.001***
		(3.584)	(3.818)	(3.232)
CashAssets		0.002	0.003	0.003
		(1.056)	(1.358)	(1.150)
Leverage		0.001	0.001	0.004
		(0.532)	(0.439)	(1.159)
ROA		-0.001	-0.001	-0.002
		(-0.840)	(-0.646)	(-1.164)
R&DCapital		0.003	0.003	0.001
		(1.381)	(1.340)	(0.400)
CapexAssets		-0.007	-0.004	-0.019**
		(-1.272)	(-0.695)	(-2.522)
AcqAssets		0.026***	0.028***	0.024***
		(4.605)	(4.961)	(3.270)
PPEGrowth		0.003***	0.003***	0.003***
		(4.010)	(3.617)	(3.403)
BlockOwn		0.000	0.007	0.008
		(0.116)	(1.461)	(1.297)
InstOwn			-0.005	-0.008*
			(-1.449)	(-1.748)
BlockDummy			-0.002***	-0.003**
			(-2.691)	(-2.380)
LnNum13D				0.003**
				(2.249)
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes

Observations	96,128	96,128	92,914	52,288
R-squared	0.104	0.105	0.105	0.130

Panel B: Alternative measures of cross-ownership

Dep. Variable	*MktShareGrow*$_{t+1}$					
	(1)	(2)	(3)	(4)	(5)	(6)
LnNumCross	0.007***					
	(4.809)					
AvgPercent		0.063***				
		(3.811)				
LnAvgNum			0.002***			
			(3.277)			
TotalCrossOwn				0.027***		
				(4.204)		
LastCrossDummy					0.003***	
					(2.784)	
AllCrossDummy						0.003**
						(2.237)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,288	52,288	52,288	52,288	52,288	52,288
R-squared	0.130	0.129	0.129	0.130	0.129	0.129

Panel C: Robustness tests

Dep. Var.	*MktShareGrow*$_{t,t+1}$ (*or MktShareGrow*$_{t,t+3}$ in Model (8))							
	FIC500	Manu	Refine	Drop5	Block	SP500	Alter	3-year
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CrossDummy	0.007***	0.006***	0.006***	0.003***	0.007***	0.013***	0.052***	0.013***
	(4.232)	(3.375)	(3.223)	(2.653)	(4.743)	(3.194)	(3.939)	(3.937)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42,974	24,298	26,235	43,237	41,565	7,782	51,609	37,292
R-squared	0.090	0.132	0.141	0.216	0.142	0.092	0.166	0.294

Panel D: Activist institutions

Dep. Variable	$MktShareGrow_{t+1}$				
	(1)	(2)	(3)	(4)	(5)
CrossDummy_13D	0.005***				
	(3.327)				
CrossDummy_Non13D	0.002				
	(1.031)				
LnNumCross_13D		0.006***			
		(2.922)			
LnNumCross_Non13D		0.002			
		(1.101)			
AvgPercent_13D			0.069***		
			(3.219)		
AvgPercent_Non13D			-0.010		
			(-0.488)		
LnAvgNum_13D				0.003***	
				(2.976)	
LnAvgNum_Non13D				-0.001	
				(-0.537)	
TotalCrossOwn_13D					0.047***
					(2.931)
TotalCrossOwn_Non13D					0.013
					(1.096)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Observations	40,310	40,310	40,310	40,310	40,310
R-squared	0.141	0.141	0.141	0.141	0.141
Wald-test F-stat	3.477	2.841	8.741	6.595	4.385
p-value	0.062	0.092	0.003	0.010	0.036

Table 3 Regression of Other Performance Measures on Cross-Ownership

This table reports the OLS regression results of one-year-ahead abnormal stock performance and industry-adjusted operating performance (profit margins) on cross-ownership measures and other controls. We use buy-and-hold abnormal returns (*BHAR*) and cumulative abnormal returns (*CAR*) obtained using the Fama-French-Carhart four-factor model to measure abnormal stock performance. *NOP* is the industry-adjusted net operating profitability (net income before extraordinary items and discontinued operations, plus tax expense and interest expense net of interest income, divided by sales). *NPM* is the industry-adjusted net profit margin (net income before extraordinary items and discontinued operations divided by sales). *OPMBD* is the industry-adjusted operating profit margin before depreciation (operating income before depreciation divided by sales). Each regression includes a separate intercept and the same set of control variables as in Column (4) of Table 2, Panel A. The estimations correct for error heteroskedasticity and within-firm error clustering. We report t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Variable	$BHAR_{t+1}$	CAR_{t+1}	NOP_{t+1}	NPM_{t+1}	$OPMBD_{t+1}$
	(1)	(2)	(3)	(4)	(5)
CrossDummy	0.041***	0.020**	0.008**	0.007**	0.004*
	(2.604)	(2.137)	(2.176)	(2.340)	(1.942)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Observations	51,774	52,005	51,769	51,769	51,691
R-squared	0.225	0.233	0.634	0.640	0.685

Table 4 The Quasi-natural Experiment of Institution Mergers

This table reports the baseline difference-in-differences (DiD) test results on how exogenous shocks to a firm's cross-ownership (due to institution mergers) affect its future product market performance. The treatment firms are those block-held by one of the merging institutions but not cross-held by either merging institution during the last quarter before the merger date, while during the same pre-merger quarter, the other party of the merger block-holds at least one other same-industry stock. The control firms for each merger-institution pair are those also block-held by the same institution (that holds the treatment) but not cross-held by either merging institutions during the last quarter before the merger date. We further require both groups to have non-missing Compustat records for a symmetric seven-year window around the merger year. We drop the event (merger) year in our analysis and examine the average market share growth (*AvgMktShareGrow*) for treatments and controls during a six-year window (i.e., three years before and three years after the merger). We measure control variables at year -4 for the pre-merger period and at year 0 for the post-merger period. *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. Definitions of other variables are given in Table 1. Each regression has a separate intercept. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Variable	*AvgMktShareGrow*			
	(1)	(2)	(3)	(4)
*Treat * Post*	0.014*	0.023**	0.024***	0.023***
	(1.942)	(2.579)	(2.624)	(2.638)
Post	-0.004	-0.001	-0.001	-0.002
	(-1.112)	(-0.118)	(-0.212)	(-0.337)
Treat			-0.039	-0.020
			(-0.954)	(-0.559)
LnAssets		-0.010	-0.012*	-0.009
		(-1.365)	(-1.669)	(-1.227)
TobinQ		0.003	0.004	0.004
		(0.658)	(0.774)	(0.902)
CashAssets		0.024	0.010	0.011
		(0.622)	(0.263)	(0.303)
Leverage		0.037	0.027	0.030
		(1.609)	(1.186)	(1.308)
ROA		0.001	-0.000	0.002
		(0.024)	(-0.016)	(0.057)
R&DCapital		0.027	0.014	0.017
		(0.707)	(0.351)	(0.428)
CapexAssets		0.061	0.025	0.043
		(0.786)	(0.330)	(0.562)
AcqAssets		-0.187***	-0.181***	-0.180***
		(-3.492)	(-3.556)	(-3.430)
PPEGrowth		0.008	0.011	0.009
		(0.655)	(0.812)	(0.679)
BlockOwn		0.018	0.040	0.039
		(0.453)	(1.020)	(0.994)

InstOwn		-0.014	-0.018	-0.018
		(-0.449)	(-0.604)	(-0.594)
BlockDummy		-0.014	-0.012	-0.016
		(-1.005)	(-0.942)	(-1.201)
Firm*Merger FEs	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Merger FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	1,354	1,223	1,223	1,223
R-squared	0.434	0.477	0.440	0.453

Table 5 Robustness Tests for the Difference-in-differences Analysis of Institution Mergers

This table reports the results of robustness tests for the difference-in-differences (DiD) analysis of institution mergers. Panel A reports the results of robustness DiD tests that define control firms as the same-industry rivals (as the treatments) not cross-held by the merging institutions during the quarter before the merger and those that are block-held by some non-merging institutions during that quarter. Panel B uses the baseline DiD sample (as in Table 4) but adopts the same regression framework as in the baseline OLS analysis (in Table 2) by considering the year-by-year variation in market share growth for treatment and control firms during the three years before and three years after the event. In this analysis, the control variables are lagged by one year than the market share growth. Panel C follows the specifications in Table 4 but uses a propensity-score-matched sample of treatment and control firms (with the matching done in year -4). *Treat* is a dummy variable that equals one if a firm is a treatment stock and zero if it is a control. *Post* is a dummy that equals one for the post-event period and zero for the pre-event period. All other variables are defined in Table 1. Each regression has a separate intercept. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Defining control firms as same-industry rivals block-held by non-merging institutions

Dep. Variable	*AvgMktShareGrow*			
	(1)	(2)	(3)	(4)
*Treat * Post*	0.022***	0.019***	0.019***	0.019***
	(3.488)	(2.751)	(2.835)	(2.932)
Post	0.001	0.003	0.002	0.002
	(1.467)	(1.594)	(1.116)	(1.568)
Treat			-0.006	-0.007
			(-0.690)	(-0.757)
Controls	No	Yes	Yes	Yes
Firm*Merger FEs	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Merger FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	4,392	3,261	3,261	3,261
R-squared	0.527	0.548	0.369	0.409

Panel B: Maintaining the baseline regression framework and considering the year-by-year variation

Dep. Variable	$MktShareGrow_{t+1}$			
	(1)	(2)	(3)	(4)
*Treat * Post*	0.022***	0.027***	0.027***	0.031**
	(2.767)	(3.220)	(3.263)	(2.554)
Post	-0.002	-0.002	-0.000	0.001
	(-0.127)	(-0.199)	(-0.020)	(0.107)
Treat			-0.052**	-0.042***
			(-2.161)	(-2.807)
Controls	No	Yes	Yes	Yes
Firm*Merger FEs	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Merger FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Observations	4,515	4,465	4,465	4,465
R-squared	0.141	0.146	0.133	0.274

Panel C: Baseline DiD tests on the propensity-score-matched sample

Dep. Variable	*AvgMktShareGrow*			
	(1)	(2)	(3)	(4)
*Treat * Post*	0.026**	0.027**	0.027**	0.027**
	(2.314)	(2.121)	(2.162)	(2.162)
Post	-0.015*	-0.001	-0.001	-0.001
	(-1.664)	(-0.138)	(-0.142)	(-0.142)
Treat			-0.131	-0.131
			(-1.370)	(-1.370)
Controls	No	Yes	Yes	Yes
Firm*Merger FEs	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Merger FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	294	293	293	293
R-squared	0.493	0.530	0.530	0.530

Table 6 Possible Sources of Product Market Gains

This table reports test results on sources of product market gains induced by cross-ownership. Panel A presents the DiD results on same-industry joint ventures, strategic alliances, and acquisitions among firms cross-held by the same institution. Panel B presents the DiD results on interlocking boards among firms cross-held by the same institution. Panel C presents the DiD results on innovation productivity. Panel D presents the DiD results on industry-adjusted price-cost margin. All dependent variables are measured during a three-year period before or after the merger year. Control variables are measured at year -4 for the pre-merger period and at year 0 for the post-merger period. *LnNumSame* is the log number of total same-industry joint ventures, strategic alliances, and acquisitions (including asset sales) a given firm makes with other cross-held firms by the same institution. *FracInterlock* is the average fraction of a given firm's board of directors who simultaneously sit on the boards of other same-industry firms cross-held by the same institution. *PatentLagRD* is the number of patents generated in a year over the total amount of R&D expenditures in the previous year. *NOP* is the industry-adjusted net operating profitability (net income before extraordinary items and discontinued operations, plus tax expense and interest expense net of interest income, divided by sales). *NPM* is the industry-adjusted net profit margin (net income before extraordinary items and discontinued operations divided by sales). *OPMBD* is the industry-adjusted operating profit margin before depreciation (operating income before depreciation divided by sales). Definitions of other variables are given in Table 1. Each regression has a separate intercept and different layers of fixed effects depending on model specifications. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Same-industry joint ventures, strategic alliances, and acquisitions

Dep. Variable	*LnNumSame*			
	(1)	(2)	(3)	(4)
*Treat * Post*	0.030***	0.033***	0.033***	0.033***
	(2.714)	(2.786)	(2.917)	(2.889)
Post	-0.002	-0.002	-0.002	-0.002
	(-0.738)	(-0.548)	(-0.593)	(-0.562)
Treat			-0.018	-0.019
			(-0.585)	(-0.479)
TobinQ		-0.003	-0.003	-0.003
		(-1.065)	(-1.056)	(-1.078)
PPEAssets		0.021	0.020	0.021
		(1.002)	(1.020)	(1.028)
CashAssets		0.018	0.017	0.017
		(0.673)	(0.711)	(0.704)
LnAssets		-0.004	-0.003	-0.003
		(-0.611)	(-0.589)	(-0.602)
ROA		0.027	0.026	0.026
		(0.856)	(0.875)	(0.868)
Leverage		-0.044**	-0.042**	-0.043**
		(-2.129)	(-2.155)	(-2.165)
BlockOwn		-0.010	-0.010	-0.010
		(-0.313)	(-0.347)	(-0.346)
InstOwn		0.003	0.003	0.003
		(0.112)	(0.135)	(0.115)

BlockDummy		0.012	0.012	0.012
		(1.189)	(1.204)	(1.194)
Firm*Merger FEs	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Merger FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	1,354	1,287	1,287	1,287
R-squared	0.502	0.511	0.510	0.510

Panel B: Interlocking board

Dep. Variable	*FracInterlock*			
	(1)	(2)	(3)	(4)
*Treat * Post*	0.010***	0.010***	0.010***	0.010***
	(3.298)	(3.126)	(3.229)	(3.193)
Post	-0.001	-0.002	-0.002	-0.002
	(-0.962)	(-1.369)	(-1.542)	(-1.541)
Controls in Panel A	No	Yes	Yes	Yes
Firm*Merger FEs	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Merger FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	1,118	1,066	1,066	1,066
R-squared	0.736	0.738	0.724	0.725

Panel C: Innovation productivity

Dep. Variable	*PatentLagRD*		*R&DCapital*	
	(1)	(2)	(3)	(4)
*Treat * Post*	0.094**	0.091**	0.018**	0.019**
	(2.167)	(1.988)	(2.062)	(2.236)
Post	-0.036***	-0.052***	0.007**	0.003
	(-3.066)	(-2.999)	(2.127)	(0.671)
Controls in Panel A	No	Yes	No	Yes
Firm*Merger FEs	Yes	Yes	Yes	Yes
Observations	1,322	1,255	1,354	1,287
R-squared	0.792	0.796	0.919	0.921

Panel D: Price cost margin

Dep. Variable	*NOP*		*NPM*		*OPMBD*	
	(1)	(2)	(3)	(4)	(5)	(6)
*Treat * Post*	0.060*	0.068**	0.049	0.055*	0.048*	0.060**
	(1.934)	(2.144)	(1.588)	(1.755)	(1.652)	(1.991)
Post	0.008	-0.002	0.004	-0.006	0.002	-0.004
	(0.685)	(-0.184)	(0.306)	(-0.490)	(0.173)	(-0.325)
MktShareGrow		0.126		0.166*		0.087

		(1.340)		(1.787)		(0.974)
R&DCapital		0.014		0.034		0.041
		(0.130)		(0.332)		(0.412)
CapexAssets		-0.066		-0.081		-0.077
		(-0.386)		(-0.478)		(-0.475)
AcqAssets		0.067		0.034		-0.043
		(0.586)		(0.305)		(-0.398)
PPEGrowth		-0.065***		-0.057***		-0.035*
		(-3.332)		(-2.972)		(-1.923)
Controls in Panel A	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Merger FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,287	1,223	1,287	1,223	1,287	1,223
R-squared	0.738	0.753	0.713	0.727	0.744	0.760

Table 7 Stock Returns Tests

Panel A reports the average cumulative abnormal returns of various groups of stocks surrounding the filing of an initial 13D form on a newly acquired block by an institution. "Cross-held Blocks (Same Institution)" are stocks already blockheld by the 13D-filing institution that are in the same industry as the newly acquired block. "Non-cross-held Blocks (Same Institution)" are stocks already blockheld by the 13D-filing institution that are not in the same industry as the newly acquired block. "Rival Blocks (Different Institution)" are stocks blockheld by institutions other than the 13D-filing institution that are in the same industry as the newly acquired block. "Corporate Customers of Cross-held Firms" are stocks of the corporate customers of the cross-held firms, identified using the Compustat industry segment file. Panel B reports the average cumulative abnormal returns of treatment and control stocks in our institution merger sample surrounding the announcement of the mergers. For both panels, we use a 12-day event window, from day -1 to +10, with day 0 as the filing/announcement date. We adjust the returns using the CAPM and the Fama-French-Carhart four-factor model. T-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Average CARs around initial Schedule 13D filings

	CAPM Alpha	*Fama-French-Carhart Four-factor Alpha*
	(1)	(2)
CARs of Cross-held Blocks (Same Institution) (1)	0.018***	0.024***
	(2.598)	(3.011)
CARs of Non-cross-held Blocks (Same Institution) (2)	0.002*	0.002
	(1.784)	(0.999)
CARs of Rival Blocks (Different Institution) (3)	0.002	0.002*
	(1.569)	(2.070)
CARs of Corporate Customers of Cross-held Firms (4)	0.008	0.009
	(1.65)	(1.49)
Difference (1 – 2)	0.016**	0.023***
	(2.274)	(2.936)
Difference (1 – 3)	0.016*	0.022**
	(1.884)	(2.101)
Difference (1 – 4)	0.011	0.015
	(0.819)	(1.010)

Panel B: Average CARs around institution mergers

	CAPM Alpha	*Fama-French-Carhart Four-factor Alpha*
	(1)	(2)
CARs of Treatment Stocks (1)	0.031**	0.025**
	(2.412)	(2.005)
CARs of Control Stocks (2)	0.007*	-0.001
	(1.774)	(0.204)
Difference (1 – 2)	0.024**	0.025**
	(2.051)	(2.220)